
**MALLA REDDY COLLEGE OF ENGINEERING & TECHNOLOGY**
**(Autonomous Institution – UGC, Govt. of India)**
**Sponsored by CMR Educational Society**
(Affiliated to JNTU, Hyderabad, Approved by AICTE - Accredited by NBA & NAAC – 'A' Grade - ISO 9001:2015 Certified)
Maisammaguda, Dhulapally (Post Via. Kompally), Secunderabad – 500100, Telangana State, India.
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# BACHELOR OF TECHNOLOGY
# AERONAUTICAL ENGINEERING

# ACADEMIC REGULATIONS
## (Batches admitted from the academic year 2017 - 2018)

*Note: The regulations hereunder are subject to amendments as may be made by the Academic Council of the College from time to time. Any or all such amendments will be effective from such date and to such batches of candidates (including those already pursuing the program) as may be decided by the Academic Council.*

## PRELIMINARY DEFINITIONS AND NOMENCLATURES

- ”Autonomous Institution /College” means an institution/college designated as autonomous institute / college by University Grants Commission (UGC), as per the UGC Autonomous College Statutes.
- “Academic Autonomy” means freedom to a College in all aspects of conducting its academic programs, granted by the University for promoting excellence.
- “Commission” means University Grants Commission.
- “AICTE” means All India Council for Technical Education.
- “University” the Jawaharlal Nehru Technological University, Hyderabad.
- “College” means Malla Reddy College of Engineering & Technology, Secunderabad unless indicated otherwise by the context.
- “Program” means:
  - Bachelor of Technology (B.Tech) degree program
  - UG Degree Program: B.Tech
- “Branch” means specialization in a program like B.Tech degree program in Electronics & Communication Engineering, B.Tech degree program in Computer Science and Engineering etc.
- “Course” or “Subject” means a theory or practical subject, identified by its course – number and course-title, which is normally studied in a semester.
- T–Tutorial, P–Practical, D–Drawing, L-Theory, C-Credits

**FOREWORD**

The autonomy is conferred on Malla Reddy College of Engineering & Technology (MRCET) by UGC based on its performance as well as future commitment and competency to impart quality education. It is a mark of its ability to function independently in accordance with the set norms of the monitoring bodies like UGC and AICTE. It reflects the confidence of the UGC in the autonomous institution to uphold and maintain standards it expects to deliver on its own behalf and thus awards degrees on behalf of the college. Thus, an autonomous institution is given the freedom to have its own curriculum, examination system and monitoring mechanism, independent of the affiliating University but under its observance.

Malla Reddy College of Engineering & Technology (MRCET) is proud to win the credence of all the above bodies monitoring the quality of education and has gladly accepted the responsibility of sustaining, and also improving upon the values and beliefs for which it has been striving for more than a decade in reaching its present standing in the arena of contemporary technical education. As a follow up, statutory bodies like Academic Council and Boards of Studies are constituted with the guidance of the Governing Body of the College and recommendations of the JNTU Hyderabad to frame the regulations, course structure and syllabi under autonomous status.

The autonomous regulations, course structure and syllabi have been prepared after prolonged and detailed interaction with several experts drawn from academics, industry and research, in accordance with the vision and mission of the college which reflects the mindset of the institution in order to produce quality engineering graduates to the society.

All the faculty, parents and students are requested to go through all the rules and regulations carefully. Any clarifications, if needed, are to be sought at appropriate time and with principal of the college, without presumptions, to avoid unwanted subsequent inconveniences and embarrassments. The Cooperation of all the stake holders is sought for the successful implementation of the autonomous system in the larger interests of the institution and brighter prospects of engineering graduates.

***"A thought beyond the horizons of success committed for educational excellence"***

**PRINCIPAL**

# MALLA REDDY COLLEGE OF ENGINEERING & TECHNOLOGY

## (Autonomous Institution – UGC, Govt. of India)

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**VISION**

- To establish a pedestal for the integral innovation, team spirit, originality and competence in the students, expose them to face the global challenges and become technology leaders of Indian vision of modern society.

**MISSION**

- To become a model institution in the fields of Engineering, Technology and Management.
- To impart holistic education to the students to render them as industry ready engineers.
- To ensure synchronization of MRCET ideologies with challenging demands of International Pioneering Organizations.

**QUALITY POLICY**

- To implement best practices in Teaching and Learning process for both UG and PG courses meticulously.
- To provide state of art infrastructure and expertise to impart quality education.
- To groom the students to become intellectually creative and professionally competitive.
- To channelize the activities and tune them in heights of commitment and sincerity, the requisites to claim the never ending ladder of SUCCESS year after year.

**For more information: www.mrcet.ac.in**

## PRE-REQUISITES FOR CORE ELECTIVES

| Core Elective Number | Subject Code | Title of the Subject | Pre-Requisite Subject Code | Pre-Requisite Subject Title |
|---|---|---|---|---|
| 1 | R17A0327 | Composite Materials | R17A2103 | Aircraft materials and Production Technology |
| | R17A0365 | Mechanisms and Mechanical Design | R17A0301 | Engineering Mechanics |
| | R17A0367 | Experimental Stress Analysis | R17A0301<br>R17A0363<br>R17A2105 | Engineering Mechanics<br>Mechanics of Solids<br>Aerospace vehicle structures - I |
| 2 | R17A2117 | Wind Tunnel techniques | R17A2104 | Aerodynamics |
| | R17A2118 | Air transportation Systems | R17A2101 | Introduction to Aerospace Engineering |
| | R17A2119 | Space Mechanics | R17A2101 | Introduction to Aerospace Engineering |
| 3 | R17A2123 | Aircraft Maintenance Engineering | R17A2115 | Aircraft Systems |
| | R17A2124 | Flight Scheduling Operations | R17A0022 | Mathematics-II |
| | R17A2125 | Civil Aviation Rules and Regulations | R17A2101 | Introduction to Aerospace Engineering |
| 4 | R17A0323 | CAD/CAM | R17A2103 | Aircraft materials and Production Technology |
| | R17A2126 | Hypersonic Aerodynamics | R17A2109 | High Speed Aerodynamics |
| | R17A2127 | Analysis of composite structures | R17A0363<br>R17A2105<br>R17A2110 | Mechanics of Solids<br>Aerospace vehicle structures – I<br>Aerospace Vehicle Structures -II |
| 5 | R17A2128 | Helicopter Engineering | R17A2104 | Aerodynamics |
| | R17A2129 | Advanced Computational Aerodynamics | R17A2119 | Computational Aerodynamics |
| | R17A0321 | Heat Transfer | R17A0364 | Thermodynamics |
| 6 | R17A2130 | Aeroelasticity | R17A2104<br>R17A2110 | Aerodynamics<br>Aerospace Vehicle Structures -II |
| | R17A0370 | Fatigue and Fracture Mechanics | R17A0368 | Mechanical Vibrations & Structural Dynamics |
| | R17A2131 | Airport Management | R17A2101 | Introduction to Aerospace Engineering |

# DEPARTMENT OF AERONAUTICAL ENGINEERING

**VISION**

Department of Aeronautical Engineering aims to be indispensable source in Aeronautical Engineering which has a zeal to provide the value driven platform for the students to acquire knowledge and empower themselves to shoulder higher responsibility in building a strong nation.

**MISSION**

a) The primary mission of the department is to promote engineering education and research.

(b) To strive consistently to provide quality education, keeping in pace with time and technology.

(c) Department passions to integrate the intellectual, spiritual, ethical and social development of the students for shaping them into dynamic engineers.

# PROGRAMME EDUCATIONAL OBJECTIVES (PEOs)

| |
|---|
| **PEO1: PROFESSIONALISM & CITIZENSHIP**<br><br>To create and sustain a community of learning in which students acquire knowledge and learn to apply it professionally with due consideration for ethical, ecological and economic issues. |
| **PEO2: TECHNICAL ACCOMPLISHMENTS**<br><br>To provide knowledge based services to satisfy the needs of society and the industry by providing hands on experience in various technologies in core field. |
| **PEO3: INVENTION, INNOVATION AND CREATIVITY**<br><br>To make the students to design, experiment, analyze, interpret in the core field with the help of other multi disciplinary concepts wherever applicable. |
| **PEO4: PROFESSIONAL DEVELOPMENT**<br><br>To educate the students to disseminate research findings with good soft skills and become a successful entrepreneur. |
| **PEO5: HUMAN RESOURCE DEVELOPMENT**<br><br>To graduate the students in building national capabilities in technology, education and research. |

## PROGRAM SPECIFIC OBJECTIVES (PSOs)

To mould students to become a professional with all necessary skills, personality and sound knowledge in basic and advance technological areas.

1. To promote understanding of concepts and develop ability in design manufacture and maintenance of aircraft, aerospace vehicles and associated equipment and develop application capability of the concepts sciences to engineering design and processes.
2. Understanding the current scenario in the field of aeronautics and acquire ability to apply knowledge of engineering, science and mathematics to design and conduct experiments in the field of Aeronautical Engineering.
3. To develop leadership skills in our students necessary to shape the social, intellectual, business and technical worlds.

# PROGRAM OUTCOMES
# (POs)

**Engineering Graduates will be able to:**

1. **Engineering knowledge**: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
2. **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.
3. **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.
4. **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.
5. **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.
6. **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.
7. **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.
8. **Ethics**: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
9. **Individual and team work**: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
10. **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.
11. **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 multi disciplinary environments.
12. 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.

**DEPARTMENT OF AERONAUTICAL ENGINEERING**

**COURSE STRUCTURE**

## I Year B. Tech (ANE) – I Semester

| S.NO | SUBJECT CODE | SUBJECT | L | T/P/D | C | MAX.MARKS | |
|---|---|---|---|---|---|---|---|
| | | | | | | Int | Ext |
| 1 | R17A0001 | ENGLISH | 2 | | 2 | 30 | 70 |
| 2 | R17A0021 | MATHEMATICS-I | 4 | 1 | 4 | 30 | 70 |
| 3 | R17A0011 | ENGINEERING PHYSICS-I | 2 | 1 | 2 | 30 | 70 |
| 4 | R17A0014 | ENVIRONMENTAL STUDIES | 3 | | 3 | 30 | 70 |
| 5 | R17A0501 | COMPUTER PROGRAMMING WITH C | 3 | | 3 | 30 | 70 |
| 6 | R17A0301 | ENGINEERING MECHANICS | 4 | 1 | 4 | 30 | 70 |
| 7 | R17A0581 | COMPUTER PROGRAMMING LAB | - | 3 | 2 | 25 | 50 |
| 8 | R17A0084 | IT WORKSHOP /ENGINEERING WORKSHOP | - | 3 | 2 | 25 | 50 |
| 9 | R17A0081 | ENGLISH LANGUAGE COMMUNICATION SKILLS LAB-I | - | 3 | 2 | 25 | 50 |
| *10 | R17A0003 | *HUMAN VALUES AND SOCIETAL PERSPECTIVES | 2 | - | - | 50 | - |
| | | **TOTAL** | **20** | **12** | **24** | **305** | **570** |

***Mandatory course: Non-credit subject, 50% of scoring is required for the award of the degree**

## I Year B. Tech (ANE) – II Semester

| S.NO | SUBJECT CODE | SUBJECT | L | T/P/D | C | MAX.MARKS | |
|---|---|---|---|---|---|---|---|
| | | | | | | Int | Ext |
| 1 | R17A0002 | PROFESSIONAL ENGLISH | 2 | | 2 | 30 | 70 |
| 2 | R17A0022 | MATHEMATICS-II | 4 | 1 | 4 | 30 | 70 |
| 3 | R17A0012 | ENGINEERING PHYSICS-II | 2 | 1 | 2 | 30 | 70 |
| 4 | R17A0013 | ENGINEERING CHEMISTRY | 3 | | 3 | 30 | 70 |
| 5 | R17A0502 | OBJECT ORIENTED PROGRAMMING THROUGH C++ | 3 | 1 | 3 | 30 | 70 |
| 6 | R17A0302 | ENGINEERING DRAWING | 4 | -3- | 4 | 30 | 70 |
| 7 | R17A0582 | OBJECT ORIENTED PROGRAMMING THROUGH C++ LAB | - | 3 | 2 | 25 | 50 |
| 8 | R17A0083 | ENGINEERING PHYSICS/ENGINEERING CHEMISTRY LAB | - | 3 | 2 | 25 | 50 |
| 9 | R17A0082 | ENGLISH LANGUAGE COMMUNICATION SKILLS LAB-II | - | 3 | 2 | 25 | 50 |
| | | **TOTAL** | **18** | **15** | **24** | **255** | **570** |

**II Year B. Tech (AE) – I Semester (6 Core Subjects + 2 Labs+1 Mandatory Course)**

| S.NO. | SUBJECT CODE | SUBJECT | L | T/P/D | C | MAX MARKS | |
|---|---|---|---|---|---|---|---|
| | | | | | | INT | EXT |
| 1 | R17A0362 | Mechanics Of Fluids | 4 | 1 | 4 | 30 | 70 |
| 2 | R17A0363 | Mechanics Of Solids | 3 | 1 | 3 | 30 | 70 |
| 3 | R17A0364 | Thermodynamics | 4 | - | 4 | 30 | 70 |
| 4 | R17A2101 | Introduction to Aerospace Engineering | 3 | - | 3 | 30 | 70 |
| 5 | R17A2103 | Aircraft Materials & Production Technology | 3 | 1 | 3 | 30 | 70 |
| 6 | R17A0206 | Electrical and Electronics Engineering | 3 | 1 | 3 | 30 | 70 |
| 7 | R17A0384 | MOS and MOF Lab | - | 3 | 2 | 25 | 50 |
| 8 | R17A0282 | Electrical and Electronics Engineering lab | - | 3 | 2 | 25 | 50 |
| *9 | R17A0006 | Gender Sensitization* | 3 | - | - | 50 | - |
| **Total** | | | **23** | **10** | **24** | **280** | **520** |

***Mandatory course: Non-credit course, 40% of scoring in Gender Sensitization is required for the award of the degree**

**II Year B. Tech (AE) – II Semester (5 Core Subjects + 1 Open Elective + 2 Labs+1 mandatory course)**

| S.NO. | SUBJECT CODE | SUBJECT | L | T/P/D | C | MAX MARKS | |
|---|---|---|---|---|---|---|---|
| | | | | | | INT | EXT |
| 1 | R17A2104 | Aerodynamics | 3 | 1 | 3 | 30 | 70 |
| 2 | R17A2105 | Aerospace Vehicle Structures -I | 4 | 1 | 4 | 30 | 70 |
| 3 | R17A2106 | Air Breathing propulsion | 3 | 1 | 3 | 30 | 70 |
| 4 | R17A2107 | Aircraft Performance | 4 | 1 | 4 | 30 | 70 |
| 5 | R17A0061 | Managerial Economics and Financial Analysis | 3 | 1 | 3 | 30 | 70 |
| 6 | | Open Elective – I | 3 | - | 3 | 30 | 70 |
| 7 | R17A2181 | Aircraft Materials & Production Lab | - | 3 | 2 | 25 | 50 |
| 8 | R17A2182 | AED with CAD LAB | - | 3 | 2 | 25 | 50 |
| *9 | R17A0004<br>R17A0005 | Foreign Language : French<br>Foreign Language : German | 2 | - | - | 50 | - |
| **Total** | | | **22** | **11** | **24** | **280** | **520** |

***Mandatory course: Non-credit course, 50% of scoring is required for the award of the degree**

**OPEN ELECTIVE – I**

| | |
|---|---|
| R17A0451 | Digital Electronics |
| R17A0251 | Fundamentals of Electrical Machines |
| R17A0551 | Database Systems |
| R17A0351 | Elements of Mechanical Engineering |
| R17A0352 | Green Energy systems |
| R17A0051 | Intellectual Property Rights |

**III Year B. Tech (AE) – I Semester (4 Core Subjects+1 Core Elective+1 Open Elective+2 Labs)**

| S.NO. | SUBJECT CODE | SUBJECT | L | T/P/D | C | MAX MARKS | |
|---|---|---|---|---|---|---|---|
| | | | | | | INT | EXT |
| 1 | R17A2108 | Advanced Propulsion systems | 3 | 1 | 4 | 30 | 70 |
| 2 | R17A2109 | High Speed Aerodynamics | 3 | 1 | 4 | 30 | 70 |
| 3 | R17A2110 | Aerospace Vehicle Structures -II | 3 | 0 | 3 | 30 | 70 |
| 4 | R17A2111 | Aircraft Stability And Control | 3 | 0 | 3 | 30 | 70 |
| 5 | R17A0325<br>R17A0365<br>R17A0367 | **Core Elective – I**<br>Composite Materials<br>Mechanisms and Mechanical Design<br>Experimental Stress Analysis | 3 | 0 | 3 | 30 | 70 |
| 6 | | **Open Elective – II** | 3 | - | 3 | 30 | 70 |
| 7 | R17A2183 | Aerodynamics and Propulsion Lab | - | 3 | 2 | 25 | 50 |
| 8 | R17A2184 | Aerospace Structures Lab | - | 3 | 2 | 25 | 50 |
| **Total** | | | **18** | **8** | **24** | **230** | **520** |

**OPEN ELECTIVE – II**

| | |
|---|---|
| R17A0452 | Industrial Electronics |
| R17A0453 | Communication Networks |
| R17A0552 | Introduction to JAVA Programming |
| R17A1251 | Introduction to Scripting Languages |
| R17A1252 | Software Project Management |
| R17A0353 | Enterprise Resource Planning |

**III Year B. Tech (AE) – II Semester (4 Core Subjects+1 Core Elective+1 Open Elective+2 Labs+1 Mandatory course)**

| S.NO. | SUBJECT CODE | SUBJECT | L | T/P/D | C | MAX MARKS | |
|---|---|---|---|---|---|---|---|
| | | | | | | INT | EXT |
| 1 | R17A2112 | Finite Element Analysis | 3 | 1 | 4 | 30 | 70 |
| 2 | R17A2113 | Control Theory for Aircraft | 3 | 1 | 4 | 30 | 70 |
| 3 | R17A2114 | Flight Vehicle Design | 3 | 0 | 3 | 30 | 70 |
| 4 | R17A2115 | Aircraft Systems | 3 | 0 | 3 | 30 | 70 |
| 5 | R17A2116<br>R17A2117<br>R17A2118 | **Core Elective – II**<br>Wind Tunnel techniques<br>Air Transportation Systems<br>Space Mechanics | 3 | 0 | 3 | 30 | 70 |
| 6 | | **Open Elective – III** | 3 | - | 3 | 30 | 70 |
| *7 | R17A0007 | Technical Communication And Soft Skills | 2 | - | - | 50 | - |
| 8 | R17A2185 | Flight Vehicle Design and Instrumentation Lab | - | 3 | 2 | 25 | 50 |
| 9 | R17A2186 | Programming Language for Mathematical Models Lab | - | 3 | 2 | 25 | 50 |
| **Total** | | | **20** | **8** | **24** | **280** | **520** |

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**OPEN ELECTIVE – III**

| | | | |
|---|---|---|---|
| R17A0454 | Robotics and Automation | R17A0354 | Nano Technology |
| R17A0519 | Web Technologies | R17A0355 | Total Quality Management |
| R17A0553 | Data Structures | R17A1253 | Management Information Systems |

**IV Year B. Tech (AE) – I Semester (4 Core Subjects+2 Core Electives+2 Labs)**

| S.No. | Subject Code | SUBJECT | L | T/P/D | C | Max. Marks | |
|---|---|---|---|---|---|---|---|
| | | | | | | Int | Ext |
| 1 | R17A2119 | Computational Aerodynamics | 3 | 1 | 4 | 30 | 70 |
| 2 | R17A2120 | Airframe Structural Design | 3 | 0 | 3 | 30 | 70 |
| 3 | R17A0368 | Mechanical Vibrations & Structural Dynamics | 3 | 1 | 4 | 30 | 70 |
| 4 | R17A2121 | Avionics | 3 | 0 | 3 | 30 | 70 |
| 5 | R17A2122<br>R17A2123<br>R17A2124 | **Core Elective – III**<br>Aircraft Maintenance Engineering<br>Flight Scheduling Operations<br>Civil Aviation Rules and Regulations | 3 | 0 | 3 | 30 | 70 |
| 6 | R17A0323<br>R17A2125<br>R17A2126 | **Core Elective – IV**<br>CAD/CAM<br>Hypersonic Aerodynamics<br>Analysis of composite structures | 3 | 0 | 3 | 30 | 70 |
| 7 | R17A2187 | Computational Aerodynamics Lab | - | 3 | 2 | 25 | 50 |
| 8 | R17A2188 | Computational Structures Lab | - | 3 | 2 | 25 | 50 |
| **TOTAL** | | | **18** | **8** | **24** | **230** | **520** |

**IV Year B. Tech (AE) – II Semester (2 Core Electives)**

| S.No. | Subject Code | SUBJECT | L | T/P/D | C | Max. Marks | |
|---|---|---|---|---|---|---|---|
| | | | | | | Int | Ext |
| 1 | R17A2127<br>R17A2128<br><br>R17A0321 | **Core Elective - V**<br>Helicopter Engineering<br>Advanced Computational Aerodynamics<br>Heat Transfer | 3 | 0 | 3 | 30 | 70 |
| 2 | R17A2129<br>R17A0370<br>R17A2130 | **Core Elective – VI**<br>Aeroelasticity<br>Fatigue and Fracture Mechanics<br>Airport Management | 3 | 0 | 3 | 30 | 70 |
| 3 | R17A2189 | Mini Project | - | - | 4 | - | 100 |
| 4 | R17A2190 | Technical Seminar | - | 6 | 2 | 50 | - |
| 5 | R17A2191 | Major Project | 15 | - | 12 | 100 | 200 |
| **TOTAL** | | | **21** | **6** | **24** | **210** | **440** |

# MALLA REDDY COLLEGE OF ENGINEERING & TECHNOLOGY

**I Year B. Tech ANE-I Sem** **L T/P/D C**
**2 - / - / - 2**

## R17A0001 - ENGLISH

**INTRODUCTION:**

In view of the growing importance of English as a tool for global communication and the consequent emphasis on training students to acquire communicative competence, the syllabus has been designed to develop linguistic and communicative competencies of Engineering students. The prescribed books and the exercises are meant to serve broadly as students' handbooks.

In the English classes, the focus should be on the skills of reading, writing, listening and speaking, and for this the teachers should use the text prescribed for detailed study. For example, the students should be encouraged to read the texts/selected paragraphs silently. The teachers can ask comprehension questions to stimulate discussion and based on the discussions students can be made to write short paragraphs/essays etc.

The text for non-detailed study is for extensive reading/reading for pleasure. Hence, it is suggested that they read it on their own the topics selected for discussion in the class. The time should be utilized for working out the exercises given after each section, as also for supplementing the exercises with authentic materials of a similar kind for example, from newspaper articles, advertisements, promotional material etc. However, the stress in this syllabus is on skill development, fostering ideas and practice of language skills.

**OBJECTIVES:**

- To provide amateur engineers with the critical faculties necessary in an academic environment, using the theoretical and practical components of English syllabus.
- To upgrade the capability of analyzing of texts from different periods and genres.
- To improve the language proficiency of the students in English with emphasis on LSRW skills to face complex engineering activities at work place.
- To understand the basics of grammar to speak correct English and communicate effectively both formally and informally.

**SYLLABUS:**

**Listening Skills:**

**Objectives**

1. To enable students to develop their listening skill so that they may appreciate its role in the LSRW skills approach to language and improve their pronunciation
2. To equip students with necessary training in listening so that they can comprehend the speech of people of different backgrounds and regions. Students should be given practice in listening to the sounds of the language to be able to recognize them, to distinguish between them to mark stress and recognize and use the right intonation in sentences.
   • Listening for general content
   • Listening to fill up information

- Intensive listening
- Listening for specific information

**Speaking Skills:**

**Objectives**

1. To make students aware of the role of speaking in English and its contribution to their success.
2. To enable students to express themselves fluently and appropriately in social and professional contexts.
   - Oral practice
   - Describing objects/situations/people
   - Role play – Individual/Group activities (Using exercises from all the nine units of the prescribed text: Learning English: A Communicative Approach)
   - Just A Minute (JAM) Sessions.

**Reading Skills:**

**Objectives**

1. To develop an awareness in the students about the significance of silent reading and comprehension.
2. To develop the ability of students to guess the meanings of words from context and grasp the overall message of the text, draw inferences etc.
   Skimming the text
   - Understanding the gist of an argument
   - Identifying the topic sentence
   - Inferring lexical and contextual meaning
   - Understanding discourse features
   - Scanning the text
   - Recognizing coherence/sequencing of sentences

NOTE:

The students will be trained in reading skills using the prescribed text for detailed study.
They will be examined in reading and answering questions using 'unseen' passages which may be taken from authentic texts, such as magazines/newspaper articles.

**Writing Skills:**

**Objectives**

1. To develop an awareness in the students about writing as an exact and formal skill
2. To equip them with the components of different forms of writing, beginning with the lower order ones.
   - Writing sentences
   - Use of appropriate vocabulary
   - Paragraph writing
   - Coherence and cohesiveness
   - Narration / description
   - Note Making
   - Formal and informal letter writing
   - Describing graphs using expressions of comparison

**TEXTBOOKS PRESCRIBED:**

In order to improve the proficiency of the student in the acquisition of the four skills mentioned above, the following text and course content, is prescribed for this semester.

Textbook titled "Epitome of Wisdom", published by Maruthi Publications, Hyderabad.

**Unit –I**

Chapter entitled 'Mokshagundam Visvesvaraya' from *Epitome of Wisdom*

**and**

Listening – Conversations – introducing each other, talking about a course
Speaking – Jam sessions
Reading – The Palm Islands
Writing – Writing Paragraphs
Grammar – Conjunctions and Adverbs
Vocabulary – Prefixes and Suffixes

**Unit – II**

Chapter entitled "Three Days to See" from *Epitome of Wisdom*

**and**

Listening –Conversations-planning for an outing
Speaking –Telephone Etiquettes
Reading – Physically challenged athletes
Writing – Memo writing
Grammar –Modal Auxiliaries
Vocabulary – Synonyms & antonyms

**Unit – III**

Chapter entitled "The Road Not Taken" from *A Selection of Robert Frost's Poems (Owl Book)*, by Holt Paperbacks: 2 Revised Edition. 2002.

**and**

Listening – News items
Speaking – Public speaking
Reading – 'If' poem
Writing – Letter writing-formal/informal
Grammar – Knowing with questions (Wh –questions,) Question tags
Vocabulary –Similes and Metaphors

**Unit – IV**

Chapter entitled "The Last Leaf" from *Epitome of Wisdom*

**and**

Listening – Speech on environmental conservation
Speaking – Group discussion

Reading – Choose how to start your day
Writing – Writing a narrative
Grammar –Prepositions
Vocabulary – Idioms and one-word substitutes

**Unit –V**

5. Chapter entitled "The Convocation Speech" from *Epitome of Wisdom*

**and**

Listening – Speech on 'How do you make a teacher great'?
Speaking –Role plays
Reading – What is meant by entrepreneurship?
Writing – Essay writing
Grammar – Active voice and Passive voice
Vocabulary – Phrasal verbs

* Exercises apart from the text book shall also be used for classroom tasks.

**REFERENCES:**

1. Contemporary English Grammar Structures and Composition by David Green, MacMillan Publishers, New Delhi. 2010.
2. Innovate with English: A Course in English for Engineering Students, edited by T Samson, Foundation Books.
3. English Grammar Practice, Raj N Bakshi, Orient Longman.
4. Technical Communication by Daniel Riordan. 2011. Cengage Publications. New Delhi.
5. Effective English, edited by E Suresh Kumar, A RamaKrishna Rao, P Sreehari, Published by Pearson.
6. Handbook of English Grammar& Usage, Mark Lester and Larry Beason, Tata Mc Graw – Hill.
7. Spoken English, R.K. Bansal & JB Harrison, Orient Longman.
8. Technical Communication, Meenakshi Raman, Oxford University Press
9. Objective English Edgar Thorpe & Showick Thorpe, Pearson Education
10. Grammar Games, Renuvolcuri Mario, Cambridge University Press.

**OUTCOMES:**

- Acquire and apply the critical thought process effectively on complex engineering activities.
- Utilize the analytical capability to comprehend and design any text effortlessly.
- Imbibe the English proficiency to receive clear instructions, make notes and draft letters vividly.
- Identify the basic grammatical structures and its application accurately to communicate with society at large.

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## R17A0021 - MATHEMATICS – I

**Objectives:**

To learn

- Concept of rank of a matrix and applying the concept of rank to know the consistency of linear equations and to find all possible solutions if exist and concept of eigen values and eigen vectors of a matrix
- The mean value theorems and to understand the concepts geometrically , functions of several variables and optimization of these functions.
- Methods of solving the differential equations of first and higher order ,Newton's law of cooling, Natural growth and decay, bending of beams etc.
- In many engineering fields the physical quantities involved are vector valued functions. Hence the vector calculus aims at basic properties of vector-valued functions and their applications to line, surface and volume integrals.

**UNIT - I:Matrix Theory**

Introduction to matrices- Rank of a matrix - Finding rank of a matrix by reducing to Echelon and Normal forms-Consistency of system of linear equations (homogeneous and non-homogeneous) using the rank of a matrix-Cayley - Hamilton Theorem (without proof) – Verification- finding inverse of a matrix and powers of a matrix by Cayley-Hamilton theorem-Linear dependence and Independence of Vectors- Eigen values and eigen vectors of a matrix-Properties of eigen values and eigen vectors of real and complex matrices-Diagonalization of a matrix.

**UNIT – II: Differential Calculus**

**Mean Value Theorms:** Rolle's Theorem – Lagrange's Mean Value Theorem – Cauchy's mean value theorems with geometrical interpretations (all theorems without proof)- verification of the Theorems and testing the applicability of these theorems to the given function-Taylor's series -Maclaurin's series.

**Functions of Several Variables:** Jacobian-Functional dependence- Maxima and Minima of functions of two variables without constraints and with constraints - Method of Lagrange multipliers.

**UNIT – III: Ordinary Differential Equations of First Order and Applications**

Introduction to ordinary differential equation - Variable Separable form- Homogeneous-Non homogeneous- Exact-Non Exact-Linear and Bernoulli's equations-Applications of first order

differential equations – Newton's Law of cooling- Law of natural growth and decay- Orthogonal trajectories.

**UNIT - IV: Linear Differential Equations of Higher Order and Applications**

Linear differential equations of second and higher order with constant coefficients- Non-homogeneous term of the type f(x) = $e^{ax}$ , sinax, cosax, $x^n$ , $e^{ax}$ V and $x^n$ V- Method of variation of parameters-Applications to bending of beams, Electrical circuits and simple harmonic motion.

**UNIT – V : Vector Calculus**

Introduction- Scalar point function and vector point function, Gradient- Divergence- Curl and their related properties - Laplacian operator, Line integral – work done – Surface integrals -Volume integral. Green's Theorem,Stoke's theorem and Gauss's Divergence Theorems (Statement & their Verification).

**TEXT BOOKS:**

1. Mathematics – I, SpecialEdition - MRCET, Mc Graw Hill Publishers - 2017.
2. Engineering Mathematics – I by T.K.V Iyenger ,B.Krishna Gandhi and Others ,S Chand Publishers.

**REFERENCES:**

1. Engineering Mathematics by P. Sivaramakrishna Das, Pearson Publishers.
2. Advanced engineering Mathematics by Kreyszig, John Wiley & Sons Publishers.

**Outcomes:**

- After learning the contents the student is able to write the matrix representation of a set of linear equations and to analyze solutions of system of equations.
- The student will be able to understand the methods of differential calculus to optimize single and multivariable functions.
- The student is able to identify the type of differential equation and uses the right method to solve the differential equations. Also able to apply the theory of differential equations to the real world problems.
- The student will be able to evaluate multiple integrals(line, surface volume integrals) and convert line integrals to area integrals and surface integrals to volume integrals.

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## R17A0011 - ENGINEERING PHYSICS – I

**OBJECTIVES:**

- The information in optics is required for engineering technology students to understand wave nature of light for applying accurate measurements by means of optical instruments.
- Fromthe study of quantum and statistical aspects dual behavior of electron and solid state physics can be realized by the engineering students.
- Thebasic information regarding electrons and holes and their functioning in semiconductors is evident to the students. The semiconductor devices provide basic information for the present communication system

**UNIT-I**

**OPTICS:**

Interference-Coherence-Coherent sources, Constructive and destructive interference. Theory of interference fringes(Expression for band width). - Interference in thin films by reflected light, Newton's rings Experiment. Diffraction-Types of diffraction, Difference between interference and diffraction, Fraunhofer's diffraction (Single Slit), Diffraction grating, Polarization, Types of polarization, Double Refraction, Nicol Prism.

**UNIT-II**

**LASERS:**

Characteristics of lasers, Spontaneous and Stimulated emissions, Einstein's Coefficients, Population inversion, Meta stable state, pumping, lasing action, Construction and working of Ruby Laser, Helium-Neon Laser, Semi conductor lasers, Applications of lasers.

**FIBER OPTICS:**

Construction and Working Principle of an optical fiber, Advantages of optical fibers, Numerical aperture and Acceptance angle, Types of Optical fibers - Mode and Propagation through step and graded index fibers, Optical Fiber Communication System, Attenuation, Applications of optical fibers.

**UNIT-III**

**PRINCIPLES OF QUANTUM MECHANICS**:

Wave nature and particle nature-de Broglie's Hypothesis, GP Thomson's Experiment, Davisson and Germer's experiment, Matter Waves, Heisenberg's uncertainty principle, physical significance of wave function, Schrodinger time-independent wave equation, Particle in One dimensional infinite potential box.

**UNIT-IV**

**ELEMENTS OF STATISTICAL MECHANICS & BAND THEORY OF SOLIDS:**

Micro and Macro states, Maxwell Boltzmann, Bose Einstein, Fermi Dirac Statistical distributions ( Qualitative), Density of States, Fermi Energy, Introduction to electron theory of metals, Bloch Theorem (Qualitative), Kronig Penny model(Qualitative), EK curve (Brillouin Zone)-Effective mass of electron, Origin of energy bands in solids, Classification of solids-conductors, semi conductors and insulators.

**UNIT-V**

**SEMICONDUCTOR PHYSICS:**

Types of semi conductors**,** Carrier concentration and Fermi level of intrinsic and Extrinsic Semiconductors, Hall Effect and applications, Direct and indirect band gap of semiconductors.

**SEMICONDUCTORDEVICES:**

Formation of PN junction diode, Energy level diagram of PN junction diode. V-I characteristics of PN junction diode- PN junction diode as LED and Solar cell.

**TEXT BOOKS:**

1. Engineering Physics - S Mani Naidu- Pearson Publishers.
2. A Text Book of Engineering Phyiscs- P.G. Kshirsagar, Avadhanulu – S.Chand

**REFERENCES:**

1. Solid State Physics, Kittel- Wiley International.
2. Solid State Physics – AJ DekKer-Macmillan Publishers.
3. Engineering Physics, P.K. Palaniswamy, Scitech Publishers

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## R17A0014 - ENVIRONMENTAL STUDIES

**Objectives:**

1. Understanding the importance of ecological balance for sustainable development.
2. Understanding the impacts of developmental activities and mitigation measures.
3. Understanding the environmental policies and regulations

**UNIT-I:**

**Introduction:** Definition of Environment and multidisciplinary nature of environmental sciences.

**Ecosystems**: Definition, structure and function of an ecosystem, Food chains, food webs and ecological pyramids. Flow of energy, Biogeochemical cycles (Carbon, Nitrogen, Water cycle) Bioaccumulation and Biomagnification with examples.

**UNIT-II:**

**Natural Resources**: Classification of Resources: water resources:types: surface and ground water and over utilization effects of ground water. Dams: benefits and problems. Forest resources: functions, causes and effects of Deforestation, Energy resources: renewable and non-renewable energy sources, use of alternate energy resources.

**UNIT-III:**

**Biodiversity and Biotic Resources**: Introduction, Definition, genetic, species and ecosystem diversity. Value of biodiversity; consumptive use, productive use, social, ethical, aesthetic and optional values. Hot spots of biodiversity. Threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts; conservation of biodiversity: In-Situ and Ex-situ conservation.

**UNIT-IV:**

**Environmental Pollution and Control Technologies: Environmental Pollution**: **Classification of pollution, Air Pollution**: Primary and secondary pollutants, sources, causes, effects and control measures**Water pollution**: Sources and types of pollution, causes and effects, water treatment methods. **Soil Pollution**: Sources and types, Impacts of modern agriculture. Solid waste management, e-Waste management.

**Global Environmental Problems**: Green house effect, Global warming, Climate change and impacts on human environment. Ozone depletion and Ozone depleting substances (ODS).

**UNIT-V:**

**Environmental Policy, Legislation & EIA**: Environmental Protection act1986, Air act 1981, Forest conservation act 1980, Biomedical waste management and handling rules, International conventions / Protocols: Earth summit, Kyoto protocol and Montréal Protocol.
EIA: EIA structure, methods of baseline data acquisition. Concepts of Environmental Management Plan (EMP).
**Towards Sustainable Future**: Concept, threats and strategies of Sustainable Development, Environmental Education.

**SUGGESTED TEXT BOOKS**:

1. Environmental Studies by Anubha Kaushik, 4th Edition, New age international Publishers.
2. Text book of Environmental Science and Technology - Dr. M. Anji Reddy 2007, BS Publications.
3. Environmental Studies by R. Rajagopalan, Oxford University Press.

**REFERENCE BOOKS**:

1. Environmental Science: towards a sustainable future by Richard T.Wright. 2008 PHL Learning Private Ltd. New Delhi.
2. Environmental Engineering and science by Gilbert M.Masters and Wendell P. Ela .2008 PHI Learning Pvt. Ltd.
3. Environmental Science by Daniel B.Botkin& Edward A.Keller, Wiley INDIA edition.
4. Principles of Environmental Science by William . P. Cunnningham& Mary Inn Cunnningham Tata McGRAW –Hill Publishing Company Ltd.
5. Environmental Studies by S. Rama Lakshmi & Purnima Smarath Kalyani Publishers.

**Outcomes:**

Based on this course, the Engineering graduate will understand /evaluate / develop technologies on the basis of
Ecological principles and environmental regulations which in turn helps in sustainable development

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## R17A0501 - COMPUTER PROGRAMMING WITH C

**Objectives**

- To understand the various steps in Program development.
- To understand the basic concepts in C Programming Language.
- To learn how to write modular and readable C Programs
- To learn to write programs (using structured programming approach) in C to solve problems.
- To introduce the students to basic data structures such as lists, stacks and queues.
- To make the student understand simple sorting and searching methods

**UNIT - I**

Introduction to Computing – Computer Systems, Computing Environments, Computer Languages, Creating and running programs, Software Development Life Cycle, Algorithm, Flowchart.

Introduction to C – History of C, Features Of C, Structure Of C Program, Character Set, C Tokens-keywords, Identifiers, Constants, Data types, Variables, Operators, Expressions, Precedence and Associativity, Expression Evaluation, Type conversion, Statements- Selection Statements( Decision Making) – if and switch statements, Repetition statements ( loops)- while, for, do-while statements, other statements related to looping –break, continue, goto.

**UNIT-II**

Functions-Designing Structured Programs, Types of Functions- user defined functions, Standard Functions, Inter function communication, Categories of functions ,Parameter Passing techniques, Scope, Storage classes-auto, register, static, extern, Type qualifiers, Recursion- recursive functions, Preprocessor commands.

**UNIT – III**

**Arrays** – Declaration and Initialization, Arrays with functions , Array Applications, Two dimensional arrays, Multi dimensional arrays.

**Strings** – Declaration and Initialization, String Input / Output functions, Arrays of strings, String manipulation functions.

**UNIT-IV**

**Pointers**-Introduction, Definition and uses of pointers, address operator, Pointer variables, Pointer constants , void pointers, Pointer arithmetic, Pointers to Pointers, Pointers with

Arrays, Pointers with Functions, Pointers to functions, Array of pointers, Pointers with Strings. Dynamic Memory Management functions: malloc(), calloc(), realloc() and free()

**UNIT**-V

Structures and Unions - **I**ntroduction, Declaration and Initialization, Structure within a structure, Operations on structures, Array of Structures, Pointer to Structures, Structures with Functions, Self referential structures, Typedef, enum, bitfields, Unions.

Files – Concept of a file, Streams, Text files and Binary files, Opening and Closing files, File input / output functions, File Status functions (Error handling), Positioning functions, Command line arguments.

**TEXT BOOKS:**

1. Computer Programming, Special Edition - MRCET, Mc Graw Hill PUBLISHERS-2017.
2. Computer Science: A Structured Programming Approach Using C, B.A.Forouzan and R.F. Gilberg, Third Edition, Cengage Learning.

**REFERENCE BOOKS:**

1. The C Programming Language, B.W. Kernighan and Dennis M.Ritchie, PHI.
2. Computer Programming, E.Balagurusamy, First Edition, TMH.
3. C and Data structures – P. Padmanabham, Third Edition, B.S. Publications.
4. Programming in *C, Ashok Kamthane*. Pearson Education India.
5. Let us C ,Yashwanth Kanethkar, 13th Edition, BPB Publications.

**Outcomes:**

- Demonstrate the basic knowledge of computer hardware and Software.
- Ability to apply solving and logical skills to programming in C language and also in other languages.

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## R17A0301 - ENGINEERING MECHANICS

**Unit – I**

Introduction to Engineering Mechanics – Basic Concepts. **Resultants of Force System:** Parallelogram law –Forces and components- Resultant of coplanar Concurrent Forces – Components of forces in Space – Moment of Force - principle of moments – Coplanar Applications – Couples - Resultant of any Force System.

**Unit – II**

**Equilibrium of Force Systems:** Free Body Diagrams, Equations of Equilibrium - Equilibrium of planar Systems -Equilibrium of Spatial Systems.

**FRICTION:** Introduction – Theory of Friction – Angle of friction - Laws of Friction – Static and Dynamic Frictions –Motion of Bodies: Wedge, Screw, Screw-jack, and Differential Screw-jack.

**Unit – III**

**Centroids and Centers of Gravity:** Introduction – Centroids and Centre of gravity of simple figures (frombasic principles ) – Centroids of Composite Figures - Theorem of Pappus – Center of gravity of bodies and centroids of volumes.

**Unit – IV**

**Moments of Inertia:** Definition – Polar Moment of Inertia –Radius of gyration - Transfer formula for moment ofinertia - Moments of Inertia for Composite areas - Products of Inertia, Transfer Formula for Product of Inertia.

**Mass Moment of Inertia:** Moment of Inertia of Masses- Transfer Formula for Mass Moments of Inertia - massmoment of inertia of composite bodies.

**Unit – V**

**Kinematics of a Particle:** Motion of a particle – Rectilinear motion – motion curves – Rectangular componentsof curvilinear motion– Kinematics of Rigid Body - Types of rigid body motion -Angular motion - Fixed Axis Rotation

**Kinetics of particles:** Translation -Analysis as a Particle and Analysis as a Rigid Body in Translation – Equations ofplane motion - Angular motion - Fixed Axis Rotation – Rolling Bodies.

**TEXT BOOKS:**

1. Engineering Mechanics/ S. Timoshenko and D.H. Young, Mc Graw Hill Book Company.
2. Engineering Mechanics - Statics and Dynamics by Vijaya Kumar Reddy K , Suresh Kumar J.BS Publications

**REFERENCES:**

1. Engineering Mechanics / S.S. Bhavikati & K.G. Rajasekharappa
2. A text of Engineering Mechanics / YVD Rao / K. Govinda Rajulu/ M. Manzoor Hussain, Academic Publishing Company
3. Engg. Mechanics / M.V. Seshagiri Rao & D Rama Durgaiah/ Universities Press
4. Engineering Mechanics, Umesh Regl / Tayal.
5. Engineering Mechanics / KL Kumar / Tata McGraw Hill.
6. Engineering Mechanics / Irving Shames / Prentice Hall

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## R17A0581 - COMPUTER PROGRAMMING LAB

**Objectives:**

- Understand the basic concept of C Programming, and its different modules that includes conditional and looping expressions, Arrays, Strings, Functions, Pointers, Structures and File programming
- Acquire knowledge about the basic concept of writing a program.
- Role of constants, variables, identifiers, operators, type conversion and other building blocks of C Language.
- Use of conditional expressions and looping statements to solve problems associated with conditions and repetitions.
- Role of Functions involving the idea of modularity.
- Concept of Array and pointers dealing with memory management.
- Structures and unions through which derived data types can be formed
- File Handling for permanent storage of data or record.
- Programming using gcc compiler in Linux.

**Week 1:**

a) Write a C program to find sum and average of three numbers.

b)Write a C program to find the sum of individual digits of a given positive integer.

c) Write a C program to generate the first n terms of the Fibonacci sequence.

**Week 2:**

a)Write a C program to generate prime numbers between 1 to n.

b)Write a C program to Check whether given number is Armstrong Number or Not.

c) Write a C program to evaluate algebraic expression (ax+b)/(ax-b).

**Week 3:**

a)Write a C program to check whether given number is perfect number or Not.

b)Write a C program to check whether given number is strong number or not.

**Week 4:**

a) Write a C program to find the roots of a quadratic equation.

b)Write a C programperformarithmeticoperations using switch statement.

**Week 5:**

a)Write a C program to find factorial of a given integer using non-recursive function.

b)Write a C program to find factorial of a given integer using recursive function.

**Week 6:**

a)Write C program to find GCD of two integers by using recursive function.

b)Write C program to find GCD of two integers using non-recursive function.

**Week 7:**

a)Write a C program to find both the largest and smallest number in a list of integers.

b) Write a C Program to Sort the Array in an Ascending Order

c) Write a C Program to find whether given matrix is symmetric or not.

**Week 8:**

Revision of programs

**Week 9:**

a)Write a C program to perform addition of two matrices.

b)Write a C program that uses functions to perform Multiplication of Two Matrices.

**Week 10:**

a)Write a C program to use function to insert a sub-string in to given main string from a given position.

b)Write a C program that uses functions to delete n Characters from a given position in a given string.

**Week 11:**

a)Write a C program using user defined functions to determine whether the given string is palindrome or not.

b)Write a C program that displays the position or index in the main string S where the sub string T begins, or - 1 if S doesn't contain T.

**Week 12:**

a)Write C program to count the number of lines, words and characters in a given text.

b)Write a C program to find the length of the string using Pointer.

**Week 13:**

a) Write a C program to Display array elements using calloc( ) function.

b)Write a C Program to Calculate Total and Percentage marks of a student using structure.

**Week 14:**

a)Write a C program that uses functions and structures to perform the following operations:

i) Reading a complex number ii) Writing a complex number

iii) Addition of two complex numbers iv) Multiplication of two complex numbers

b) Write a C program to display the contents of a file.

**Week 15:**

a)Write a C program to copy the contents of one file to another.

b)Write a C program to merge two files into a third file.

c)Write a C program to reverse the first n characters in a file.

**Week 16:**

Revision Of Programs

**TEXT BOOKS**

1. C Programming and Data Structures, P.Padmanabham, Third Edition, BS Publications
2. Computer programming in C.V.RAjaraman, PHI Publishers.
3. C Programming, E.Balagurusamy, 3rd edition, TMH Publishers.
4. C Programming, M.V.S.S.N Venkateswarlu and E.V.Prasad,S.Chand Publishers
5. Mastering C,K.R.Venugopal and S.R.Prasad, TMH Publishers.

**Outcomes:**

- Acquire knowledge about the basic concept of writing a program.
- Understand the Role of constants, variables, identifiers, operators, type conversion and other building blocks of C Language.
- Learn how to use of conditional expressions and looping statements to solve problems associated with conditions and repetitions.
- Understand the Role of Functions involving the idea of modularity.
- Understand the Concept of Array and pointers dealing with memory management.
- Learn Structures and unions through which derived data types can be formed
- Learn File Handling for permanent storage of data or record.

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## R17A0084 - IT WORKSHOP LAB / ENGINEERING WORKSHOP

**OBJECTIVES:**

The IT Workshop for engineers is a training lab course spread over 54 hours. The modules include training on PC Hardware, Internet & World Wide Web and Productivity tools including Word, Excel and Power Point.

### PC HARDWARE

**Week 1:**

Identify the peripherals of a computer, components in a CPU and its functions. Draw the block diagram of the CPU along with the configuration of each peripheral

**Week 2:**

i. Every student should individually install MS windows on the personal computer.
ii. Basic DOS Commands

**Week 3:**

a) Hardware Troubleshooting: Students have to be given a PC which does not boot due to improper assembly or defective peripherals
b) Software Troubleshooting: Students have to be given a malfunctioning CPU due to system software problems. They should identify the problem and fix it to get the computer back to working condition.

### INTERNET & WEB BROWSERS

**Week 4:**

Web Browsers, Surfing the Web: Students customize their web browsers with the LAN proxy settings, bookmarks, search toolbars and pop up blockers And How to access the websites and email& Search Engines & various threats on the internet and would be asked to configure their computer to be safe on the internet, Antivirus downloads to avoid viruses and/or worms.

### MS OFFICE

**Week 5:**

a) Word Orientation: an overview of Microsoft (MS) office 2007/ 10: Importance of MS office 2007/10, overview of toolbars, saving files, Using help and resources, rulers, format painter. Table of Content, Newspaper columns, Images from files and clipart, Drawing toolbar and Word Art, Formatting Images, Textboxes, Paragraphs and Mail Merge in word.

b) Using Word to create project certificate. Features to be covered:-Formatting Fonts in word, Drop Cap in word, Applying Text effects, Using Character Spacing, Borders and Colors, Inserting Header and Footer, Using Date and Time option in Word &Formatting Styles, Inserting table, Bullets and Numbering, Changing Text Direction, Cell alignment, Footnote, Hyperlink, Symbols, Spell Check, Track Changes.

## ENGINEERING WORKSHOP

**1. TRADES FOR EXERCISES:**

**At least two exercises from each trade:**

1. Carpentry
2. Fitting
3. Tin-Smithy and Development of jobs carried out and soldering.
4. Black Smithy
5. House-wiring

**1. TRADES FOR DEMONSTRATION & EXPOSURE:**

1. Plumbing
2. Machine Shop
3. Welding
4. Foundry
5. Metal Cutting (Water Plasma)

**TEXT BOOK:**

1. Work shop Manual - P.Kannaiah/ K.L.Narayana/ Scitech Publishers.
2. Workshop Manual / Venkat Reddy/ BS Publications/Sixth Edition

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## R17A0081 - ENGLISH LANGUAGE COMMUNICATION SKILLS LAB

The Language Lab focuses on the production and practice of sounds of the English language and familiarizes the students with its use in everyday situations and contexts.

**Objective:**

- To facilitate computer-aided multi-media instruction enabling individualized and independent language learning
- To sensitize the students to the nuances of English speech sounds, word accent, intonation and rhythm
- To bring about a consistent accent and intelligibility in their pronunciation, ample speaking opportunities are provided.
- To improve the fluency in spoken English and neutralize mother tongue influence
- To train students to use language appropriately for interviews, group discussions and public speaking

**Syllabus**: English Language Communication Skills Lab has two parts:

a. Computer Assisted Language Learning (CALL) Lab

b. Interactive Communication Skills (ICS) Lab

The following course content is prescribed for the English Language Communication Skills Lab

**UNIT –I**

**CALL Lab:** Introduction to Phonetics –Speech Sounds –Vowels and Consonants Transcriptions

**ICS Lab:** Ice-Breaking activity - JAM session

**UNIT –II**

**CALL Lab:** Pronunciation: Past Tense Markers and Plural Markers, Mispronounced sounds, Silent letters

**ICS Lab:** Situational Dialogues/Role Plays – Informal

**UNIT -III**
**CALL Lab:** Syllable and Syllabification
**ICS Lab:** Situational Dialogues/Role Plays – Formal

**WORKSHEETS FOR LETTER WRITING**

**ELCS Lab:**

1. **Computer Assisted Language Learning (CALL) Lab:**

   The Computer aided Language Lab for 60 students with 60 systems, one master console, LAN facility and English language software for self-study by learners.

   **System Requirement (Hardware component):**

   Computer network with LAN with minimum 60 multimedia systems with the following specifications:

   i) P –IV Processor

   a)Speed –2.8 GHZ

   b)RAM –512 MB Minimum

   c)HardDisk –80 GB

   ii) Headphones of High quality

2. **Interactive Communication Skills (ICS) Lab :**

   A Spacious room with movable chairs and audio-visual aids with a Public Address System, a T. V., a digital stereo –audio & video system and camcorder etc.

**DISTRIBUTION AND WEIGHTAGE OF MARKS**

**English Language Laboratory Practical Examination:**

1. The practical examinations for the English Language Laboratory shall be conducted as per the University norms prescribed for the core engineering practical sessions.
2. For the Language lab sessions, there shall be a continuous evaluation during the year for 25 marks and 50 year-end Examination marks. Of the 25 marks, 15 marks shall be awarded for day-to-day work and 10 marks to be awarded by conducting Internal Lab Test(s). The year-end Examination shall be conducted by the teacher concerned with the help of another member of the staff of the same department of the other institution.

**OUTCOMES:**

- Learning with precision through computer-assisted individualized and independent language learning to work independently in engineering set up.
- Improved conversational reception and articulation techniques in the course of repetitive instruction thereby gaining confidence both in institutional and professional environment.
- Accuracy in pronunciation and restoring Standard English thereby crafting better command in English language so that the students have a cutting edge over others in society.
- Imbibing appropriate use of language in situations to work as an individual and as o leader in diverse teams

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## R17A0003 - HUMAN VALUES AND SOCIETAL PERSPECTIVES

**(MANDATORY COURSE)**

**Objective:**

- To help the students appreciate the essential complementarity between 'VALUES' and skills' to ensure sustained happiness and prosperity which are the core aspirations of all human beings.
- To facilitate the development of a Holistic perspective among students towards life, profession and happiness, based on a correct understanding of the Human reality and the rest of Existence. Such a holistic perspective form the basis of value based living in a natural way.
- To highlight plausible implications of such a Holistic understanding in terms of ethical human conduct, trustful and mutually satisfying human behavior and mutually enriching interaction with Nature.

**Unit-I**

**Course Introduction–Need, Basic Guidelines, Content and Process of Value Education:** Understanding the need, basic guidelines, content and process for value Education. Animal consciousness vs Human consciousness, Self Exploration -What is it? Its content and process; Continuous Happiness and Prosperity-A look at basic Human Aspirations. Right understanding, Relationship and physical Facilities –the basic requirements for fulfillment of aspirations of every human being with their correct priority. Understanding Happiness and prosperity correctly –A critical appraisal of the current scenario. Method to fulfill the above human aspirations: understanding and living in harmony at various levels.

**Unit-II**

**Understand Harmony in the Human Being –Harmony in Myself:** Understanding human being as a co-existence of the sentient 'I' and the material 'Body', understanding the needs of self ('I') and 'Body'-Sukh and Suvidha. Understanding the body as an instrument of 'I' (I being the does, seer and enjoyer). Understanding the characteristics and activities of 'I' and harmony in 'I' . Understanding the harmony of I with the Body: Sanyam and Swasthya: correct appraisal of physical needs, meaning of prosperity in detail. Programs to ensure Sanyam and Swasthya.

**Unit-III**

**Understanding Harmony in the Family and Society-Harmony in Human-Human Relationship:** Understanding harmony in the Family –the basic unit of human interaction. Understanding values in human-human relationship; meaning of Nyaya and program for its fulfillment to ensure Ubhay-tripti: Trust (Vishwas) and Respect (Samman) as the foundational values of relationship. Understanding the meaning of Vishwas: Difference between intention and competence. Understanding the meaning of Samman, Difference between respect and differentiation; the other salient values in relationship. Understanding the harmony in the society (society being an extension of family): Samadhan, Samridhi, Abhay, Sah-astitva as comprehensive Human Goals.

Visualizing a universal harmonious order in society –Undivided society (Akhand Samaj), Universal Order (Sarvabhaum Vyawastha) –from family to world family!

**Unit-IV**

**Understanding Harmony in the Nature and Existence –Whole existence as Co-existence:** Understanding the harmony in the Nature. Interconnectedness and mutual fulfillment among the four orders of nature, Recyclability and Self-regulation in nature. Understanding Existence as Co-existence (Sah-astiva) of mutually interacting units in all –pervasive space. Holistic perception of harmony at all levels of existence.

**Unit-V**

**Implications of the above Holistic Understanding of Harmony on Societal Perspectives:** Natural acceptance of human values. Definitiveness of Ethical Human Conduct. Basis of Humanistic Education, Humanistic Constitution and Humanistic Universal Order.

**TEXT BOOKS**

1. R R Gaur, R Sangal, G P BAgaria, 2009 A Foundation Course in Human Values and Professional Ethics.
2. Prof.KV Subba Raju, 2013, Success secrets for Engineering students , Smart student Publications, 3rd Edition.

**REFERENCE BOOKS**

1. Ivan llich, 1974, Energy & Equity, The Trinity press, Worcester and Harpercollins, USA.
2. E.F. Schumacher, 1973, small is Beautiful: a study of economics as if people mattered, Blond, Briggs, & Britain.
3. A Nagraj, 1998, Jeevan Vidya ek Parichay, Divya path Sansathan Amarkantak.
4. Sussan George, 1976, How the other Half Dies, Penguin press Reprin ted 1986, 1991
5. PL Dhar, RR Gaur, 1990 Science and Humanism Commonwealth Publishers.
6. A.N.Tripathy, 2003, Human Values, New Age International Publishers.
7. Subhas Palekar, 2000, How to practice Natural Farming, Pracheen (Vaidik) Krishi Tantra Shodh, Amravati.
8. Done lla H.Meadows, Dennis L. Meadows, Jorgen Randers, Willian A. Behrens lll, 1972, Limits to Growth – Club of Rome's report Universe Books.
9. E.G Seebauer & Robert L. Beery, 2000, Fundamentals of Ethics for Scientists & Engineers, Oxford University Press.
10. M Govindrajran , S Natrajan & V.S Senthil kuma, Engineering Ethichs (including Human Values), Eastern Economy Edition, prentice Hall of India Ltd.

**Relevant CDs, Movies, Documentaries & other Literature:**

1. Value Education website http://www.uptu.ac.in
2. Story of stuff, http://www.storyofstuff.com
3. Al Gore, An Inconvenient Truth, Paramount classics, USA
4. Charlie Chaplin, Modern Times, United Artists, USA
5. IIT Delhi, Modern Technology - the Untold Story

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## R17A0002 - PROFESSIONAL ENGLISH

**INTRODUCTION:**

In view of the growing importance of English as a tool for global communication and the consequent emphasis on training students to acquire communicative competence, the syllabus has been designed to develop linguistic and communicative competencies of Engineering students. The prescribed books and the exercises are meant to serve broadly as students' handbooks.

In the English classes, the focus should be on the skills of reading, writing, listening and speaking, and for this the teachers should use the text prescribed for detailed study. For example, the students should be encouraged to read the texts/selected paragraphs silently. The teachers can ask comprehension questions to stimulate discussion and based on the discussions students can be made to write short paragraphs/essays etc.

The text for non-detailed study is for extensive reading/reading for pleasure. Hence, it is suggested that they read it on their own the topics selected for discussion in the class. The time should be utilized for working out the exercises given after each section, as also for supplementing the exercises with authentic materials of a similar kind for example, from newspaper articles, advertisements, promotional material etc. However, the stress in this syllabus is on skill development, fostering ideas and practice of language skills.

**OBJECTIVES:**

- Provide amateur engineers with the critical faculties necessary in an academic environment, using the theoretical and practical components of English syllabus.
- Upgrade the capability of analyzing of texts from different periods and genres.
- Improve the language proficiency of the students in English with emphasis on LSRW skills to face complex engineering activities at work place.
- Understand the basics of grammar to speak correct English and communicate effectively both formally and informally.

**SYLLABUS:**

**Listening Skills:**
**Objectives**

1. To enable students to develop their listening skill so that they may appreciate its role in the LSRW skills approach to language and improve their pronunciation
2. To equip students with necessary training in listening so that they can comprehend the speech of people of different backgrounds and regions. Students should be given practice in listening to the sounds of the language to be able to recognize them, to distinguish between them to mark stress and recognize and use the right intonation in sentences.
   • Listening for general content
   • Listening to fill up information

- Intensive listening
- Listening for specific information

**Speaking Skills:**

**Objectives**

1. To make students aware of the role of speaking in English and its contribution to their success.
2. To enable students to express themselves fluently and appropriately in social and professional contexts.
   - Oral practice
   - Describing objects/situations/people
   - Role play – Individual/Group activities (Using exercises from all the nine units of the prescribed text: Learning English: A Communicative Approach)
   - Just A Minute (JAM) Sessions.

**Reading Skills:**

**Objectives**

1. To develop an awareness in the students about the significance of silent reading and comprehension.
2. To develop the ability of students to guess the meanings of words from context and grasp the overall message of the text, draw inferences etc.
   Skimming the text
   - Understanding the gist of an argument
   - Identifying the topic sentence
   - Inferring lexical and contextual meaning
   - Understanding discourse features
   - Scanning the text
   - Recognizing coherence/sequencing of sentences

NOTE:

The students will be trained in reading skills using the prescribed text for detailed study.
They will be examined in reading and answering questions using 'unseen' passages which may be taken from authentic texts, such as magazines/newspaper articles.

**Writing Skills:**

**Objectives**

1. To develop an awareness in the students about writing as an exact and formal skill
2. To equip them with the components of different forms of writing, beginning with the lower order ones.
   - Writing sentences
   - Use of appropriate vocabulary
   - Paragraph writing
   - Coherence and cohesiveness
   - Narration / description
   - Note Making
   - Formal and informal letter writing
   - Describing graphs using expressions of comparison

**TEXTBOOKS PRESCRIBED:**

In order to improve the proficiency of the student in the acquisition of the four skills mentioned above, the following text and course content is prescribed.

Text book entitled "Skills Annexe: Functional English for Success", published by Orient Black Swan, Hyderabad.

**UNIT-I**

Chapter entitled "Of parents and children" from *"The essays of Francis Bacon"*, paperback-Import, 11 Oct 2008.

**and**

Listening – Listening for the theme and gist
Speaking – Describing situations and objects
Reading – Why pure science in India lags behind? – By P Rajendran
Writing – Note-taking and Note-making
Grammar – Nouns and Articles
Vocabulary – Homonyms, Homographs, Homophones

**Unit –II**

Chapter entitled "Sachin Tendulkar" from *Skills Annexe -Functional English for Success*,

**and**

Listening – listening for opinions
Speaking – Project Oral Presentations
Reading – Benefits of physical activity
Writing – Report writing
Grammar – Common Errors
Vocabulary –Technical Vocabulary

**Unit –III**

Job applications: Cover letter & Curriculum vitae

**and**

Listening – listening for main and sub-points
Speaking –Giving directions and instructions
Reading – Editorial letters from newspapers
Writing –Formal letter writing
Grammar – Tenses
Vocabulary – Collocations

**Unit – IV**

Chapter entitled "Human Values and Professional Ethics" from *Skills Annexe -Functional English for Success*

**and**

Listening – Listening for details
Speaking – Talking about hypothetical situations

Reading – What I Cherish Most
Writing – E-mail writing
Grammar – Types of verbs: Transitive, Intransitive, Ergative, finite and non – finite
Vocabulary – Commonly confused words

**Unit – V**

Chapter entitled "The fringe benefits of failure and the importance of imagination" a speech by J.K. Rowlings

**and**

Listening – listening for information
Speaking – Oral Presentations
Reading – The one thing every business executive must understand about social media
Writing –Picture composition
Grammar – Concord
Vocabulary –Commonly misspelt Words

* Exercises apart from the text book shall also be used for classroom tasks.

**REFERENCES:**

1. Contemporary English Grammar Structures and Composition by David Green, MacMillan Publishers, New Delhi. 2010.
2. Innovate with English: A Course in English for Engineering Students, edited by T Samson, Foundation Books.
3. English Grammar Practice, Raj N Bakshi, Orient Longman.
4. Technical Communication by Daniel Riordan. 2011. Cengage Publications. New Delhi.
5. Effective English, edited by E Suresh Kumar, A RamaKrishna Rao, P Sreehari, Published by Pearson.
6. Handbook of English Grammar& Usage, Mark Lester and Larry Beason, Tata Mc Graw –Hill.
7. Spoken English, R.K. Bansal & JB Harrison, Orient Longman.
8. Technical Communication, Meenakshi Raman, Oxford University Press
9. Objective English Edgar Thorpe & Showick Thorpe, Pearson Education
10. Grammar Games, Renuvolcuri Mario, Cambridge University Press.

**OUTCOMES:**

- Acquire and apply the critical thought process effectively on complex engineering activities.
- Utilize the analytical capability to comprehend and design any text effortlessly.
- Imbibe the English proficiency to receive clear instructions, make notes and draft letters vividly.
- Identify the basic grammatical structures and its application accurately to communicate with society at large.

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## R17A0022 - MATHEMATICS – II

**Objectives**

- The objective of interpolation is to find an unknown function which approximates the given data points and the objective of curve fitting is to find the relation between the variables x and y from given data and such relationships which exactly pass through the data (or) approximately satisfy the data under the condition of sum of least squares of errors.
- The aim of numerical methods is to provide systematic methods for solving problems in a numerical form using the given initial data and also used to find the roots of an equation and to solve differential equations.
- In the diverse fields like electrical circuits, electronic communication, mechanical vibration and structural engineering, periodic functions naturally occur and hence their properties are very required. Indeed, any periodic and non periodic function can be best analyzed in one way by Fourier series method.
- PDE aims at forming a function with many variables and also their solution methods .Method of separation of variables technique is learnt to solve typical second order PDE.
- Properties of Laplace Transform, Inverse Laplace Transform and Convolution theorem

**UNIT – I: Solution of Algebraic, Transcendental Equations and Interpolation**

**Solution of Algebraic and Transcendental Equations:** Introduction – Graphical interpretation of solution of equations .The Bisection Method – Regula-Falsi Method – The Iteration Method – Newton-Raphson Method.

**Interpolation:** Introduction-Errors in polynomial interpolation-Finite differences- Forward Differences- Backward differences –Central differences – Symbolic relations and separation of symbols-Differences of a polynomial-Newton's formulae for interpolation – Central difference interpolation Formulae – Gauss Central Difference Formulae – Interpolation with unevenly spaced points-Lagrange's Interpolation formula.

**UNIT – II : Numerical techniques**

**Numerical integration**: Generalized Quadrature-Trapezoidal rule, Simpson's $1/3^{rd}$ and $3/8^{th}$ Rule.

**Numerical solution of Ordinary Differential equations:** Solution by Taylor's series method – Picard's Method of successive Approximation- single step methods-Euler's Method-Euler's modified method, Runge-Kutta Methods.

**Curve fitting**: Fitting a straight line –Second degree curve-exponential curve-power curve by method of least squares.

**UNIT – III: Fourier series**

Definition of periodic function. Fourier expansion of periodic functions in a given interval of length $2\pi$.Determination of Fourier coefficients – Fourier series of even and odd functions – Half-range Fourier sine and cosine expansions-Fourier series in an arbitrary interval .

**UNIT-IV: Partial differential equations**

Introduction -Formation of partial differential equation by elimination of arbitrary constants and arbitrary functions, solutions of first order linear (Lagrange) equation and non-linear equations (Charpit's method), Method of separation of variables for second order equations and Applications of PDE to one dimensional (Heat equation).

**UNIT – V Laplace Transforms and Applications**

Definition of Laplace transform- Domain of the function and Kernel for the Laplace transforms- Existence of Laplace transform- Laplace transform of standard functions- first shifting Theorem,-Laplace transform of functions when they are multiplied or divided by "t"- Laplace transforms of derivatives and integrals of functions – Unit step function – second shifting theorem – Dirac's delta function- Periodic function – Inverse Laplace transform by Partial fractions-Inverse Laplace transforms of functions when they are multiplied or divided by "s", Inverse Laplace Transforms of derivatives and integrals of functions- Convolution theorem –Solving ordinary differential equations by Laplace transforms.

**PRESCRIBED TEXT BOOKS:**

1. Mathematics-II, Special Edition - MRCET,TATA Mc Graw HILL-2017 Publishers.
2. Mathematical Methods by T.K.V Iyenger ,B.Krishna Gandhi and Others ,S Chand.

**REFERENCES:**

1. Introductory Methods by Numerical Analysis by S.S. Sastry, PHI Learning Pvt. Ltd.
2. Advanced Engineering Mathematics by Kreyszig, John Wiley & Sons Publishers.

**Outcomes:**

- From a given discrete data, one will be able to predict the value of the data at an intermediate point and by curve fitting, one can find the most appropriate formula for a guesses relation of the data variables. This method of analysis data helps engineers to understand the system for better interpretation and decision making.
- The student will be able to find a root of a given equation and will be able to find a numerical solution for a given differential equation. Helps in describing the system by an ODE, if possible. Also, suggests to find the solution as a first approximation.
- One will be able to find the expansion of a given function by Fourier series.
- One will be able to find a corresponding Partial Differential Equation for an unknown function with many independent variables and to find their solution.
- The student is able to solve certain differential equations using Laplace Transform. Also able to transform functions on time domain to frequency domain using Laplace transforms

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## R17A0012 - ENGINEERING PHYSICS-II

**OBJECTIVES:**

- To understand the basics of bonding in solids, crystal structures and characterization techniques.
- To make the students aware of X-ray diffraction and different techniques of it.
- To understand the behavior of dielectric materials, magnetic materials and nano materials.

**UNIT-I**
**BONDING IN SOLIDS:**

Types of bonds - Primary, Secondary, Forces between atoms, Expression for cohesive energy between two atoms**.**

**CRYSTALLOGRAPHY:**

Space lattice, Basis, Unit cell, lattice parameters, Crystal systems, Bravais lattices, Atomic number, coordination number, packing factor of SC,BCC,FCC crystals, Crystal planes and directions - Miller indices. Expression for inter planar distance in cubic crystal, Structure of NaCl and Diamond.

**UNIT- II**
**X-RAY DIFFRACTION:**

Bragg's law**,** Experimental techniques -Laue's method, powder method**,** Applications of x-ray diffraction.

**DEFECTS IN CRYSTALS:**

Classification of crystal defects**,** Point defects-Vacancies & Interstitials, Concentrations of Schottky and Frenkel defects, Line defects- edge dislocation and screw dislocation**,** Burger's vector.

**UNIT-III**
**DIELECTRIC PROPERTIES:**

Electric dipole, Dipole moment, Polarization vector (P), Displacement vector (D), Dielectric constant (K), Electric susceptibility (χ), Types of polarizations-Expression for Electronic and Ionic polarization, Internal fields in dielectrics, Classius Mosotti relation, Piezo electricity and Ferro electricity, Applications of dielectric materials.

**UNIT-IV**

**MAGNETIC PROPERTIES:**

Magnetic permeability, Field intensity, Magnetic field induction, Magnetization, Magnetic susceptibility, Origin of Magnetic moment -Bhor magneton**,** Classification of magnetic materials-Dia, Para and Ferro**,** Ferri and Anti ferro magnetic materials, Explanation of Hysteresis loop on the basis of domain theory of ferromagnetism. Soft and hard magnetic materials.

**SUPER CONDUCTIVITY:**

Super conductivity, Properties of super conductors,Meissner effect**,** Types –I Type-II super conductors**,** Applications of super conductors.

**UNIT-V**

**NANO SCIENCE & NANO TECHNOLOGY:**

Nano scale, Types of Nano materials, Surface to volume ratio and Quantum confinement, Bottom up Fabrication- Sol gel ,Top down Fabrication- Physical Vapour Deposition, Characterisation of Nano particles –TEM and SEM, Applications of Nano materials.

**TEXT BOOKS:**

1. Engineering Physics - S Mani Naidu- Pearson Publishers.
2. A Text Book of Engineering Phyiscs- P.G. Kshirsagar, Avadhanulu – S.Chand

**REFERENCES:**

1. Solid State Physics, Kittel- Wiley International.
2. Solid State Physics – AJ DekKer-Macmillan Publishers.
3. Engineering Physics, P.K. Palaniswamy, Scitech Publishers

**OUTCOMES:**

- The students would be able to learn the fundamental concepts on behavior of crystalline solids.
- The student will be able to think about the applications of dielectric, magnetic and nano materials.
- Finally Engineering physics course helps the student to develop problem solving skills and analytical skills.

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## R17A0013 - ENGINEERING CHEMISTRY

**Objectives**

- To impart the basic concepts and ideas in chemistry, to develop scientific attitudes and enable the students to correlate the concepts of chemistry with the core programmes.
- Electrochemistry unit give conceptual knowledge about spontaneous processes and how can they be harnessed for producing electrical energy and efficiency of systems. Fuel cells which are the alternate energy sources for generating electrical energy on spot and portable applications.
- Understand various techniques involved in polymerization and application of polymer technology in the area of various engineering fields and manufacturing process of important metallurgical materials.

**UNIT I: Electrochemistry:** Conductance - Specific, Equivalent, Molar conductance and their unit, Applications of Conductance-Conductometric titrations (Acid base and Precipitation titrations); EMF-electrode and electrode potentials; Nernst equation and its applications; Electrochemical cells-Galvanic cell (Daniel cell) and Concentration cell (electrolytic concentration cell); Types of Electrodes–(construction and functioning of Calomel, Quinhydrone and Glass electrodes); determination of $P^H$ using glass electrode; Potentiometric titrations (Acid Base and Redox titrations); electrochemical series and its applications; Numerical problems on conductance.

**Batteries**: Primary (Lithium cells) and Secondary cells (Lead-Acid cell and Ni-Cd cell); **Fuel cells** - Hydrogen -Oxygen fuel cell and Methanol-Oxygen fuel cell - construction, functioning, advantages and applications.

**Unit II: Corrosion and its Control:** Causes and effects of corrosion; Theories of corrosion – Chemical corrosion (oxidation corrosion) & Electrochemical corrosion (mechanism of evolution of Hydrogen and Absorption of oxygen); Galvanic corrosion; Factors affecting rate of corrosion – Nature of metal (position of metal in galvanic series, overvoltage, relative areas of anodic and cathodic parts, purity of metal and passivity) and Nature of environment (temperature, humidity and pH effect)

**Corrosion control methods:** Cathodic protection (Sacrificial Anodic and Impressed Current Cathodic protection). Surface coatings: Metallic coatings & methods of application of metallic coatings - hot dipping (galvanization & tinning), cladding, electroplating (Cu plating) and Electroless plating (Ni plating) – advantages and applications of electroplating/electroless plating.

**UNIT- III: Engineering Materials**

**Polymers:** Classification of Polymers, Types of Polymerization (Chain growth, Step growth & Zeigler Natta) **Plastics:** Thermoplastic & Thermosetting resins, Preparation, properties, engineering applications of PVC, Teflon and Bakelite. **Fibers-** Characteristics of fibers – preparation, properties and uses of Nylon – 6,6 and Dacron – Fiber Reinforced Plastics (FRP) – applications. **Rubbers**–Natural rubber and its vulcanization; **Elastomers**–Buna-S and Butyl rubber; **Conducting polymers:** Polyacetylene-Mechanism of conduction, doping; applications of conducting polymers; **Bio-degradable Polymers:** preparation and applications of Poly vinylacetate and Poly lactic acid.

**Lubricants:** Characteristics of a good lubricant; Classification with examples; properties of lubricants: viscosity, cloud point, pour point, flash and fire point.

**Refractories:** Classification of refractories with examples, characteristics of a good refractory and applications of refractories.

**Nanomaterials:** Introduction and applications of nanomaterials.

**UNIT IV: Water and its Treatment:**

Hardness of Water: Causes of hardness, types of hardness, units of hardness; determination of hardness of water by EDTA method - numerical problems. Boiler troubles – Scales & Sludges, Priming, Foaming, and Caustic Embrittlement; Treatment of boiler feed water – Internal treatment (Phosphate, Colloidal and Calgon conditioning); External treatment– Zeolite process and Ion exchange process; **Potable Water**-Its Specifications–Disinfectation of water by ozonisation, chlorination (break point chlorination and its significance); Reverse Osmosis.

**UNIT V: Fuels**

**Fuels** – Characteristics of a good fuel, Classification – Solid fuels: Coal – analysis of coal - proximate and ultimate analysis and their significance, Liquid fuels – petroleum and its refining; Cracking – Fixed bed catalytic cracking. Knocking – octane and cetane rating, synthetic petrol- Fischer-Tropsch's process: Gaseous fuels - constituents, characteristics and applications of Natural gas, LPG and CNG; Calorific value of fuel – HCV, LCV; Determination of calorific value by Junker's gas calorimeter.

**TEXT BOOKS:**

1. Engineering Chemistry by P.C Jain & Monica Jain, Dhanpatrai Publishing Company 14th Edition (2013)
2. Engineering Chemistry by B. Rama Devi, Ch. Venkataramana Reddy and R.P. Mani, CENGAGE learning (2016)

**REFERENCE BOOKS**

**1.** Engineering Chemistry by M. Thirumala Chary and E. Laxminarayana, Scitech publications (2016).

2. Engineering Chemistry by Bharathi Kumari and Jyotsna Cherukuri, VGS Techno Series (2016).

**Course Outcomes:**

- Familiarize the student with the fundamentals of the treatment technologies and the considerations for its design and implementation in water treatment plants.
- Understand the operating principles of various types of electrochemical cells, including fuel cells and batteries.
- Analyze and develop a technically sound, economic and sustainable solution to corrosion problems related to engineering service.
- Be able to apply core concepts in Materials Science to solve engineering problems
- To learn about types of fuels and their characteristics, and combustion systems with emphasis on engineering applications.
- Recently modern materials synthesized find applications in industry and creating instruments for solving problems of electronics, telecommunications, health care, agriculture, and technology etc., In order to emphasize the above the topics like composite materials, polymers, conducting polymers and nanomaterials have been incorporated in the curriculum.

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## R17A0502 - OBJECT ORIENTED PROGRAMMING THROUGH C++

**Objectives**

- To teach the student the concepts of object oriented and generic programming.
- To differentiate between object oriented programming and procedural programming.
- To design applications using object oriented features.
- To teach the student to implement object oriented concepts.

**Unit I**

**Concepts of Object Oriented programming:** Object oriented paradigm - differences between Object Oriented Programming and Procedure oriented programming, Basic concepts of Object Oriented Programming , Encapsulation, Inheritance and Polymorphism. Benefits of OOP. Structure of a C++ program, namespace, Data types, identifiers, variables, constants, enum, operators, typecasting, control structures &loops.

**Unit-II**

**Functions, Classes and Objects:**

Introduction of Classes,Class Definition, Defining a Members,Objects,Access Control, Class Scope,Scope Resolution Operator,Inline functions,Memory Allocation for Objects, Static Data Members, Static Member Functions, Arrays of Objects, Objects as Function Arguments, Default Arguments,Friend Functions

**Unit-III**

**Constructors, Destructors, Inheritance:**

Introduction to Constructors, Parameterized Constructors, Multiple Constructors in a Class, Constructors with Default Arguments, Dynamic initialization of Objects, Copy Constructors, Dynamic Constructors, Destructors.

**Inheritance :**Introduction to inheritance, Defining Derived Classes, Single Inheritance, Multiple Inheritance, Multi-Level Inheritance, Hierarchical Inheritance, Hybrid Inheritance, Constructors in Derived Classes.

**Unit-IV**

**Pointers, Virtual Functions and Polymorphism:**

Introduction, Memory Management, new Operator and delete Operator, Pointers to Objects, this Pointer, Pointers to Derived Classes, Polymorphism, compile time

polymorphism, Run time polymorphism, Virtual Functions, Pure Virtual Functions, Abstract Classes, Virtual Base Classes, Virtual Destructors. Function Overloading, Operator overloading, Rules for Operator overloading, overloading of binary and unary operators.

**Unit-V.**

**Templates and Exception handling:**

Introduction, Class Templates, Class Templates with Multiple Parameters, Function Templates, Function Templates with Multiple Parameters, Member Function Templates.

**Exception handling:**

Basics of Exception Handling, Types of exceptions, Exception Handing Mechanism, Throwing and Catching Mechanism, Rethrowing an Exception, Specifying Exceptions

**Text Books:**

1. Object Oriented Programming, Special Edition - MRCET, Tata Mc Graw Hill PUBLISHERS-2017
2. Object Oriented Programming with C++ by Balagurusamy

**References:**

1. C++ Primer, 3rd Edition, S.B.Lippman and J.Lajoie, Pearson Education.
2. The C++ Programming Language, 3rd Edition, B.Stroutstrup, Pearson Educ

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## R17A0302 - ENGINEERING DRAWING

**UNIT – I**

**Introduction To Engineering Drawing**: Principles of Engineering Drawing/Graphics – Various DrawingInstruments – Conventions in Drawing- Dimensioning – Lettering practice – BIS Conventions.

a) Polygons – Construction of regular polygons (General Method only)
b) Conic Sections (General Method only- Eccentricity Method)
c) Cycloid, Epicycloid and Hypocycloid
d) Scales-Plain, Diagonal and Vernier

**UNIT – II**

**Orthographic Projection in First Angle only**: Principles of Orthographic Projections – Conventions – First and Third Angle projections (Introduction).

**Projections of Points**. Points in all four quadrants.

**Projections of Lines**– Parallel and inclined to both planes.

**UNIT – III**

**Projections of Planes**: Projection of regular planes, Plane inclined to both reference planes (No conditional problems).

**Projections of Solids**: Projections of regular solids prism and pyramid inclined to both planes (No conditional problems).

**UNIT – IV**

**Isometric Projections:**Principles of Isometric Projection – Isometric Scale – Isometric Views– Conventions –Plane Figures, Simple and Compound Solids.

**UNIT – V**

**Transformation of Projections:**Conversion of Isometric Views to Orthographic Views. Conversion oforthographic views to isometric views – simple objects

Basic Principles of ACAD – Demo Only.

**TEXT BOOKS**

1. Engineering Drawing, Special Edition - MRCET, Mc Graw Hill PUBLISHERS-2017
2. Engineering Drawing, N.D. Bhatt
3. Engineering Drawing by K.Venu Gopal& V.Prabu Raja New Age Publications.

**REFERENCES**

1. Engineering drawing – P.J. Shah .S.Chand Publishers.
2. Engineering Drawing- Johle/Tata Macgraw Hill Book Publishers.

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## R17A0582 - OBJECT ORIENTED PROGRAMMING THROUGH C++ LAB

**Objectives:**

- To strengthen problem solving ability by using the characteristics of an object-oriented approach.
- To design applications using object oriented features
- To handle Exceptions in programs.
- To teach the student to implement object oriented concepts

**Week 1**:

Basic C++ Programs

**Week2:**

a) Write a C++ program to find the sum of individual digits of a positive integer.
b) Write a C++ program to generate the first n terms of the sequence.

**Week 3:**

a) Write a C++ program to generate all the prime numbers between 1 and n, where n is a value supplied by the user.
b) Write a C++ program to find both the largest and smallest number in a list of integers.

**Week 4:**

a) Write a C++ program to sort a list of numbers in ascending order.
b) Write aProgram to illustrate New and Delete Keywords for dynamic memory allocation

**Week 5**

a) Write a program Illustrating Class Declarations, Definition, and Accessing Class Members.
b) Program to illustrate default constructor, parameterized constructor and copy constructors
c) Write a Program to Implement a Class STUDENT having Following Members:

| Member | Description |
|---|---|
| **Data members** | |
| Sname | Name of the student |
| Marks array | Marks of the student |
| Total | Total marks obtained |
| Tmax | Total maximum marks |

| **Member functions** | |
|---|---|
| Member | Description |
| assign() | Assign Initial Values |
| compute() | to Compute Total, Average |
| display() | to Display the Data. |

**Week 6:**

a) Write a Program to Demonstrate the i)Operator Overloading.ii) Function Overloading.

b) Write a Program to Demonstrate Friend Function and Friend Class.

**Week 7:**

a) Write a Program to Access Members of a STUDENT Class Using Pointer to Object Members.

b) Write a Program to Generate Fibonacci Series use Constructor to Initialize the Data Members.

**Week 8:**

Revision laboratory

**Week 9**

Write a C++ program to implement the matrix ADT using a class. The operations supported by this ADT are:

a) Reading a matrix. b) Addition of matrices. c) Printing a matrix.

d) Subtraction of matrices. e) Multiplication of matrices

**Week 10**

Write C++ programs that illustrate how the following forms of inheritance are supported:

a)Single inheritance b)Multiple inheritance

c)Multi level inheritance d)Hierarchical inheritance

**Week 11**

a.)Write a C++ program that illustrates the order of execution of constructors and destructors when new class is derived from more than one base class.

b) Write a Program to Invoking Derived Class Member Through Base Class Pointer.

**Week 12**

a) Write a Template Based Program to Sort the Given List of Elements.

b) Write a C++ program that uses function templates to find the largest and smallest number in a list of integers and to sort a list of numbers in ascending order.

**Week 13**

a) Write a Program Containing a Possible Exception. Use a Try Block to Throw it and a Catch Block to Handle it Properly.
b) Write a Program to Demonstrate the Catching of All Exceptions.

**Week 14**

Revision

**Text Books:**

1. Object Oriented Programming with C++ by Balagurusamy
2. C++, the Complete Reference, 4th Edition, Herbert Schildt, TMH.

**References:**

1. C++ Primer, 3rd Edition, S.B.Lippman and J.Lajoie, Pearson Education.
2. The C++ Programming Language, 3rd Edition, B.Stroutstrup, Pearson Education.

# MALLAREDDY COLLEGE OF ENGINEERING AND TECHNOLOGY

**I Year B. Tech ANE -I Sem** **L T/P/D C**

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## R17A0083 - ENGINEERING PHYSICS / ENGINEERING CHEMISTRY LAB

## ENGINEERING PHYSICS LAB

**(Any EIGHT experiments compulsory)**

**OBJECTIVES**

- The students are exposed to various experimental skills which is very essential for an Engineering student.
- The experiments are selected from various areas of physics like physical optics, Lasers, Fiber optics, Sound, Mechanics, Electricity & Magnetism and Basic Electronics.
- The students are exposed to various tools like Screw gauge, Vernier calipers, and physics.

**OUTCOMES**

- The student learns the concept of error and its analysis and try formulate new solutions to problems related to engineering physical balance, Spectrometer and Microscope.
- The student develops experimental skills to design new experiments in Engineering that accelerates development of society considering the public health and safety of society.
- Comprehension power of the engineering student increases with exposure to these experiments that helps them to compare the theory and correlate with experiment.

This course on physics lab is designed with 12 experiments in an academic year. It is common to all branches of Engineering in B.Tech 1$^{st}$ year.

**LIST OF EXPERIMENTS: (Any Eight experiments compulsory)**

1. Dispersive power of the material of a prism - Spectrometer.
2. Wave length of light –Diffraction grating-using laser.
3. Newton's Rings –Radius of curvature of Plano convex lens.
4. Melde's experiment –Transverse and Longitudinal modes.
5. Time Constant of an R-C circuit.
6. L-C-R circuit.
7. Magnetic field along the axis of current carrying coil – Stewart and Gee's method.
8. Study the characteristics of LED.
9. Evaluation of numerical aperture of given fiber.
10. Energy gap of a material of p-n junction.
11. Rigidity modulus of given wire - Torsional pendulum.
12. Characteristics of a Solar cell.

# ENGINEERING CHEMISTRY LAB

**List of Experiments** (Any Eight experiments compulsory)

**OBJECTIVES**

This course on chemistry lab is designed with 12 experiments in an academic year. It is common to all branches of Engineering in 1st B.Tech.

The objective of the course is that the student will have exposure to various experimental skills which is very essential for an Engineering student. At the end of the course the student is expected to

- Provide the students with a solid foundation in chemistry laboratory required to solve engineering problems.
- Practical implementation of fundamental concepts.

**OUTCOMES**

- At the end of the course
- Students are able to estimate the total hardness and alkalinity present in a sample of water.
- Ability to select lubricants for various purposes.
- Ability to determine the surface tension of a given liquid.
- Ability to prepare advanced polymer materials.
- Ability to know the strength of an acid by conductometric and potentiometric method.
- Ability to find the $Fe^{+2,}$ and $Mn^{+2}$ present in unknown substances/ ores using titrimetric and instrumental methods.

**List of Experiments**

**Titrimetry:**

1. Estimation of hardness of water by EDTA method.
2. Estimation of alkalinity of water.

**Mineral analysis:**

3. Estimation of manganese dioxide in pyrolusite.

**Instrumental Methods:**

**Colorimetry:**

4. Determination of ferrous iron in cement by colorimetric method

**Conductometry:**

5. Conductometric titration of strong acid vs strong base.
6. Conductometric titration of mixture of acids vs strong base.

**Potentiometry:**

7. Titration of strong acid vs strong base by Potentiometry.
8. Titration of weak acid vs strong base by Potentiometry.

**Preparation:**

9. Preparation of Phenol Formaldehyde Resin(Bakelite)-Demonstration
10. Preparation of Aspirin.

**Physical properties:**

11. Determination of Viscosity of sample oil by Redwood Viscometer.
12. Determination of Surface Tension of a given liquid by Stalagmometer

**TEXT BOOKS:**

1. Practical Engineering Chemistry by K. Mukkanti, etal, B.S. Publications, Hyderabad.
2. Inorganic quantitative analysis, Vogel.

**REFERENCE BOOKS:**

1. Text Book of engineering chemistry by R. N. Goyal and HarrmendraGoel, Ane Books Private Ltd.,
2. A text book on experiments and calculation Engg. S.S. Dara.
3. Instrumental methods of chemical analysis, Chatwal, Anand, Himalaya Publications.

# MALLA REDDY COLLEGE OF ENGINEERING & TECHNOLOGY

| **I Year B. Tech ANE -II Sem** | **L** | **T/ P/ D** | **C** |
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## R17A0082 - ENGLISH LANGULAGE COMMUNICATION SKILS LAB-II

The Language Lab focuses on the production and practice of sounds of the English language and familiarizes the students with its use in everyday situations and contexts.

**Objectives:**

- To make students acquire language skills at their own pace with the usage of authentic learning environment through different media, e-materials and language lab.
- To make learners acquire listening and speaking skills in both formal and informal contexts through diverse interactive sessions and computer aided multi-media training.
- To impart nuances of linguistics to help novices to resolve mother tongue interference by ensuring precision in pronunciation to befit Standard English.
- To help develop the students communication skills by familiarizing them with different strategies to suit academic as well as workplace contexts.

**Syllabus:** English Language Communication Skills Lab shall have two parts:

a. Computer Assisted Language Learning (CALL) Lab
b. Interactive Communication Skills (ICS) Lab

The following course content is prescribed for the English Language Communication Skills Lab

**Exercise –IV**

**CALL Lab:** Word Accent – Rules of Stress and Stress shift
**ICS Lab:** Describing Object, Places, Persons, Events and Experiences.

**Exercise –V**

CALL Lab: Intonation
ICS Lab: Etiquette – Professional and telephone

**Exercise –VI**

**CALL Lab:** Neutralization of Mother Tongue Influence
**ICS Lab**: Oral Presentations (Team or Individual)

**PROJECTS**

## PROJECTS

Students have to choose one of the following projects for their External Examinations, and submit before the end of the semester. This project carries 10 marks in the Lab External Examinations.

1. **Conduct interview using interrogative sentences.**

   Students should interview any teacher, or HOD, or Principal, record their responses and submit the project with those questions and answers. The questions asked should not be less than ten.

2. **Project on differences between group discussion and debate.**

   Students are supposed to do research on the differences between GD and debate and submit a project on it. There should a minimum of ten points with detailed explanation. Students can use pictures as well.

3. **Book Review**

   Choose any fiction of your choice and write a book review on the following parameters.

   - Characterization, plot, theme, message

   Please note that the review is not the summary of the story. The project should not be less than 250 words.

4. **Idioms and Phrasal Verbs**

   Collect at least ten idioms and ten phrasal verbs and concoct a story using those expressions. Word limit is 250.

5. **Project on Kinesics**

   Students are expected to read and research on body language and their implications. You have to make a list of at least ten body movements with pictures and explain them properly.

6. **UK and US vocabulary**

   Find words that are used differently in UK and US English. Make separate lists for different spellings and different pronunciations. The project can answer one or more of the following questions:

   - Which pronunciation do you think are Indians following?
   - Which one is your choice? Which one do you feel comfortable in speaking?
   - Are we Indians influenced by both UK and US English? How can you prove it?

7. **Magazine Article Review**

   Pick a magazine article with a social relevance, which has around 2500 words. Write a review of 250 words as a project. Make sure you voice your opinion in the review.

8. **Career Guidance Project**

   Browse the net and gather information on any professional competitive exam of your choice, like UPSC or GRE. Prepare and present a paper on the scope and relevance of the exam of your choice. The paper should have a minimum of 300-400 words. Students are expected to answer the questions asked by the audience after the paper presentation.

9. **Mother Tongue Influence**

   Choose a particular paragraph of 250 words and ask five of your friends, from different states, to read that. One has to record their accent and pronunciation to check the difference. Make a list of ten words that each one pronounces differently. Find out the reasons behind the differences in pronunciations.

   Also, mention the correct pronunciation in your project with transcription.

10. **Correction of Letter Writing: Language, Sentences, Spelling, Tone and Format**

    Teacher will distribute a set of five letters with errors in spelling, tone, grammar and sentence construction. Give the correct form of the letters as the project

**ELCS LAB:**

3. **Computer Assisted Language Learning (CALL) Lab:**
   The Computer aided Language Lab for 60 students with 60 systems, one master console, LAN facility and English language software for self-study by learners.
   **System Requirement (Hardware component):**
   Computer network with LAN with minimum 60 multimedia systems with the Following specifications:
   i) P –IV Processor
   a)Speed –2.8 GHZ
   b)RAM –512 MB Minimum
   c)HardDisk –80 GB
   ii) Headphones of High quality
4. **Interactive Communication Skills (ICS) Lab :**
   A Spacious room with movable chairs and audio-visual aids with a Public Address System, a T. V., a digital stereo –audio & video system and camcorder etc.

**REFERENCES:**

Books Suggested for English Language Lab Library (to be located within the lab in addition to the CDs of the text book which are loaded on the systems):

1. Suresh Kumar, E. & Sreehari, P. 2009. A Handbook for English Language Laboratories. New Delhi: Foundation
2. Speaking English Effectively 2ndEdition by Krishna Mohan and N. P. Singh, 2011. Macmillan Publishers India Ltd. Delhi.
3. Sasi Kumar, V & Dhamija, P.V. How to Prepare for Group Discussion and Interviews. Tata McGraw Hill
4. Hancock, M. 2009. English Pronunciation in Use. Intermediate. Cambridge: CUP
5. Spoken English: A Manual of Speech and Phonetics by R. K. Bansal & J. B. Harrison. 2013.Orient Blackswan. Hyderabad.
6. Hewings, M. 2009. English Pronunciation in Use. Advanced. Cambridge: CUP
7. Marks, J. 2009. English Pronunciation in Use. Elementary. Cambridge: CUP
8. Nambiar, K.C. 2011. Speaking Accurately. A Course in International Communication. New Delhi: Foundation
9. Soundararaj, Francis. 2012. Basics of Communication in English. New Delhi: Macmillan
10. Spoken English(CIEFL) in 3 volumes with 6 cassettes, OUP.
11. English Pronouncing DictionaryDaniel Jones Current Edition with CD.
12. A textbook of English Phonetics for Indian Studentsby T.Balasubramanian (Macmillan)

**DISTRIBUTION AND WEIGHTAGE OF MARKS**
**English Language Laboratory Practical Examination:**

1. The practical examinations for the English Language Laboratory shall be conducted as per the University norms prescribed for the core engineering practical sessions.
2. For the Language lab sessions, there shall be a continuous evaluation during the year for 25 marks and 50 year-end Examination marks. Of the 25 marks, 15 marks shall be awarded for day-to-day work and 10 marks to be awarded by conducting Internal Lab Test(s). The year-end Examination shall be conducted by the teacher concerned with the help of another member of the staff of the same department of the other institution.

**OUTCOMES:**

- Learning with precision through computer-assisted individualized and independent language learning to work independently in engineering set up.
- Improved conversational reception and articulation techniques in the course of repetitive instruction thereby gaining confidence both in institutional and professional environment.
- Accuracy in pronunciation and restoring Standard English thereby crafting better command in English language so that the students have a cutting edge over others in society.
- Imbibing appropriate use of language in situations to work as an individual and as o leader in diverse teams

# MALLA REDDY COLLEGE OF ENGINEERING & TECHNOLOGY

**II Year B. Tech, ANE-I Sem**

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## R17A0362 - MECHANICS OF FLUIDS

**Objectives**:

- The student will gain insight into a number of potentially useful phenomena involving movement of fluids.
- He/she will learn to do elementary calculations for engineering application of fluid motion.
- This course also prepares the student for more advanced courses such as Aerodynamics- I & -II.

**UNIT I**

**Fluid Properties**: Density, specific weight, specific gravity, surface tension & capillarity, Newton's law of viscosity, incompressible & compressible fluid, numerical problems. Hydrostatic forces on submerged bodies: Pressure at a point, Pascal's law, pressure variation with temperature and height, Center of pressure on vertical, inclined and curved surfaces. Manometers- simple and differential manometers, inverted manometers, micro manometers, Pressure gauges and numerical problems. Buoyancy- Archimedes's Principle, Metacenter, Meta centric height calculations.

**UNIT II**

**Fluid Kinematics**: Stream line, path line, streak line, stream surface, stream tube, classification of flows: steady, unsteady, uniform, non uniform, laminar, turbulent flows. One dimensional approximation, examples of real 1-D flows, two dimensional approximation, 2-D flow in wind tunnel, continuity equations for 1-D and 2-D flows both compressible and incompressible, stream function for two dimensional incompressible flows. Vorticity, irrotational flow, Velocity potential function. Introduction to vortex flows.

**UNIT III**

**Fluid Dynamics**: Surface & body forces, substantive derivative, local derivative and convective derivative, momentum equation, Euler equation, Bernoulli's equation. Phenomenological basis of Navier-Stokes equation.

**Flow measurements:** pressure, velocity and mass flow rate, viscosity, Pitot-static tube, venturi meter and orifice meter, viscometers.

**Flow of through pipes:** major and minor losses.

**UNIT IV**

**Boundary Layer**: Introductory concepts of boundary layer, Large Reynolds number flows and Prandtl's boundary layer hypothesis, Qualitative description of Boundary layer thickness and velocity profile on a flat plate and forces due to laminar and turbulent boundary layer. Separation of boundary layer. Methods of preventing separation of boundary layer.

**UNIT V**

**Dimensional and Model Analysis and Forces on submerged bodies**:

Statement of Buckingham's π-theorem, Similarity parameters: Dimensionless numbers, Types of similarities, Similarity laws, Model testing and Classification of models. Forces exerted by a flowing fluid on a stationary body, Expressions for drag and lift.

**Text Books:**

1. Engineering Fluid mechanics – K.L . Kumar, S.Chand & Co.
2. Introduction to Fluid Mechanics and Fluid machines – S.K. Som and G. Biswas
3. Fluid Mechanics and Hydraulic Machines – RK Bansal, Laxmi Publications

**Reference Books:**

1. Fluid Mechanics – Frank M and White, Mc-Grawhill.
2. Fluid Mechanics- Fox and Mc Donald
3. Fluid Mechanics – E. Rathakrishnan

**Outcomes:**

- Students can define the governing equations of fluid flow problems.
- It makes the student ready to understand about aerodynamics.
- Students can able to create models for experimental analysis.

# MALLA REDDY COLLEGE OF ENGINEERING & TECHNOLOGY

**II Year B. Tech, ANE-I Sem**

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## R17A0363 - MECHANICS OF SOLIDS

**Objectives:**

- To introduce behavior of structural components under various loading conditions.
- To impart the knowledge of Shear force and Bending moment diagrams.

**UNIT – I**

**Simple Stresses & Strains** : Elasticity and plasticity – Types of stresses & strains–Hooke's law– stress – strain diagram for mild steel – Working stress – Factor of safety – Lateral strain, Poisson's ratio & volumetric strain – Elastic module & the relationship between them – Bars of varying section – compositebars – Temperature stresses. Strain energy – Resilience – Gradual, sudden, impact and shock loadings.

**UNIT – II**

**Shear Force And Bending Moment** : Definition of beam – Types of beams – Concept of shear force and bending moment – S.F and B.M diagrams for cantilever, simply supported and overhanging beams subjected to point loads, u.d.l., uniformly varying loads and combination of these loads – Point of contra flexure – Relation between S.F., B.M and rate of loading at a section of a beam.

**UNIT – III**

**Flexural Stresses** : Theory of simple bending – Assumptions – Derivation of bending equation: M/I = f/y = E/R Neutral axis – Determination bending stresses – section modulus of rectangular and circular sections (Solid and Hollow), I,T,Angle and Channel sections – Design of simple beam sections. Shear Stresses: Derivation of formula – Shear stress distribution across various beams sections like rectangular, circular, triangular, I, T angle sections.

**UNIT-IV**

**Principal Stresses and Strains**: Introduction – Stresses on an inclined section of a bar under axial loading – compound stresses – Normal and tangential stresses on an inclined plane for biaxial stresses – Two perpendicular normal stresses accompanied by a state of simple shear – Mohr's circle of stresses – Principal stresses and strains – Analytical and graphical solutions. Theories of Failure: Introduction – Various theories of failure - Maximum Principal Stress Theory, Maximum Principal Strain Theory, Strain Energy and Shear Strain Energy Theory (Von Mises Theory).

**UNIT – V**

**Torsion of Circular Shafts** : Theory of pure torsion – Derivation of Torsion equations : T/J = q/r = Nθ/L – Assumptions made in the theory of pure torsion – Torsional moment of resistance – Polar section modulus – Power transmitted by shafts – Combined bending and torsion and end thrust – Design of shafts according to theories of failure.

**Thin Cylinders**: Thin seamless cylindrical shells – Derivation of formula for longitudinal and circumferential stresses – hoop, longitudinal and Volumetric strains – changes in dia, and volume of thin cylinders– Thin
spherical shells.

**Text Books:**

1. Strength of materials – R.S. Kurmi and Gupta.
2. Solid Mechanics, by Popov
3. Strength of Materials – Ryder. G.H.; Macmillan Long Man Pub.
4. Strength of Materials – W.A. Nash, TMH

**Reference Books:**

1. Strength of Materials -By Jindal, Umesh Publications.
2. Analysis of structures by Vazirani and Ratwani.
3. Mechanics of Structures Vol –I by H.J.Shah and S.B.Junnarkar, Charotar Publishing House Pvt. Ltd.
4. Strength of Materials by D.S Prakash Rao, Universities Press Pvt. Ltd.
5. Strength of Materials by S.S.Rattan, Tata McGraw Hill Education Pvt. Ltd.
6. Fundamentals of Solid Mechancis by M.L.Gambhir, PHI Learning Pvt. Ltd
7. Strength of Materials by R.K Rajput, S.Chand & Company Ltd.

**Outcomes:**

Solve the problems related to the structural components under various loading conditions.

# MALLA REDDY COLLEGE OF ENGINEERING & TECHNOLOGY

**II Year B. Tech, ANE-I Sem**

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## R17A0364 - THERMODYNAMICS

**Objectives:**

- Learn about concepts and laws used in thermodynamics.
- Students acquire knowledge of various cycles.
- Students gain information about the working principle of different engines.

**UNIT - I**

**Introduction: Basic Concepts:** System, Control Volume, Surrounding, Boundaries, Universe, Types of Systems, Macroscopic and Microscopic view points, Concepts of Continuum, Thermodynamic Equilibrium, State, Property, Process, Exact & Inexact Differentials, Cycle - Reversibility - Quasi - static Process, Irreversible Process, Causes of Irreversibility - Energy in State and in Transition, Types, Displacement & Other forms of Work, Heat, Point and Path functions, Zeroth Law of Thermodynamics - Concept of Temperature - Principles of Thermometry - Reference Points - Const. Volume gas Thermometer - Scales of Temperature, Ideal Gas Scale - Joule's Experiments - First law of Thermodynamics – applied to a process and system, Corollaries , Steady Flow Energy Equation.

**UNIT - II**

Limitations of the First Law - Thermal Reservoir, Heat Engine, Heat pump, Parameters of performance, Second Law of Thermodynamics, Kelvin-Planck and Clausius Statements and their Equivalence / Corollaries, PMM of Second kind, Carnot's principle, Carnot cycle and its specialties, Thermodynamic scale of Temperature, Clausius Inequality, Entropy, Principle of Entropy Increase - Energy Equation, Availability and Irreversibility - Thermodynamic Potentials, Gibbs and Helmholtz Functions, Maxwell Relations - Elementary Treatment of the Third Law of Thermodynamics.

**UNIT - III**

Perfect Gas Laws - Equation of State, specific and Universal Gas constants - various Non-flow processes, properties, end states, Heat and Work Transfer, changes in Internal Energy - Throttling and Free Expansion Processes - Flow processes. Perfect Gas Model, derivations - Vader Waals Equation of State - Compressibility charts - variable specific Heats - Gas Tables - Phase Transformations - Triple point at critical state properties during change of phase, Dryness Fraction - Clausius - Clapeyron Equation Property tables. Mollier charts - Various Thermodynamic processes and energy Transfer - Steam Calorimetry.

**UNIT - IV**

Mixtures of perfect Gases - Mole Fraction, Mass friction Gravimetric and volumetric Analysis - Dalton's law of partial pressure, Avogadro's Laws of additive volumes - Mole fraction, Volume fraction and partial pressure, Equivalent Gas const. and Molecular Internal Energy. Enthalpy, specific heats. Heats and Entropy of Mixture of perfect Gases and Vapour, Atmospheric air - Psychrometric Properties and Psychrometric chart.

**UNIT - V**

**Thermodynamic Cycles:** Power cycles: Otto, Diesel, Dual Combustion cycles, Sterling Cycle, Atkinson Cycle, Lenoir Cycle - Description and representation on P-V and T-S diagram, Thermal Efficiency, Mean Effective Pressures on Air standard basis - comparison of Cycles. Application of Brayton cycles in aviation.

**Refrigeration Cycles:** Bell-Coleman cycle - Vapour compression cycle performance Evaluation.

**Text Books:**

1. Engineering Thermodynamics, Special Edition - MRCET, McGrawHill Publishers-2017
2. Engineering Thermodynamics / PK Nag / TMH, 5th Edition
3. Engineering Thermodynamics / E Rathakrishnan / PHI / Second Edition / 2013

**Reference Books:**

1. Engineering Thermodynamics / DP Mishra / Cengage Learning / Second impression 2012
2. Thermodynamics - An Engineering Approach - Yunus Cengel & Boles / TMH
3. Thermodynamics - J.P. Holman / McGrawHill
4. Engineering thermodynamics - Jones & Dugan
5. Engineering Thermodynamics / P. Chattopadhyay / Oxford higher Education / Revised First Edition
6. Thermodynamics & Heat Engines - Yadav - Central Book Dept. Allahabad

**Outcomes:**

- Basic concepts can be applied by the students
- Students can correlate cycles applicable for engines.
- Students should be able to analyze the relationship between various processes and working mechanisms of the engines.

# MALLA REDDY COLLEGE OF ENGINEERING & TECHNOLOGY

| II Year B. Tech, ANE-I Sem | L | T/P/D | C |
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## R17A2101 - INTRODUCTION TO AEROSPACE ENGINEERING

**Objective:**

1. Insight overview of various important areas in Aeronautical Engineering
2. Students will acquire the knowledge of the Evolution of Aerospace industry.
3. To provide an exposure of various forces and performance aspects important for flight.

**UNIT - I**

**History of Flight - The Aerospace Environment**

Evolution of flight, usage of balloons, dirigibles, Heavier than air aircraft, various advances in techniques for commercial transportation. Helicopters, missiles, Conquest of space and exploring solar system and beyond, Earth's atmosphere, standard atmosphere, the temperature extremes of space, laws of gravitation low earth orbit, microgravity, benefits of micro gravity. The near earth Radiative environment, magnetosphere, Environmental impact on spacecraft. Meteoroids, micrometeoroids, space debris and the planetary environments.

**UNIT - II**

**Aerodynamics and Performance**

Airfoil- nomenclature and types, Aerodynamic forces on a wings and bodies, Generation of lift, Sources of drag, Force and moment coefficients, centre of pressure. Rotary wing aircraft concepts – Forces while hovering, Propeller Theory.

Performance requirements of a civil and military aircrafts. Control surfaces,

**UNIT - III**

**Propulsion- Aircrafts, Rockets and Missiles:** Thrust for flight, Reciprocating engines-2 stroke/4 stroke; Jet engine and types, Rocket engines - Description, Principles of operation. Types of orbits and maneuvers, Types of Missiles, simililarities and differences with launch vehicle, controls for missiles, Airframe components of missiles

**Evolution of Space Missions:** Space missions, Mission objectives, Case studies, Human space flight missions - goals, historical background, The Soviet and US missions, The Mercury, Gemini, Apollo (manned flight to the moon), Skylab, Apollo-Soyuz, Space Shuttle, International Space Station, extravehicular activity, Life support systems. History and evolution of ISRO, Missions carried in ISRO.

**UNIT – IV**

**Structures:** History of airplane construction, Loads on aircraft, Lift production/augmentation devices, Low speed/ high speed airfoils, Monocoque and semi-monocoque structures, Load bearing structural components, use of composites in aircraft and aerospace vehicles.

**UNIT - V**

**Experimental Aerodynamics:** Requirement and importance of Wind tunnel, Shock Tubes, Shock Tunnel – types and principle of operation,

**Measurement Techniques:** Sensors and instrumentation- Pitot static tube, Cockpit layout of modern civil aircraft, Basic principles of Gyro, accelerometers.

**TEXT BOOKS:**

1. Anderson, J.D., Introduction to Flight, fifth edition, Tata McGraw-Hill, 2007, ISBN: 0-07-006082-4.
2. Kermode, Flight Without Formulae, fifth edition, Pearson Education, 2004, *ISBN*-10: 0273403605; *ISBN*-13: 978-0273403609

**REFERENCES:**

1. Bamard, R. H. and Philpot, D.R., Aircraft Flight, third edition, Pearson, 2004, ISBN: 81-297-0783-7.

**Outcome:**

1. Students acquire knowledge with Aerospace Engineering to take up study in detail through subsequent courses.
2. Students acquire fundamental concepts of all aspects of flight.
3. Students acquire the knowledge of the important design aspects of aerospace vehicles.

# MALLA REDDY COLLEGE OF ENGINEERING & TECHNOLOGY

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## R17A2103 - AIRCRAFT MATERIALS AND PRODUCTION TECHNOLOGY

**OBJECTIVES :**

On completion of the course, the student will have knowledge about the selection of aircraft materials and process involved during production.

**UNIT-I INTRODUCTION:**

Classification of aircraft materials, properties of flight vehicle materials and their significant, factors affecting the selection of material for different parts of airplanes, Process associated to conventional materials.

**UNIT-II METALS AND ALLOYS:**

Aluminum and its alloys, high strength and high corrosion alloys. Titanium and its alloys: applications, machining, forming,welding and heat treatment; Classification of steels alloys, effect of alloying elements, magnesium alloys and their properties, heat treatment processes, maraging steels: properties and applications.

**UNIT-III HIGH STRENGTH AND HEAT RESISTANT ALLOYS:**

Classification of heat resistant materials, iron, nickel and cobalt based alloys, refractory materials, ceramics, properties of inconel, monal, nimonic and super alloys; application of heat resistant alloy in aircrafts. Heat treatment of steel and its alloys. Case hardening, initial stresses and stress alleviation procedures, corrosion prevention and protective treatments.

**UNIT-IV COMPOSITE MATERIALS:**

Classification, characteristics of composite materials, volume fraction, laminated composites, particulate composites and fibrous composites. Types of reinforcements, their shape and size, production and properties of fiber reinforced plastics. Application of Composite materials.

**UNIT-V AIRCRAFT MANUFACTURING PROCESSES:**

Profiling, hydro forming, spar milling, spark erosion and powered metal parts, integral machining, contour etching, high energy rate forming and manufacturing of honeycomb structures and general methods of construction of aircraft engine parts.

**Text Books:**

1. G. F. Titterton, Aircraft Materials and Processes, 5/e, Sterling Book House,1998.
2. F. C. Campbell, Manufacturing Technology for Aerospace Structural Materials,1/e, Elsevier Publications, 2006.
3. Agarwal, B.D., and Broutman, L.J., "Analysis and Performance of Fibre Composites," John Wiley and sons. Inc., New York, 1995.
4. L. Gupta, Advanced Composite Materials, 2/e, Himalayan Books, 2006.

**Reference Books:**

1. R. H. Avner, Introduction to Physical Metallurgy, 2/e, Tata McGraw Hill,
2. W. D. Callister, D. G. Rethwisch, An Introduction on Material Science and Engineering, John Wiley, 2010.
2. Autar K Kaw, 'Mechanics of Composite Materials', CRC Press, 1997.
2. Lubin, G., "Handbook on Advanced Plastics and Fibre Glass", Von Nostrand Reinhold Co., New York, 1989.
4. Allen Baker, "Composite Materials for Aircraft Structures", AIAA Series, II Edition, 1999.

**Outcomes:**

- The Students can able to understand factors involved with the selection of aircraft materials and their production techniques.
- The student can correlate the various methods of manufacturing employed for different materials.

# MALLA REDDY COLLEGE OF ENGINEERING & TECHNOLOGY

**II Year B. Tech, ANE-I Sem**

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## R17A0206 - ELECTRICAL AND ELECTRONICS ENGINEERING

**Objectives:**

- This course introduces the concepts of electrical DC and AC circuits, basic law's of electricity, instruments to measure the electrical quantities
- Different methods to solve the electrical networks, construction operational features of energy conversion devices i.e. DC and AC machines, transformers.
- It also emphasis on basics of electronics, semiconductor devices and their characteristics and operational features.

**UNIT-I:**

**Electrical Circuits:** Basic definitions, Types of elements, Ohm's Law, Resistive networks, Kirchhoff's Laws, Inductive networks, Capacitive networks, Series, Parallel circuits and Star-delta and delta-star transformations.

**Instruments:** Basic Principle of indicating instruments, Permanent magnet moving coil and moving iron instruments.

**UNIT-II:**

**DC Machines:** Principle of operation and operation of DC Generator, EMF equation, Types, Losses and efficiency, Magnetization and load characteristics of DC generators. DC Motors-Types, Characteristics, Losses and efficiency, Swinburne's Test, 3-Pont starter, Speed control of DC shunt motor-Flux and armature voltage control methods.

**UNIT-III:**

**Transformers**: Principle of operation of single phase transformers, EMF equation, Equivalent circuit, Losses, OC and SC tests, Efficiency and regulation.

**AC Machines:** Principle of operation of alternators, Regulation by synchronous impedance method .Principle of operation of induction motor, slip – torque characteristics, Applications.

**UNIT–IV:**

**Diodes**: P-n junction diode, symbol, V-I Characteristics, Diode applications, and Rectifiers – Half wave, Full wave and Bridge rectifiers (simple Problems).

**Transistors:** PNP and NPN Junction transistor, Transistor as an amplifier, SCR characteristics and applications.

**UNIT-V: Cathode Ray Oscilloscope**: Principles of CRT (Cathode Ray Tube), Deflection, Sensitivity, Electrostatic and magnetic deflection, Applications of CRO - Voltage, Current and frequency measurements.

**EEE: Text Books**

1. Basic Electrical Engineering, Abhijit Chakrabarthi, Sudiptanath, Chandrakumar Chanda, Tata-McGraw-Hill.
2. Basic concepts of Electrical Engineering, PS Subramanyam, BS Publications.
3. Principles of Electrical Engineering, V.K Mehta, Rohit Mehta, S.Chand Publications.

**EEE: Reference Books:**

1. Basic Electrical Engineering, S.N. Singh, PHI.
2. Basic Electrical Engineering, T.K.Nagasarkar and M.S. Sukhija, Oxford University Press.
3. Fundamentals of Electrical Engineering, Rajendra Prasad, PHI.
4. Basic Electrical Engineering by D.P.Kothari, I.J. Nagrath, McGraw-Hill.

**ECE: Text Books**

1. Electronic Devices and Circuits, S.Salivahanan, N.Suresh Kumar, A.Vallavaraj,Tata McGraw- Hill companies.
2. Electronic Devices and Circuits, K. Lal Kishore, BS Publications.

**ECE: Reference Books:**

1. Millman's Electronic Devices and Circuits,J. Millman, C.C.Halkias, and Satyabrata Jit, Tata McGraw-Hill companies.
2. Electronic Devices and Circuits, R.L. Boylestad and Louis Nashelsky,PEI/PHI.
3. Introduction to Electronic Devices and Circuits, Rober T. Paynter,PE.
4. Integrated Electronics, J. Millman and Christos C. Halkias, Tata McGraw-Hill companies.
5. Electronic Devices and Circuits, Anil K. Maini, Varsha Agarwal,Wiley India Pvt. Ltd.

**Outcomes:**

After going through this course the student gets a thorough knowledge on basic electrical circuits, parameters, electromechanical energy conversion, construction and operational characteristics of DC and AC machines, the constructional features and operation of measuring instruments like voltmeter, ammeter, wattmeter etc., different semiconductor devices, operation of diodes and transistors, their voltage-current characteristics, realization of various electronic circuits with the various semiconductor devices ,and cathode ray oscilloscope, With which he/she can able to apply the above conceptual things to real-world electrical, electronics problems and applications.

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## R17A0384 - MECHANICS OF SOLIDS AND MECHANICS OF FLUIDS LAB

**Objectives:**

- To supplement the theoretical knowledge gained in Mechanics of Solids with practical testing for determining the strength of materials under externally applied loads.
- This would enable the student to have a clear understanding of the design for strength and stiffness**.**
- Upon Completion of this subject, the students can able to have hands on experience in flow measurements using different devices

**(A) MECHANICS OF SOLIDS LAB:**

1. Direct tension test
2. Torsion test
3. Hardness test

a) Brinells hardness test

b) Rockwell hardness test

4. Test on springs
5. Compression test on cube
6. Impact test
7. Punch shear test

**(B) MECHANICS OF FLUIDS LAB**

8. Calibration of Venturimeter
9. Calibration of orifice meter
10. Calibration of Triangular notch
11. Verification of Bernoulli's apparatus.
12. Pipe friction.
13. Determination of co-efficient of loss of head in a sudden retraction (Mouth Piece Apparatus)

**Note:** Any 10 experiments can be conducted minimum five from each section.

**Equipment needed**

**MOS – lab**

1. UTM – 20 / 40 Tons with load Vs Elongation graphical attachment and provision for Bending and sheering along with accessories and end grips
2. Deflection test rig (Fabricated hardware + precession dial gauge)
3. Torsion testing Machine
4. Hardness testing Machine ( Brinnel and Rockwell)
5. Impact Testing Machine
6. Spring testing Machine.

**MOF – lab**

1 Venturimeter test rig

2.Test rig for Flow over notch

3.Pipe friction apparatus

4.Bernoulli's apparatus

5.test rig for Orifice meter

6. Mouthpiece apparatus.

**Outcomes:**

- Ability to characteristic materials
- Ability to use the measurement equipments for flow measurement

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## R17A0282 - ELECTRICAL AND ELECTRONICS ENGINEERING LAB

**SECTION-A: ELECTRICAL ENGINEERING**

1. Magnetization characteristics of D.C. shunt generator.
2. Speed control of DC shunt motor.
3. Swinburne's test on DC shunt machine.
4. Brake test on DC shunt motor.
5. OC and SC tests on Single-phase transformer.
6. Brake test on 3-phase induction motor.
7. Regulation of an alternator by synchronous impedance method.

**SECTION-B: ELECTRONICS ENGINEERING**

8. PN Junction diode characteristics.
9. Zener diode characteristics.
10. Half wave rectifier with and without filter.
11. Full wave rectifier with and without filter.
12. Transistor CB characteristics (Input and Output).
13. Transistor CE characteristics (Input and Output).

**Note:** Any 10 experiments can be conducted.

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## R17A0006 - GENDER SENSITIZATION
### (An Activity – based Course)

**Objectives of the Course:**

- To develop students sensibility with regard to issues of gender in contemporary India.
- To provide a critical perspective on the socialization of men and women.
- To introduce students to information about some key biological aspects of genders.
- To expose the students to debates on the politics and economics of work.
- To help students reflect critically on gender violence.
- To expose students to more egalitarian interactions between men and women.

**Learning Outcomes:**

- Students will have developed a better understanding of important issues related to gender in contemporary India.
- Students will be sensitized to basic dimensions of the biological, sociological, psychological and legal aspects of gender. This will be achieved through discussion of materials derived from research, facts, everyday life, literature and film.
- Students will attain a finer grasp of how gender discrimination works in our society and how to counter it.
- Students will acquire insight into the gendered division of labor and its relation to politics and economics.
- Men and women students and professionals will be better equipped to work and live together as equals.
- Students will develop a sense of appreciation of women in all walks of life.
- Through providing accounts of studies and movements as well as the new laws that provide protection and relief to women, the textbook will empower students to understand and respond to gender violence.

**Unit – I**

**UNDERSTANDING GENDER:**

**Gender: Why should we study it? (*Towards a world of Equals: Unit – 1*)**

**Socialization: Making women, making men (*Towards a World of Equals: Unit – 2*)**

Introduction. Preparing for Womanhood. Growing up Male. First lessons in Caste. Different Masculinities.

**Just Relationships: Being Together and Equals (*Towards a World of Equals: Unit – 12*)**

Mary Kom and Onler. Love and Acid just do not Mix. Love Letters. Mothers and Fathers. Further Reading: Rosa Parks – The Brave Heart.

**Unit – II**

**GENDER AND BIOLOGY:**

**Missing Women: Sex Selection and its Consequences (*Towards a World of Equals: Unit – 4)***

Declining Sex Ratio. Demographic Consequences.

**Gender Spectrum: Beyond the Binary (*Towards a World of Equals: Unit – 10*)**

Two or Many? Struggles with Discrimination.

**Additional Reading: Our Bodies, Our Health (Towards a World of Equals: Unit – 13)**

**Unit – III**
**GNNDER AND LABOUR:**
**Housework: the Invisible Labor(Towards a World of Equals: Unit – 3)**
**"My Mother doesn`t Work". *Share the Load*.**
**Women`s Work: Its Politics and Economics (Towards a World of Equals: Unit – 7)**
Fact and Fiction. Unrecognized and Unaccounted work. Further Reading: Wages and Conditions of Work

**Unit – IV**
**ISSUES OF VIOLENCE:**
**Sexual Harassment: Say No! (Towards a World of Equals: Unit – 6)**
Sexual Harassment, not Eve – teasing – Coping with Everyday Harassment – Further Reading: "Chupulu"
**Domestic Violence: Speaking Out (Towards a World of Equals: Unit – 8)**
Is Home a Safe Place? – When Women Unite [Film]. Rebuilding Lives. Further Reading. New Forums for justice.
**Thinking about Sexual Violence (Towards a World of Equals: Unit – 11)**
Blaming the Victim – "! Fought for my Life ……" – Further Reading. The Caste Face of Violence.

**Unit – V**
**GENDERS STUDIES:**
**Knowledge: Through the Lens of Gender (Towards a World of Equals: Unit – 5)**
Point of View. Gender and the Structure of Knowledge. Further Reading. Unacknowledged Women Artists of Telangana
**Whose History? Questions for Historians and Others (Towards a World of Equals: Unit – 9)**
Reclaiming a Past. Writing other Histories. Further Reading. Missing Pages from Telangana History.

**Essential Reading**: All the Units in the Text books, "Towards a World of Equals: A Bilingual Textbook on Gender" Written by A. Suneetha, Uma Bhrugubanda, Duggirala Vasanta, Rama Melkote, Vasudha Nagaraj, Asma Rasheed, Gogu Shyamala, Deepa Sreenivas and Susie Tharu.
**Note**: Since it is Innterdisciplinary Course, reasource Persons can be drawn from the fields of English Literature of Sociology or Political Science or any other qualified faculty who has expertise in this field.

**Reference Books:**

1. Sen, Amartya. "More than Once Million Women are Missing". New York Review of Books 37.20 ( 20 December 1990). Print. `We Were Making History……' Life Stories of Women in the Telangana People`s Struggle. New Delhi : Kali for Women, 1989.
2. Tripti Lahiri. "By the Numbers: Where India Women Work." Women`s Studies Journal (14 November 2012) Available online at: http://blogs. Wsj.com/India real time/2012/11/14/by – the –numbers – where- Indian- women-works/>
3. K. Satyanarayana and Susie Tharu (Ed.) Steel Nibs Are Sprouting: New Dalit Writing From South India, Dossier 2: Telugu And Kannada http://harpercollints.co.in/BookDetail.asp?Book Code=3732
4. Vimala "Vantilu (The Kitchen)". Omen Writing in India: 600BC to the Present, Volume II The 20th Century. Ed. Susie Tharu and K. Lalita. Delhi: Oxford University Press, 1995. 599-601.
5. Shatrughna, Veena et al. Women`s Work and its Impact on Child Health and Nutrition, Hyderabad, National Institute of Nutrition, India Council of Medcial Research 1993.

6. Stress Shakti Sanghatana. “We Were Making History….’Life Stories of Women in the Telangana People`s Struggle. New Delhi:Kali of Women, 1989.
7. Menon, Nivedita. Seeing Like a Feminist. New Delhi. Zubaan-Penguin Books, 2012.
8. Jayaprabha, A. “Chupulu (Stares)”. Women Writing in India: 600BC to the Present. Volume II: The 20th Century Ed. Susie Tharu and K. Lalita. Delhi: Oxford University Press, 1995. 596-597.
9. Javeed, Shayam and Anupam Manuhaar. “Women and Wage Discrimination in India: A Critical Analysis”. International Journal of Humanilities and Social Science Invention 2, 4(2013).
10. Gautam, Liela and Gita Ramaswamy. “A ‘Conversation’ between a Daughter and Mother”. Broadsheel on Contemporany Politics. Special Issue on Sexuality and Harassment: Gender Politics on Campus Today. Ed.Madhumeeta Sinha and Asma Rasheed. Hydrabad: Anveshi research Center for Women`s Studies, 2014.
11. Abdulali Sohaila. “ I Fought For My Life…and Won.” Abailable online at: http://www.thealternative. In/lifestyle/i-fought-for-my lifeand-won-sohaila-abdulal/
12. Jeganathan Pradeep, Partha Chatterjee (Ed). “Community, Gender and Violence Subaltern Studies XI”. Permanent Block and Ravi Dayal Publishers, New Delhi, 2000
13. K. Kapadia. The Violence of Development: The Politics of Identity, Gender and Social Inequalities in India. London: Zed Books, 2002.
14. S. Benhabib. Situating the self: Gender, Community, and Postmodernism in Contemporary Ethics, London:Routledge, 1992.
15. Virginia Woolf A Room of One`s Oxford: Black Swan. 1992.
16. T. Banuri and M. Mahmood, Just Development: Beyond Adjustment with a Human Face, Karachi: Oxford University Press, 1997.

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## R17A2104 - AERODYNAMICS

**Objectives:**

- To introduce the concepts of mass, momentum and energy conservation relating to aerodynamics.
- To make the student understand the concept of vorticity, irrotationality, theory of airfoils and wing sections.
- To introduce the basics of viscous flow.

**UNIT - I**

**Basics of Aerodynamics**:Review of Fluid Mechanics, Developments in aerodynamics, Fundamental aerodynamics variables, Nomenclature of Airfoil - Aerodynamic forces and moments and coefficients, Pressure distribution on an airfoil, Types of drag, Estimation of lift, Drag and pitching moment coefficient from the pressure distribution. Governing equations - Continuity, momentum and Energy equations in differential form.

**UNIT - II**

**Inviscid Incompressible Flows:** Angular Velocity, Vorticity and circulation, Kelvin Theorem and irrotational flow velocity potential, Stream function, Laplace equation, boundary condition at infinity and wall, Elementary flows and their combinations, Magnus effect, D'Alembert's Paradox, Kutta - Joukowsky theorem, kutta condition. Kelvin's circulation theorem & starting vortex, concept of small perturbation & thin airfoil theory - linearization of the boundary condition, resolution of thin airfoil problem into lifting & nonlifting cases, their solutions by method of singularity distribution, the aerodynamic center.

**UNIT - III**

**Viscous Flow and Boundary Layer:** Role of viscosity in fluid flow. Boundary layer growth along a flat plate and nearly flat surface, displacement thickness and patching of inviscid external flow to viscous boundary layer flow, laminar boundary layer, transition and turbulent boundary layer, factors influencing boundary layer separation - adverse pressure gradient and sharp bending / turning of surface. Real (viscous) flow and importance of skin friction drag airfoils. Blasius solution for the flat plate problem. Definition of momentum thickness & derivation of Von karman's momentum equation.

**UNIT - IV**

**Inviscid Flow over Wings & Panel Methods:** Vortex filament statement of Helmholtz's vortex theorems, Biot - Savart Law, starting, bound & trailing vortices of wings, Prandtl's Lifting line theorem - downwash and induced drag, Elliptic loading & wings of elliptic platforms, expression for induced drag, minimum induced drag for Elliptic platform. Source and vortex panel methods for airfoils.

**UNIT - V**

**Applied Aerodynamics:** Drag reduction & lift augmentation - Sweep, winglets, Flaps, slats and vortex generators. Airfoil design for high $C_{l\ max}$, Multiple lifting surfaces, Circulation control, Streamwise vorticity, Secondary flows, Vortex lift strakes.

**Text books:**

1. Aerodynamics for Engineers, fourth edition, Bertin, J.J., Pearson Education, 2012, ISBN: 81-297-0486-2.
2. Fundamentals of Aerodynamics, Anderson, Jr., J.D., International edition, McGraw Hill, 2001, ISBN: 0-07-118146-6.
3. Kuethe, A.M., and Chow, C., Foundations of Aerodynamics, 5th Edn, Wiley, 1998, ISBN: 0-471-12919-4.
4. Karamcheti, Krishnamurthy, Idea fluid Aerodynamics.

**Reference Books:**

1. Kuchemann, D., The Aerodynamic Design of Aircraft, Pergamon, 1978.
2. Shevell, R.S., Fundamentals of Flight, Indian reprint, Pearson Education, 2004, ISBN: 81-297-0514-1.
3. McCormick, B.W., Aerodynamics, Aeronautics & Flight Mechanics second edition John Wiley, 1995, ISBN: 0-471-575062.

**Outcomes:**

- An ability to apply thin airfoil theory to predict aerodynamic characteristics of air foil
- Application of Elementary flows to develop real problems.
- Development of devices to enhance aerodynamic characteristics of aircraft components.

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## R17A2105 - AEROSPACE VEHICLE STRUCTURES - I

**Objectives:**

- To impart basic understanding aircraft structure
- To provide the students an understanding on the linear static analysis of determinate and
  indeterminate aircraft structural components.
- To provide the design process using different failure theories.

**UNIT – I**

**INTRODUCTION TO AIRCRAFT STRUCTURE:**

Structural components of Aircraft, Monocoque, semi-monocoque and geodesic construction, typical wing and fuselage structure.

**STATICALLY DETERMINATE & INDETERMINATE STRUCTURES**

Plane truss analysis – method of joints – method of sections – method of shear – 3-D trusses –principle of super position, clapeyron's 3 moment equation and moment distribution method for indeterminate beams.

**UNIT II ENERGY METHODS**

Strain Energy in axial, bending, torsion and shear loadings. Castigliano's theorems and theirapplications. Energy theorems – dummy load & unit load methods – energy methods applied tostatically determinate and indeterminate beams, frames, rings & trusses.

**UNIT III BEAMS AND COLUMNS**

Deflection of beams-Euler's column curve – inelastic buckling – effect of initial curvature – the Southwell plot – columns with eccentricity – use of energy methods – theory of beam columns – beam columns with different end conditions – stresses in beam columns.

**UNIT IV FAILURE THEORIES**

Ductile and brittle materials – maximum principal stress theory - maximum principal strain theory -maximum shear stress theory - distortion energy theory – octahedral shear stress theory.

**UNIT V INDUCED STRESSES**

Thermal stresses – impact loading – Fatigue – Creep - Stress Relaxation

**Text Books:**

1. Megson THG, "Aircraft Structure for Engineering students", Edward Arnold Publication.
2. Timoshenko and Gere, "Mechanics of Materials", Tata McGraw Hill, 1993

**Reference Books:**

1. David J. Peery "Aircraft Structures" McGraw Hill Book Company.
2. Argyris J.H. and Kelsey S.Energy theorems and structural analysis, Butterworths Scientific Publications 1960.
3. Donaldson, B.K. "Analysis of Aircraft Structures - AnIntroduction" McGraw Hill.
4. David H. Allen, and Walter E. Haiseler "Introduction to Aeronautical Structure Analysis", Jhon Wiley & Son, 1985.

**Outcomes:**

- The student will be able to analyze basic aircraft structure.
- Analyzing determinant and indeterminant structures.
- Application of Energy principles

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## R17A2106 - AIR BREATHING PROPULSION

**Objective:**

- Students can focus on various propulsion systems available in aerospace industry and also understand the future scenario.
- Understand the performance aspects at the design point and off design operations.
- To provide an exposure with reference to numerical calculations and design limitations.

**UNIT I**

**FUNDAMENTALS OF PROPULSION**

Types of aerospace propulsion, working principles, advantages, disadvantages, applications – reciprocating engines, propellers, jet engine, turboprop, turbofan, turbo-shaft, ramjet, scramjet, pulsejet. Engine components- performance requirements, thermodynamic processes- change of state- representation by T-sand p-v diagrams - pressure ratios, temperature ratios. Energy transfer, losses- entropy generation- mechanisms. Performance- polytropic, stage and component efficiencies, burning efficiency

Station numbering in engine, thrust generation, momentum equations, equation of thrust for installed and uninstalled cases, factors affecting thrust, Role of propulsion in aircraft performance.

**UNIT II ANATOMY OF JET ENGINE-I**

**INLETS:** Locations, Types of inlets, operating principle, functions, geometry, operating conditions, flow field, capture area, sizing, flow distortion, drag, and diffuser losses and methods of mitigation, performance.
**NOZZLE:** Exhaust nozzles- primary nozzle, fan nozzle- governing equations of flow- choking, engine back pressure control, nozzle-area ratio, thrust reversal, vectoring mechanisms. Afterburner functions and its components, design requirements and parameters. Performance gross thrust coefficient, discharge, coefficient, velocity coefficient, angularity coefficient, performance maps, Numericals on nozzles.

**UNIT III ANATOMY OF JET ENGINE-II**

**COMPRESSOR & TURBINE:** types, construction, stage, cascade, blade geometry, velocity triangles, Euler equation, types of flow analysis, diffusion factor, stage loading, Variable stator, limits on compressor performance, typical blade profiles, Numericals on turbo machinery, Axial flow turbines-, similarities and differences with compressors, Velocity diagram analysis, no exit swirl condition, flow losses, causes tangential stresses, repeating stages, Computation of stage parameters for ideal and real turbine of given cascade, blade geometry and initial flow conditions and turbine speed- procedure. Typical turbine blade profiles, turbine performance maps, Thermal limits of blades, cooling, materials, construction, methods of production, Limits on stage pressure ratio of turbines- multistage, multi-spooled turbines. design parameters.

**UNIT IV ANATOMY OF JET ENGINE-III**

**BURNER:** Burners- types, components- function, schematic diagram, airflow distribution, cooling- types, cooling effectiveness, performance parameters, combustion efficiency, overall total pressure loss, exit temperature profile, ignition relight envelope- effect of combustor design, Fuel injection, atomisation, vaporisation, recirculation- flame stabilisation, flame holders. Afterburners, function, components, bypass duct, total pressure losses, Mixing process- pressure losses, fuels- composition, specifications of commonly used fuels.

**UNIT V:**

**DESIGN OF GAS TURBINE ENGINE**

Aircraft Mission Analysis, Engine Selection- Performance and Parametric Analysis, Sizing the Engine, Major Considerations in Engine Component Design - Rotating Turbo-machinery, Combustion Systems, Inlets and Exhaust Nozzles

**SYSTEM MATCHING AND ANALYSIS**

Matching of Gas Turbine Components, Cycle Analysis of one and two spool engines, Gas Generator, Component Modeling, Solution of Matching Problem, Dynamic or Transient behavior, Matching of Engine and Aircraft, Use of Matching and Cycle analysis in Second stage design

**Text Books:**

1. Mattingly, J.D., Elements of Gas Turbine Propulsion, McGraw-Hill, 1996, ISBN0-07-912196-9.
2. Flack, R.D., Fundamentals of Jet Propulsion with applications, Cambridge University Press, 2005, ISBN0-521-81983-0.

**References:**

1. Cohen, Henry, Rogers, G. F. C., Saravanamuttoo, H.H., Gas Turbine Theory, Longman Pub Group, ISBN 10: 0582236320 ISBN 13: 9780582236325.
2. V. Ganesan, Gas Turbines, Tata McGraw-Hill, 1999, ISBN, 0070681929.

**Outcomes:**

- Students attain knowledge of all propulsion systems in use and under developed.
- Students will be able to configure the engine required for specific need.
- Students understand design requirements of engine and aircraft.

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## R17A2107 - AIRCRAFT PERFORMANCE

**Objectives:**

- To equip the students with fundamental understanding of aircraft performance in various flight regimes.
- To familiarize the concepts and parameters affecting flight performance.
- To understand the performance of rockets and missiles.

**UNIT – I**

**Introduction to Aircraft Performance- the Force Systems of The Aircraft:** The role and design mission of an aircraft. Specification of the performance requirements and mission profile. Importance of performance analysis, estimation, measurement, operational safety and economy. The Standard Atmosphere. Off-standard and design atmosphere. Measurement of air data. Air data computers. Equations of motion for performance - the aircraft force system. Lift, drag, side force. Total airplane drag- estimation, drag reduction methods. The propulsive forces - the thrust production engines, power producing engines, variation of thrust, propulsive power and specific fuel consumption with altitude and flight speed.

**UNIT - II**

**Cruise Performance:** Maximum and minimum speeds in level flight. Range and endurance with thrust production, and power producing engines. Cruise techniques - constant angle of attack, constant Match number; constant altitude, methods- comparision of performance. The effect of alternative fuel flow laws, weight, altitude and temperature on cruise performance. Cruise performance with mixed power-plants.

**UNIT - III**

**Climb, Descent and Manoeuvre Performance:** Climb and descent techniques, safety considerations, performance analysis- maximum climb gradient, climb rate. Energy height and specific excess power, optimal climbs - minimum time, minimum fuel climbs. Measurement of climb performance. Descent performance in aircraft operations. Effect of wind on climb and descent perfomance. Accelerated motion of aircraft - equations of motion- the manoeuvre envelope. Longitudinal manoeuvres- the pull-up, push over manoeuvres. Lateral manoeuvres- turn performance- turn rates, turn radius-limiting factors. Manouvre boundaries, Manoeuvre performance of military aircraft, transport aircraft.

**UNIT - IV**

**Take-off And Landing- Safety Requirements - Flight Planning:** Estimation of take-off distances. The effect on the take-off distance wrt weight, wind, runway conditions, ground effect. Take off safety factors ,The estimation of landing distances, the discontinued landing ,baulked landing air safety procedures and requirements on performance The effect on the landing distance, of weight, wind, runway conditions, ground effect. Fuel planning, fuel requirement, trip fuel, reserve and tankering.

**UNIT - V**

**Performance of Rockets And Missiles:** Principal design features of rockets and missiles. Types, Applications, Staging, Launch and Climb. Performance in boost glide, boost sustain, long range cruise and long -range ballistic trajectories.

**Text Books:**

1. Eshelby, M.E., Aircraft Performance; Theory and Practice, AIAA Education Series, AIAA, 2000, ISBN: 1-56347-398-4.
2. Brandt, S.A, et. al., Introduction to Aeronautics: A Design Perspective, Second Edition, AIAA Education Series, AIAA, 2004, ISBN: 1-56347-701-7.
3. Missile Configuration Design, Chin SS, Mc Graw Hill, New York, 1961.

**Reference Books:**

1. Dole, C.E., Flight Theory and Aerodynamics: a Practical Guide for Operational Safety, Wiley Interscience, 1981, ISBN: 0-471-09152-9.
2. Anderson, J.D. Jr., Aircraft Performance and Design, International edition, McGraw Hill, 1999, ISBN: 0-07-001971-1.
3. McCormick, B.W, Aerodynamics, Aeronautics and Flight Mechanics, second edition, John Wiley, 1995, ISBN: 0-471-57506-2.
4. Shevel, R.S., Fundamentals of Flight, second edition, Pearson Education, 1989, ISBN: 81-297-0514-1.
5. Raymer, D.P., Aircraft Design: A Conceptual Approach, third edition, AIAA Education Series, AIAA, 1999, ISBN: 1-56347-281-0.
6. Yechout, T.R. et al., Introduction to Aircraft Flight Mechanics, AIAA Eduction Series , AIAA, 2003, ISBN: 1-56347-577-4.

**Outcomes:**

- To make preliminary performance estimation.
- To assess various aircraft parameters and their effect of performance.
- The student will have a clear understanding of the fundamental concept leading to aircraft performance.

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## R17A0061 - MANAGERIAL ECONOMICS AND FINANCIAL ANALYSIS

**OBJECTIVES:**

- To enable the student to understand and appreciate, with a practical insight, the importance of certain basic issues governing the business operations that are needed for sound economic decision making.
- The main purpose is to provide inputs on an overall analysis of an individual firm namely: demand and supply, production function, cost analysis, markets etc.
- To understand and analyse the financial formats of the organisation for smooth running of the business.

**Unit-I**

**Introduction to Managerial Economics:** Definition, Nature and scope of Managerial economics, Micro and Macroeconomic concepts.

Demand Analysis: Demand Determinants, Law of Demand and exceptions. Elasticity Of Demand: Definition, Types, Measurement and Significance of elasticity of Demand. Demand Forecasting, Factors governing demand Forecasting, methods of demand Forecasting.

**Unit-II**

**Production & Cost Analysis:**Production Function- Isocost and Isoquants MRTS, Least Cost Combination of Inputs, Cobb-Douglas Production function, Laws of Returns, Internal and External Economies of Scale.

Cost Analysis: Cost concepts. Break-even Analysis (BEA)-Determination of Break-Even Point (simple problems) - Managerial Significance.

**Unit-III**

**Markets & New Economic Environment:** Types of competition and Markets, Features of Perfect competition, Monopoly and Monopolistic Competition. Objectives and Policies of Pricing- Methods of Pricing.

Business: Features of different forms of Business Organisation, Changing Business Environment in Post-liberalization scenario.

**Unit-IV**

**Introduction to Capital and Financial Accounting:** Capital and its significance, Types of Capital, Estimation of Fixed and Working capital requirements, Methods and sources of raising finance – Trading forecast, Capital Budget, Cash Budget.

Accounting Definition, Concepts and Conventions (GAAP); Formats for preparation of Trial Balance and Final Accounts (Trading Account, Profit and Loss Account and Balance Sheet).

**Unit-V**

**Investment Decision:** Features of capital budgeting proposals, Methods of Capital Budgeting: Payback Method, Accounting Rate of Return (ARR) and Net Present Value Method (simple problems). Financial Analysis: Analysis and Interpretation of Liquidity Ratios, Activity Ratios, and Capital structure Ratios and Profitability ratios.

**TEXTBOOKS:**


- Varsheney & Maheswari, Managerial Economics, Sultan Chand, 2009.
- S.A. Siddiqui & A.S. Siddiqui, Managerial Economics and Financial Analysis, New Age International Publishers, Hyderabad 2013
- M. Kasi Reddy & Sarawathi, Managerial Economics and Financial Analysis, PHI, New Delhi, 2010.


**REFERENCES:**


- S.N.Maheswari & S. K. Maheswari, Financial Accounting, Vikas, 2012.
- D.N. Dwivedi, Managerial Economics, Vikas, 2012.
- Justin Paul, Leena, Sebastian, Managerial Economics, Cengage, 2012
- A,R.Aryasri: Managerial Economics and Financial Analysis, McGraw-Hill, 2011.


**OUTCOMES:**

Students should be able to understand the basic economic principles, forecast demand and supply and should be able to estimate cost and understand market structure, pricing practices and able to interpret the financial results of the organisation.

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**II Year B. Tech, ANE-II Sem**

## R17A2181 - AIRCRAFT MATERIALS AND PRODUCTION TECHNOLOGY LAB

**Objectives:**

Basic Exercises in Lathe, Shaper, Milling, Slotting, CNC and Grinding machines welding equipment comprising Microscopes polishing disc grinders as under.

**PRODUCTION LAB**

1. Plain Turning, Facing, Knurling, Taper turning, Thread Cutting.
2. Drilling, boring, counter boring, counter sinking.
3. Simple exercises on shaping
4. Simple exercises in Planing
5. Plain Milling
6. Gear Milling
7. Sheet metal joining by Soldering.
8. Simple exercises on CNC machines and Programme generation.
9. Simple exercises in Gas.
10. Simple exercises in Arc Welding.
11. Aircraft wood gluing practice
12. Study of properties of sandwich structures

**Note:** Any 10 experiments can be conducted.

**Equipment needed:** Lathe, Shaper, Milling, Slotting, EDM, CNC and Grinding machines welding equipment and metallurgy equipment comprising Microscopes polishing disc grinders.

**Reference Books:**

1. "Aircraft production techniques" Keshu S.C, Ganapathy K.K., Interline Publishing House, Banglore- 1993.
2. "Manfacturing Engineering and Technology" by Kalpakajam - Addison Wesley.

**Outcomes:**

- Student will have hands on experience on various production techniques.

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**II Year B. Tech, ANE-II Sem**

## R17A2182 - AED with CAD LAB

**Objectives:**

- To develop skill to use software to create 2D and 3D models.

**PART - A**

**Machine Drawing Conventions:**Need for drawing conventions – introduction to IS conventions - Conventional representation of materials, common machine elements and parts such as screws, nuts, bolts, keys, gears, airfoil.

**Drawing of Machine Elements I:** Selection of Views, additional views for the following machine elements and parts with every drawing proportion:

a) Popular forms of Screw threads, bolts, nuts, set screws.

b) Keys, cotter joints and knuckle joint.

c) Riveted joints for plates

d) Welded joints and welding symbols.

**Introduction to simple Air Craft components.**

a) Different types of trusses used in wings fuselage including ribs, stringers, skin, brackets

b) Different elements of fuselage structures, bulk head, and rings (frame) longerons

c) Landing gear basic elements, structural brackets, wheel, shock absorber and Hydraulic cylinder

**PART – B**

**LIST OF AUTO CAD EXPERIMENT:**

1. INTRODUCTION to CAD
2. AutoCAD – BASICS
   - 2.1 Starting with AutoCAD
   - 2.2 Layout and sketching
   - 2.3 Drawing environment
   - 2.4 Elements of drawing
   - 2.4.1 Draw commands
   - 2.5 3D functions
3. 2D – FIGURES for practice USING AutoCAD
4. ISOMETRIC DRAWING for practice USING AutoCAD
5. 3-D SOLID FIGURES USING ACAD
6. INTRODUCTION TO CREO 3.0
   - 6.1 Learning Different Operations like Threading, Sweep, Sweptblend.
   - 6.2 Modeling
   - 6.3 Assembling

**Equipment needed:** Computers and **Software:** Autocad 2013 and CREO – 3.0

**Text Books:**

1. Machine Drawing by K. L. Narayana, P. Kannaiah, K. Venkata Reddy New Age International
2. Raymer, D.P., Aircraft Design: A Conceptual Approach, third edition, AIAA Education Series, AIAA, 1999, ISBN: 1-56347-281-0.
3. Engineering graphics with Auto CAD- R.B.Choudary/Anuradha Publishes

**Outcomes:**

- Ability to use the software packers for drafting and modeling
- Ability to create 2D and 3D models of Engineering Components

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# R17A0004 - FOREIGN LANGUAGE: FRENCH
## (Mandatory Course)

**INTRODUCTION:**

Au vu de l'importance croissante des langues étrangères comme outil de communication dans certains pays du globe, le français a été identifié comme l'une des langues les plus sollicitées après l'anglais. De ce fait, tout en insistant sur la formation en compétences communicatives, le programme a été élaboré pour développer des aptitudes linguistiques et communicatives des étudiants ingénieurs. Le cours de français, sera centré sur les compétences orales de base.

**OBJECTIVES:**

- To improve the basic speaking skills of the French language.
- To hone the basic sentence constructions in day to day expressions for communication in their work place.

**SYLLABUS**

**UNITE - I:**

- **Objectif communicatifs (LSRW)**

-Se présenter / Présenter quelqu'un - Entrer en contact – Saluer – Epeler - poser des questions - comprendre et remplir un formulaire

- **Grammaire**

- Les formules de politesse
- L'alphabet
- Les nombres de 1 à 30
- Le verbe ''être'' et ''avoir'' au présent de l'indicatif

- **Vocabulaire**

**-** Les professions
- Les nationalités

**UNITE - II:**

- **Objectif communicatifs (LSRW)**

Parlerde sa famille – décrire quelqu'un – exprimer ses gouts et les préférences – écrire et comprendre un message court – compter jusqu'à 100 – exprimer la possession – exprimer la négation

- **Grammaire**

- Les articles
- Les verbes en –er- au présent
- Les noms (genre et nombre)

- Les adjectifs possessifs
- Les adjectifs qualificatifs
- « Qu'est ce que c'est ? » / « Qui est ce ? »/ « c'est… »
- La négation

- **Vocabulaire**
- La famille
- Les vêtements
- Les couleurs
- Les nombres de 1 à 100
- La salle de classe

**UNITE - III**

- **Objectif communicatifs (LSRW)**

Parler de ses activités quotidiennes – se situer dans le temps – demander et indiquer la date et l'heure – parler des sports et des loisirs – exprimer la fréquence.

- **Grammaire**
- L'expression du temps (l'heure)
- Les verbes en –ir- au présent
- Les verbes faire, aller, prendre, venir,
- Les adverbes
- Les verbes pronominaux

- **Vocabulaire**
- Les jours et les mois de l'année
- La vie quotidienne
- Les sports
- Les loisirs
-

**UNITE - IV**

- **Objectif communicatifs (LSRW)**

Exprimer la quantité – demander et donner le prix- exprimer la nécessité, la volonté et la capacité – comparer (adjectif) – s'exprimer au restaurant / dans les magasins

- **Grammaire**
- Pouvoir, vouloir, il faut
- Exprimer la capacité / la possibilité
- Exprimer la volonte / le désir
- Le futur proche
- **Vocabulaire**

- La nourriture
- Les repas
- Les fruits et légumes
- Les parties du corps

**UNITE - V**

- **Objectif communicatifs (LSRW)**

Exprimer l'interdiction et l'obligation- décrire un appartement – parler du temps qu'il fait / demander le temps qu'il fait – demander l'opinion – donner son avis – exprimer son accord ou son désaccord

- **Grammaire**
- Les adjectifs démonstratifs
- Les prépositions
- Le verbe ' devoir' et 'falloir' au présent
- « Il y a » et « Depuis »
- **Vocabulaire**
- Les saisons
- Les vacances
- La ville
- Le logement

**REFERENCE BOOKS:**

1. Apprenons le Français 1& 2, New Saraswati House, 2015|
2. A propos, A1, Langers International, 2010
3. Easy French Step-by-step by Myrna Bell Rochester-
4. Ultimate French Beginner-Intermediate (Coursebook) By Livid Language
5.Ã L'Aventure: An Introduction to French Language and Francophone Cultures By by Evelyne Charvier-Berman, Anne C. Cummings.

**OUTCOMES**

- The student will be in a position to speak in French, Which is the second most widely learned foreign language after English, and the ninth most widely spoken language in the world. French is also the only language, alongside English, that is taught in every country in the world.
- The Student will get the ability to speak French is an advantage on the international job market.
- Students with a good level of French are eligible for French government scholarships to enroll in postgraduate courses in France in any discipline and qualify for internationally recognized French degrees.

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## R17A0005 - FOREIGN LANGUAGES: GERMAN

**(Mandatory Course)**

**OBJECTIVES :**

1. To familiarize the students with a modern foreign language.
2. To familiarize the students with the sounds of German and their symbols.
3. To familiarize students with German for basic communication and functions in everyday situations.
4. To familiarize students with the basic of writing simple, direct sentences and short compositions.

**SYLLABUS**

**UNIT I**

Current trends in German orthography, German grammar and lexical units, discourse models, oral and written.

**UNIT- II**

Communication patterns, prose passages, etc.

**UNIT- III**

Communication skills in everyday situations

**UNIT-IV**

Training in creative writing in German.

**UNIT- V**

Training in creative speaking in German.

**TEXT BOOKS**

Lernziel Deutsch

**Reference books:**

1) Themen
2) Tangram
3) Sprachkurs Deutsch
4) Schulz-Griesbach

**Outcomes**

1. Students familiarize with a modern foreign language – German
2. The students with German get acquainted for basic communication in everyday situations.
3. Students will know with the basics of writing simple direct sentences and short compositions.
4. Students get to know the basics of German language to communicate in the work place when they find the necessity.

# OPEN ELECTIVE - I

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## OPEN ELECTIVE - I
## R17A0451 - DIGITAL ELECTRONICS

**OBJECTIVES:**

The main objectives of the course are:

1. To introduce basic postulates of Boolean algebra and shows the correlation between Boolean expressions.
2. To introduce the methods for simplifying Boolean expressions.
3. To outline the formal procedures for the analysis and design of combinational and sequential circuits.
4. To introduce the concept of memories and programmable logic devices.
5. To illustrate the concept of synchronous and asynchronous sequential circuits.

**UNIT I**

**BINARY SYSTEMS AND LOGIC GATES:**

Binary Systems: The Advantage of Binary, Number Systems, The Use of Binary in Digital Systems,

AND, OR, NOT, NAND, NOR, Exclusive-OR, Exclusive-NOR and Exclusive-NAND implementations of Logic Functions using gates, NAND-NOR implementations.

**UNIT II**

**MINIMIZATION TECHNIQUES:**

Minimization Techniques: Boolean postulates and laws-De-Morgan's Theorem-Principle of Duality-Boolean expression-Minimization of Boolean expressions-Minterm-Maxterm-Sum of Products (SOP)-Product of Sums (POS)-Karnaugh map minimization-Don't care conditions-Quine Mc-Cluskey method of minimization.

**UNIT III**

**COMBINATIONAL CIRCUITS:**

Design Procedure-Half Adder-Full Adder-Half Subtractor-Full Subtractor-Parallel binary adder-Parallel Binary Subtractor-Multiplexer/ Demultiplexer-Decoder-Encoder.

**UNIT IV**

**SEQUENTIAL CIRCUITS:**

Latches, Flip-flops-SR, JK, D, T and Master-Slave-Characteristic table and equation-Application Table-Edge Triggering-Level Triggering-Realization of one flip-flop using other flip-flops-serial adder/subtractor-Asynchronous Counter-Asynchronous Up/Down Counter, Decade counter-Synchronous Counters-Synchronous Up/Down Counters, Decade Counters

**UNIT V**

**MEMORY DEVICES:**

Classification of Memories-ROM_ROM Organization, PROM-EPROM-EEPROM-EAPROM, RAM-RAM Organization-Write operation-Read Operation-Programmable Logic Devices-Programmable Logic Array (PLA), Programmable Array Logic (PAL)-Implementation of combinational logic circuits suing ROM, PLA, PAL.

**OUTCOMES**

After the completion of the course, the student will be able to:

1. Analyse different methods used for simplification of Boolean expressions
2. Design and implement Combinational and Sequential circuits.
3. Design and implement Synchronous and Asynchronous Sequential Circuits.

**TEXT BOOK:**

1. M Morris Mano, "Digital Design", 4th Edition, Prentice Hall of India PVt., Ltd., 2008/Pearson Education (Singapore) Pvt., Ltd., New Delhi, 2003.
2. Donald P Leach and Albert Paul Malvino, "Digital Principles and Applications", 6th Edition, TMH, 2006.

**REFERENCES:**

1. John F Wakerly. "Digital Design, Fourth Edition, Pearson/PHI, 2008
2. John M Yarbrough, "Digital Logic Applications and Design", Thomson Learning, 2006
3. Charles H Roth, "Fundamentals of Logic Design", 6th Edition, Thomson Learning, 2013
4. Thomas L Floyd, "Digital Fundamentals", 10th Edition, Pearson Education Inc, 2011.
5. Donald D Givone, "Digital Principles and Design", TMH, 2003.

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## OPEN ELECTIVE - I

## R17A0251 - ELEMENTS OF ELECTRICAL ENGINEERING

**OBJECTIVES:**

1. To introduce the fundamental concepts of electromechanical energy conversion
2. To familiarize the students with the principle of operation, constructional features and operational characteristics of various types of Motors used in the engineering and consumer Industry

**UNIT – I**

**Electromechanical Energy Conversion:** Electromechanical Energy conversion – forces and torque in magnetic field systems – energy balance – energy and force in a singly excited magnetic field system, determination of magnetic force - co-energy – multi excited magnetic field systems.

**UNIT – II**

**D.C. Generators & Motors :**

D.C. Generators – Principle of operation – Action of commutator – constructional features – armature windings –– simplex and multiplex windings – use of laminated armature – E. M.F Equation

D.C. Motors**:** Principle of operation – Back E.M.F. - Torque equation – characteristics and application of shunt, series and compound motors – Armature reaction and commutation. Speed control of DC Motors**:** Armature voltage and field flux control methods. Ward-Leonard system. – protective devices.

**UNIT – III:**

**Single Phase Transformers:**

Single phase transformers-principle of operation-constructional details- types-emf equation-equivalent circuit – operation on no load and on load-phasor diagrams –losses- minimization of hysteresis and eddy current losses-efficiency-all day efficiency-regulation-effect of variations of frequency and supply voltage on iron losses.

**UNIT – IV:**

**Polyphase Induction Motors &Their Speed control**

Polyphase induction motors:construction details of cage and wound rotor machines-production of a rotating magnetic field – principle of operation – rotor emf and rotor frequency –Rotor power input, rotor copper loss and mechanical power developed and their inter relation-torque equation – expressions for maximum torque and starting torque – torque slip characteristic – double cage and deep bar rotors

Speed control:change of frequency; change of poles and methods of consequent poles; cascade connection. injection of an emf into rotor circuit (qualitative treatment only)-induction generator-principle of operation

**UNIT – V:**

**Single Phase Motors & Special Machines:** Single phase Motors: Single phase induction motor – Constructional features-Double revolving field theory Equivalent circuit - split-phase motors - Capacitor start Capacitor run motors. Principles of A.C. Series motor-Universal motor, Stepper motor shaded pole motor, Reluctance Motors, Brushless DC motors (Qualitative Treatment only).

**Text Books:**

1. Electrical Machines, P.S. Bimbra, Khanna Publishers.
2. Principles of Electrical Machines, V. K. Mehta, Rohit Mehta, S. Chand Publishing.
3. Electric Machines by I.J. Nagrath & D.P. Kothari, Tata Mc Graw – Hill Publishers.

**Reference Books:**

1. Electric Machines, Mulukutla S. Sarma, Mukesh K. Pathak, Cengage Learning.
2. Fundamentals of Electric Machines, B. R. Gupta, Vandana Singhal, New Age International Publishers.
3. Electric machinery – A.E. Fitzgerald, C.Kingsley and S.Umans, Mc Graw Hill Companies, 5th edition.
4. Theory of Alternating Current Machinery- by Langsdorf, Tata McGraw-Hill Companies, 2nd edition

**OUTCOMES:**

At the end of the course the student will

1. Have a clear understanding of the materials used and features in the construction of the electrical machines like transformers, DC and AC motors and special purpose motors.
2. Acquire a basic knowledge on the principle of operation of all these machines
3. Have a basic knowledge on the Torque speed relations and the effect of load torque on their performance.
4. Will have fundamental concept on the speed control of the various types of motors.

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## OPEN ELECTIVE - I
## R17A0551 - DATABASE SYSTEMS

**OBJECTIVES**

1. To understand the basic concepts and the applications of database systems
2. To Master the basics of SQL and construct queries using SQL
3. To understand the relational database design principles
4. To become familiar with the basic issues of transaction processing and concurrency control
5. To become familiar with database storage structures and access techniques

**UNIT I: INTRODUCTION**

**Data- Database**: File Processing System Vs DBMS,History, Characteristic-Three schema Architecture of a database, Functional components of a DBMS.DBMS Languages-Database users and DBA.

**UNIT II: DATABASE DESIGN**

**ER Model:** Objects, Attributes and its Type. Entity set and Relationship set-Design Issues of ER model-Constraints. Keys-primary key, Super key, candidate keys. Introduction to relational model-Tabular, Representation of Various ER Schemas. ER Diagram Notations-Goals of ER Diagram- Weak Entity Set- Views.

**UNIT III: STRUCTURED QUERY LANGUAGE**

**SQL:** Overview, The Form of Basic SQL Query -UNION, INTERSECT, and EXCEPT– join operations: equi join and non equi join-Nested queries - correlated and uncorrelated-Aggregate Functions-Null values.

**UNIT IV - DEPENDENCIES AND NORMAL FORMS**

**Importance of a good schema design,:**- Problems encountered with bad schema designs, Motivation for normal forms- functional dependencies, -Armstrong's axioms for FD's-Closure of a set of FD's,- Minimal covers-Definitions of 1NF,2NF, 3NF and BCNF-Decompositions and desirable properties -

**UNIT V:**

**Transactions:** Transaction concept, transaction state, System log, Commit point, Desirable Properties of a Transaction, concurrent executions, serializability, recoverability, implementation of isolation, transaction definition in SQL, Testing for serializability**,** Serializability by Locks-Locking Systems with Several Lock Modes-Concurrency Control by Timestamps, validation.

**TEXT BOOK:**

1. Abraham Silberschatz, Henry F. Korth, S. Sudarshan," Database System Concepts", McGraw-Hill, 6th Edition , 2010.
2. Fundamental of Database Systems, by Elmasri, Navathe, Somayajulu, and Gupta, Pearson Education.

**REFERENCES:**

1. Raghu Ramakrishnan, Johannes Gehrke, "Database Management System", McGraw Hill., 3rd Edition 2007.
2. Elmasri&Navathe,"Fundamentals of Database System," Addison-Wesley Publishing, 5th Edition, 2008.
3. Date.C.J, "An Introduction to Database", Addison-Wesley Pub Co, 8th Edition, 2006.
4. Peter rob, Carlos Coronel, "Database Systems – Design, Implementation, and Management", 9th Edition, Thomson Learning, 2009.

**OUTCOMES**

1. Demonstrate the basic elements of a relational database management system
2. Ability to identify the data models for relevant problems
3. Ability to design entity relationship and convert entity relationship diagrams into RDBMS and formulate SQL queries on the respect data

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## OPEN ELECTIVE - I

## R17A0351 - ELEMENTS OF MECHANICAL ENGINEERING

**OBJECTIVES:**

1. To give an insight to students about the behaviour of materials under external forces.
2. The concept of stress, strain, elasticity etc. as applied to various structures under loading are included.
3. The student able to learn about concept of fluids, turbines and engines.

**UNIT - I**

**Stresses and strains:** kinds of – stress-strains, elasticity and plasticity, Hooks law, stress – strain diagrams, modules of elasticity, Poisson's ratio, linear and volumetric strain, relation between E, N, and K, bars of uniform strength, compound bars and temperature stresses.

**Shear force and bending moment:** Types of supports – loads – Shear force and bending moment for cantilever and simply supported beams without overhanging for all types of loads.

**UNIT - II**

**Theory of simple bending:** simple bending formula, Distribution of Flexural and Shear stress in Beam section – Shear stress formula – Shear stress distribution for some standard sections.

**Thin cylindrical shells:** stress in cylindrical shells due to internal pressures, circumferential stress, longitudinal stress, design of thin cylindrical shells, spherical shells, change in dimension of the shell due to internal pressure, change in volume of the shell due to internal pressure

**Thick Cylinders:** Lame's equation- cylinders subjected to inside and outside pressures
Columns and Struts.

**UNIT - III**

**Properties of Fluid** : Stream line , streak line , path line , continuity equation pipes are in series, pipes are in parallel, HGL, TGL , Bernoullis equation .

**Hydraulic pumps and turbines:** working principles and velocity diagrams.

**UNIT - IV**

**Internal combustion engines:** classification of IC engines, basic engine components and nomenclature, working principle of engines, Four strokes and two stroke petrol and diesel engines, comparison of CI and SI engines, comparison of four stroke and two stroke engines, simple problems such as indicated power, brake power, friction power, specific fuel consumption, brake thermal efficiency, indicated thermal efficiency and mechanical efficiency.

**UNIT - V**

**Belts - Ropes and chain:** belt and rope drives, velocity ratio, slip, length of belt , open belt and cross belt drives, ratio of friction tensions, centrifugal tension in a belt, power transmitted by belts and ropes, initial tensions in the belt, simple problems.
**Gear trains:** classification of gears, gear trains velocity ratio, simple, compound –reverted and epicyclic gear trains.

**TEXT BOOKS:**

1. ”Strength of Materials and Mechanics of Structures”, B.C.Punmia, Standard Publications and distributions, 9 th ed.
2. Thermal Engineering, Ballaney,P.L., Khanna Publishers, 2003 .
3. Theory of Machines , S.S. Rattan , Tata McGraw Hill.
4. Fluid Mechanics and Hydraulic Machinery R.K. Bansal .

**REFERENCE BOOKS:**

1. Thermal Engineering, R.K. Rajput , Laxmi Publications .
2. Theory of Machines, R.S. Khurmi, S. Chand Publications.
3. Fluid Mechanics and Hydraulic Machinery, Modi & Seth.

**OUTCOMES:**

1. The student would be exposed to basic mechanical engineering machinery.
2. The student learned about mechanical components.
3. Student understand about engines and turbines .

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## OPEN ELECTIVE - I

## R17A0352 - GREEN ENERGY SYSTEMS

**OBJECTIVES:**

1. The course aims to highlight the significance of alternative sources of energy.
2. Green energy systems and processes and provides the theory and working principles of probable sources of renewable and green energy systems that are environmental friendly.

**UNIT-I**

**Introduction:**

**Solar Radiation:** Role and potential of new and renewable sources, the solar energy option, Environmental impact of solar power, structure of the sun, the solar constant, sun-earth relationships, coordinate systems and coordinates of the sun, extraterrestrial and terrestrial solar radiation, solar radiation on titled surface, instruments for measuring solar radiation and sun shine, solar radiation data, numerical problems. Photo voltaic energy conversion – types of PV cells, I-V characteristics.

**Solar Energy Collection**: Flat plate and concentrating collectors, classification of concentrating collectors, orientation and thermal analysis, advanced collectors.

**UNIT – II**

**Solar Energy Storage And Applications**: Different methods, sensible, latent heat and stratified storage, solar ponds, solar applications- solar heating/cooling technique, solar distillation and drying, solar cookers, central power tower concept and solar chimney. **Wind Energy:** Sources and potentials, horizontal and vertical axis windmills, performance characteristics, betz criteria, types of winds, wind data measurement.

**UNIT – III**

**Bio-Mass**: Principles of bio-conversion, anaerobic/aerobic digestion, types of bio-gas digesters, gas yield, combustion characteristics of bio-gas, utilization for cooking, bio fuels, I.C. engine operation and economic aspects.

**Geothermal Energy:** Resources, types of wells, methods of harnessing the energy, potential in India.

**Ocean Energy**: OTEC, Principles of utilization, setting of OTEC plants, thermodynamic cycles. Tidal and wave energy: Potential and conversion techniques, mini-hydel power plants, and their economics.

**UNIT –IV**

**Energy Efficient Systems: (A) Electrical Systems:** Energy efficient motors, energy efficient lighting and control, selection of luminaire, variable voltage variable frequency drives (adjustable speed drives), controls for HVAC (heating, ventilation and air conditioning), demand site management.

**(B) Mechanical Systems**: Fuel cells- principle, thermodynamic aspects, selection of fuels & working of various types of fuel cells, Environmental friendly and Energy efficient compressors and pumps.

**UNIT-V**

**Energy Efficient Processes:** Environmental impact of the current manufacturing practices and systems, benefits of green manufacturing systems, selection of recyclable and environment friendly materials in manufacturing, design and implementation of efficient and sustainable green production systems with examples like environmental friendly machining, vegetable based cutting fluids, alternate casting and joining techniques, zero waste manufacturing.

**Green Buildings:** Definition, features and benefits. Sustainable site selection and planning of buildings for maximum comfort. Environmental friendly building materials like bamboo, timber, rammed earth, hollow blocks, lime & lime pozzolana cement, agro materials and industrial waste, Ferro cement and Ferro-concrete, alternate roofing systems, paints to reduce heat gain of the buildings. Energy management.

**TEXT BOOKS:**

1. Sukhatme S.P. and J.K.Nayak, Solar Energy – Principles of Thermal Collection and Storage, TMH.
2. Khan B.H., Non-Conventional Energy Resources, Tata McGraw Hill, New Delhi, 2006.
3. Green Manufacturing Processes and Systems, Edited by J. Paulo Davim, Springer 2013.

**REFERENCES:**

1. Alternative Building Materials and Technologies / K.S Jagadeesh, B.V Venkata Rama Reddy and K.S Nanjunda Ra.
2. Principles of Solar Energy / Frank Krieth & John F Kreider.
3. Non-Conventional Energy / Ashok V Desai /Wiley Eastern.
4. Renewable Energy Technologies /Ramesh & Kumar /Narosa
5. Renewable Energy Technologies/ G.D Roy

**OUTCOMES:**

1. The student shall understand the principles and working of solar, wind, biomass, geo-thermal, ocean energies.
2. Green energy systems and appreciate their significance in view of their importance in the current scenario and their potential future applications.

# MALLA REDDY COLLEGE OF ENGINEERING AND TECHNOLOGY

| II Year B.Tech ANE-II Sem | L | T/P/D | C |
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## OPEN ELECTIVE - I

## R17A0051 - INTELLECTUAL PROPERTY RIGHTS

**OBJECTIVES:**

1. The objective of this course is to provide the knowledge on International IPR's and to make students efficient to take decisions in Global Corporate.

**Unit-I**

**Introduction:** Intellectual property rights basics, the role and value of IP in international commerce, Issues affecting IP internationally. Agreement on trade related aspects of Intellectual Property Rights. (TRIPS) - Agreement on TRIPS and India.

**Unit-II**

**Parties to IP Rights:** Owner, customer, authorized user, licensee, attorney, protection of the weak and strong, finalizing ownership and use rights.

**Unit-III**

**Ensuring the value of IP:** Ensuring the value of IP at creation stage, after creation stage, precise contractual protection of IP rights. Key issues related to IP internationally. IP rights in international forums. Fundamentals in Country legal systems, generalities. Validity of IP rights locally: specifics.

**Unit-IV**

**Managing IP Rights:** Acquiring IP Rights: letters of instruction, joint collaboration agreement, work made for hire agreement - Protecting IP Rights: non disclosure agreement, cease and desist letter, settlement memorandum. Transferring IP Rights: assignment contract, license agreement, deed of assignment or license agreement, addendum to unrecorded assignment or license.

**Unit-V**

**Remedies** and IPR Evaluation - GATT - WTO - Role of WTO in solving IPR issues.

**REFERENCES:**


- A short course in International Intellectual Property Rights – Karla C. Shippey, World Trade Press – 2nd Edition.
- Intellectual Property Rights – Heritage, Science, & Society under international treaties – A. Subbian, - Deep & Deep Publications – New Delhi.
- Intellectual Property Rights: N K Acharya: ISBN: 9381849309
- Intellectual Property Rights: C B Raju : ISBN-8183870341
- Intellectual Property : Examples and Explanation – Stephen M McJohn, 2/e, ISBN-13: 978-0735556652
- Intellectual Property Rights in the Global Economy – Keith E Maskus, PIIE, ISBN paper 0-88132-282-2


**OUTCOMES**

1. It allows students how to prepare and protect the Inventions , start up ideas and rights of patents and copy rights etc.,
2. This subject brings awareness to the students the basic legal aspects at present following at Global level.

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| **III Year B. Tech, ANE-I Sem** | **4** | **-/-/-** | **3** |

## (R17A2108) ADVANCED PROPULSION SYSTEMS

**Objective:**

1. Students acquire knowledge about the present space equipment.
2. Students can focus on various launch systems available in aerospace industry and also understand the future scenario.
3. To provide an exposure with testing and design limitations.

**UNIT-I**
**HYPERSONIC AIR-BREATHING PROPULSION**

Ramjets at high speeds and limitations of turbojets. Need for supersonic combustion, Implications criticality of efficient diffusion and acceleration, problems of combustion in high speed flow, scramjet engine- construction, flow process- description, spill-over drag, plume drag. Isolator, combustor, thermal protection, thermal throat, scheduled &distributed fuel injection. Types of nozzles and nozzle flow. Scramjet performance-numericals.

Combined cycle engines- turbo-ramjet, Air turbo-rocket (ATR), ejector ramjet, Liquid-air collection engine (LACE) - need, principle, construction, operation, performance.

**UNIT-II**
**CHEMICAL ROCKET PROPULSION**

Classification of rocket engine, chemical rocket engine types, working principle, schematic diagram, applications, types, advantages and disadvantages- solid, liquid and hybrid propellant rocket engine, TVC.

Solid propellant rocket motors, principle, applications, Solid propellant types, composition, properties, Propellant grain, properties, structural design, insulators and inhibitors-functions, requirements, Rocket motor casing- materials. Igniters, types, construction, Liquid propellants-types, composition, properties, performance, Propellant, feed systems-pressurisation, injectors, starting and ignition, cryogenic engines, Engine cooling.

**UNIT-III NUCLEAR ROCKET PROPULSION:** Nuclear propulsion history, Power, thrust, energy. Nuclear fission- basics, sustainable chain reaction, neutron leakage, control, reflection, prompt and delayed neutrons, thermal stability. Principles and fuel elements. The nuclear thermal rocket engine, start-up and shutdown. Development status of nuclear engines, alternative reactor types, safety issues in nuclear propelled missions.

**UNIT-IV ADVANCED ROCKET PROPULSION**

**ELECTRICAL:** Limitations of chemical rocket engines. Electric propulsion systems- structure, types, generation of thrust. Electrostatic thrusters, electro-magnetic thrusters, applications to space missions, pulsed plasma thrusters (PPT) for micro-spacecraft, solar electric propulsion.

**ADVANCED SYSTEMS:** Micro-propulsion, application of MEMS, chemical, electric micro-thrusters, principle, description, Propellantless propulsion, teethers, momentum exchange, Photon rocket, beamed energy propulsion, solar, magnetic sails.

**UNIT V LAUNCH VEHICLES**

Role and military functions of space launch vehicle, Types, missions, mission profile, staging employed in the vehicle, guidance and control requirements. Some successful launch vehicles, Description of space shuttle engine, Propellant slosh - Propellant hammer, geysering effect in cryogenic rocket engines, SSTO.

**Text Books:**

1. Cornelisse, J. W., Schoyer H.F.R. and Wakker, K.F., Rocket propulsion and space flight Dynamics, Pitman, 1979.
2. Turner, M.J.L., Rocket and Spacecraft Propulsion, Springer, 2001.

**Outcome:**

1. Students can correlate with the different launch vehicles and missiles available.
2. Students will be able to configure the launch vehicle or missile required for specific purpose.
3. Students will be able to design the conceptual requirements.

# MALLA REDDY COLLEGE OF ENGINEERING & TECHNOLOGY

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## (R17A2109) HIGH SPEED AERODYNAMICS

**Objectives:**

- Study the basic governing equations of compressible flows and its parameters.
- Study the effects of Shock and Expansion waves on aerodynamic characteristics.
- Learn about the experimental methods to study about compressible flows.

**Tables: Isentropic, Normal Shock, Oblique Shock, Prandtl Meyer function.**

**UNIT-I ONE DIMENSIONAL COMPRESSIBLE FLOWS**

Review of Thermodynamics. Definition of Compressibility, Stagnation conditions, Speed of sound, Mach number, flow regimes, shock waves. One dimensional flow governing equations. Alternative forms of Energy equations, Normal shock relations with numerical.

**UNIT-II OBLIQUE SHOCK AND EXPANSION WAVES**

Oblique shock waves. Supersonic flow over a wedge Θ - β - M relations strong and weak shock solutions with numericals. Regular reflection from a solid boundary. Expansion waves, Prandtl – Meyer Expansion with numericals. Shock Expansion theory with numericals.

**UNIT-III**

**SUBSONIC COMPRESSIBLE FLOW OVER AIRFOIL**

Introduction - Velocity potential equation –small perturbation equation - Prandtl-Glauert compressibility corrections - Critical Mach number with numericals - Drag divergence Mach number - Area rule - Supercritical airfoil.

**UNIT- IV**

**FLOW THROUGH NOZZLES AND VARIABLE AREA DUCTS**

Quasi one dimensional flow, Area-velocity relation, Isentropic flow through Convergent – Divergent nozzles. Choked flow conditions. Under and Over expansion conditions. Flow through diffusers – wave reflections from a free boundary. Application to supersonic wind tunnel.

**UNIT-V**

**FORCE AND FLOW MEASUREMENTS**

Pressure, Temperature, Velocity measurements – Hotwire and Laser – Doppler anemometer. Force measurements – Wind tunnel balances. Scale effects and corrections, wall interferences, Flow visualization techniques-schileren and shadowgraph methods.

**Text Books:**

1. Anderson, J .D., Fundamental of Aerodynamics, Mc Graw-Hill International third edition Singapore-2001.

2. Anderson, J .D., Modern Compressible Flow with Historical Perspective, Mc Graw-Hill International third edition Singapore-2004.
3. W.E. Rae & Allen Pope, Low speed wind tunnel testing, John Willey &sons

**Reference Books:**

1. Radhakrishnan, E, E., Gas Dynamics, Prentice Hall of India, 1995.
2. Hodge B.K & Koenig K Compressible Fluid Dynamics with Computer Application, Prentice Hall, 1995
3. Clancy, L.J., Aerodynamics, Pitman, 1986, Macmillan, 1985

**Outcomes:**

- Understand the compressible flow parameters effecting flow behavior.
- Able to design nozzle, diffuser and variable area ducts to obtain required aerodynamic outputs.
- Able to understand experimental techniques to find aerodynamic characteristics of different geometries.

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## (R17A2110) AEROSPACE VEHICLE STRUCTURES - II

**Objectives:**

- To provide the students various methods for analysis of aircraft wings and fuselage.
- To provide the behavior of major aircraft structural components.

**UNIT-I**

**Thin Plate Theory, Structural Instability:** Analysis of thin rectangular plates subject to bending, twisting, distributed transverse load, combined bending and in-plane loading. Local instability, Wagner beam analysis.

**UNIT-II**

**Bending, Shear and Torsion of Thin Walled Beams:** Unsymmetrical bending-resolution of bending moments, direct stress distribution, shear centre, twist. Torsion of beams of closed section-displacements associated with Bredt-Batho shear flow. Torsion of open section beams. St. Venant Torsion Theory of Warping

**UNIT-III**

**Structural idealization** of Thin Walled Beams: Structural idealization-principal assumptions, idealization of panel, effect on the analysis of thin Walled beams under bending, shear, and torsion loading-application to determining deflection.

**UNIT-IV**

**Structural and Loading Discontinuities in Thin Walled Beams**: Closed section beams-shear stress distribution of a closed section beam built in at one end under bending, shear and torsion loads. Open section beams-I Section beam Subjected to torsion.

**UNIT-V**

**Stress Analysis of Aircraft Components- Wing, Fuselage**: Wing spars and box beams-tapered wing spar, open and closed section beams. Wings-Three-boom shell in bending, torsion, shear, tapered wings.Bending, shear, torsion, cut-outs in fuselages, fuselage frames and wing ribs.

**Text Books:**

1. Megson, T. M. G., Aircraft Structures for Engineering Students, fourth edn., Elsevier, 2007, ISBN 0-750-667397.
2. Peery, D. J. and Azar,J.J., Aircraft structures, second edn., MCGra-Hill,1982, ISBN 0-07-049196-8.

**Reference Books:**

1. Bruhn.E.H, Analysis and Design of Flight Vechiclesstructures,Tir-state off-set company,USA,1965.

**Outcomes:**

- Ability to analyse the aircraft wings and fuselage
- Ability to demonstrate the behavior of major aircraft structural components.

# MALLA REDDY COLLEGE OF ENGINEERING & TECHNOLOGY

**III Year B. Tech, ANE-I Sem**

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## (R17A2111) AIRCRAFT STABILITY AND CONTROL

**Objectives:**

- To understand the concepts of stability and control of aircraft.
- Develop and understanding of rigid body equations of motion of aerospace vehicle, longitudinal and lateral stability control of aircraft, to know with the aircraft motions and related stability.

**UNIT –I: stability and control requirements:**Degree of freedom of a system -Static and dynamic stability -Need for stability in airplanes -Purpose of controls -Inherently and marginally stable airplanes.

**Equations of Motion**: Equations of motion of a rigid body. Inertial forces and moments, Decoupling of longitudinal and lateral-directional equations. Linearizing of equations of motion.

**UNIT –II**

**Static Longitudinal Stability and Control –Stick Fixed**: Basic equilibrium equation -Stability criterion –Contribution of wing, tail, fuselage.-the most aft center of gravity ,Power effects , Elevator power, stick fixed neutral point, Stability margins.

**UNIT –III**

**Static Longitudinal Stability-Control-Stick Free**: Effects of releasing the elevator,Hinge moment parameters, control surface floating characteristics and aerodynamic balance,Stick force gradients in unaccelerated flight, stick free neutral point –Trim tabs.

**Maneuver Stability**:forces of accelerated and unaccelerated flight(pull up) ,accelerated flight (turns) ,Elevator angle per g , stick force per g , limits on the airplane's c.g.

**UNIT –IV**

**Directional Stability and Control and Static Lateral**: Lateral and directional stability-definition, static directional stability rudder fixed , directional control, stick – free directional stability, dihedral effect and lateral control, estimation of airplane dihedral effect, lateral control introduction ,estimation of lateral control power, Adverse yaw , aileron control forces.

**UNIT –V**

**Dynamic Stability and Response to Control**: Solutions to the stability quartic of the linearised equations of motion, the principal mode-phugoid , short period, dutch roll and spiral modes -further approximations, restricted degrees of motion-solutions, response to controls, auto rotation and spin.

**Text Books:**

1. Yechout, T. R. et al., Introduction to Aircraft Flight Mechanics, AIAA education Series, 2003, ISBN 1-56347-577-4.
2. Airplane performance stability and control by Courtland D.Perkins ,Robert E.Hage John wiley & sons

**Reference Books:**

1. Etkin, B. and Reid, L. D., Dynamics of Flight, 3rd Edition. John Wiley, 1998, ISBN 0-47103418-5.
2. Schmidt, L. V., Introduction to Aircraft Flight Dynamics, AIAA Education Series, 1998, ISBN A-56347-226-0.
3. McCormick, B. W., Aerodynamics, Aeronautics and Flight Mechanics, 2nd Edition., Wiley India, 1995, ISBN 978-]
4. Nelson, R. C., Flight Stability and Automatic Control, 2nd Edition., Tata Mc Graw Hill, 2007, ISBN 0-07-066110-3.

**Outcomes:**

- An understanding of the static stability of aircraft.
- An understanding of dynamic response of aircraft.
- To assess the requirement of control force and power plant.

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**III Year B. Tech, ANE-I Sem**

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## (R17A0325) COMPOSITE MATERIALS
## (CORE ELECTIVE – I)

**Objectives**:

- To be familiar with classification and characteristics of composite material and their applications.
- To gain the knowledge about manufacturing methods of composites .
- To know the testing methods related to composite materials.

**UNIT-I**

**Introduction:** Definitions, Composites, Reinforcements and matrices, Types of reinforcements, Types of matrices, Types of composites, Carbon Fibre composites, Properties of composites in comparison with standard materials, Applications of metal, ceramic and polymer matrix composites.

**UNIT-II**

**Manufacturing methods** : Hand and spray lay - up, injection molding, resin injection, filament winding, pultrusion, centrifugal casting and prepregs. Fibre/Matrix Interface, mechanical. Measurement of interface strength.

**UNIT-III**

**Mechanical Properties -Stiffness and Strength:** Geometrical aspects – volume and weight fraction. Unidirectional continuous fibre, discontinuous fibers, Short fiber systems, woven reinforcements –Mechanical Testing: Determination of stiffness and strengths of unidirectional composites; tension, compression, flexure and shear.

**UNIT-V**

**Laminates :** Plate Stiffness and Compliance, Assumptions, Strains, Stress Resultants, Plate Stiffness and Compliance, Computation of Stresses, Types of Laminates -, Symmetric Laminates, Anti-symmetric Laminate, Balanced Laminate, Quasi-isotropic Laminates, Cross-ply Laminate, Angle-ply Laminate. Orthotropic Laminate, Laminate Moduli, Hygrothermal Stresses.

**UNIT-V**

**Joining Methods and Failure Theories** : Joining –Advantages and disadvantages of adhesive and mechanically fastened joints. Typical bond strengths and test procedures.

**TEXT BOOKS:**

1. K.K. Chawla, (1998), Composite Materials, Springer-Verlag, New York
2. B.T. Astrom, (1997), Manufacturing of Polymer Composites, Chapman & Hall
3. Composite materials by J.N.Reddy

**REFERENCE BOOKS:**

1. Stuart M Lee, J. Ian Gray, Miltz, (1989), Reference Book for Composites Technology, CRC press
2. Frank L Matthews and R D Rawlings, (2006), Composite Materials: Engineering and Science, Taylor and Francis.
3. D. Hull and T.W. Clyne, (1996), Introduction to Composite Materials, Cambridge University Press
4. Analysis and Performance of Fiber Composites by Bhagwan D. Agarwal
5. Mechanics of Composite Materials by Autar K. Kaw

**OUTCOMES :**

- To provide knowledge on characteristics of composites
- To get knowledge on manufacturing and testing methods and mechanical behavior
- of composites.
- To get the exposure of different materials .

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## (R17A0365) MECHANISMS AND MECHANICAL DESIGN (CORE ELECTIVE-I)

**Objectives:**

- The subject gives in depth knowledge on general mechanisms and mechanical design of which aircraft systems are important component.

**UNIT – I**

**Mechanisms:** Elements of links: Classification, Types of kinematic pairs: Lower and higher pairs, closed and open pairs. Constrained motion. Kinematic chain, inversions of mechanisms: inversion of quadratic cycle. Chain – single and double slider crank chains.

**UNIT – II**

**Kinematic Analysis and Design of Mechanisms:**

**Kinematic analysis:** Velocity and acceleration. Motion of link in machine determination of velocity and acceleration diagrams – graphical method. Application of relative velocity method for four bar chain. Analysis of slider crank chain for displacement, velocity and acceleration of sliding- Acceleration diagram for a given mechanism, Klein's construction, Coriolis acceleration, Determination of Coriolis component of acceleration.

Instantaneous centre of rotation, centrode and axode – relative motion between two bodies – Three centres in line theorem – Graphical determination of instantaneous centre, diagrams for simple mechanisms and determination of angular velocity of points and links.

**UNIT – III**

**Gyroscope – Processional Motion:** The gyroscope – free and restrained – working principle – the free gyro, rate gyro, integrating gyro as motion measuring instruments. Effect of precession on the stability of vehicles – motorbikes, automobiles, airplanes and ships, Static and dynamic forces generated due to in precession in rotating mechanisms.

**UNIT – IV**

**CAMS and Followers:** Cams and followers – definition, uses – types – terminology. Types of follower motion – uniform velocity, simple harmonic motion and uniform acceleration. Maximum velocity and acceleration during outward and return strokes.

**UNIT – V**

**Gears and Gear Trains:** Introduction to gears – types , law of gearing. Tooth profiles – specifications, classification – helical, bevel and worm gears, simple and reverted gear train, epicyclic gear trains – velocity ratio or train value.

**Belts & Ropes:** Types of belts, Velocity Ratio of belt drive, Slip of belt, Creep of belt, Length of open belt drive, length of cross belt drive, Power transmitted, Angle of contact, Centrifugal tension, Condition for transmission of maximum power, V-belt drives, Rope drives, Ratio of driving tensions for rope drives.

**Text Books:**

1. The Theory of machines – Thomas Beven., Third Edition – Pearson Publishers.
2. Theory of machines and Mechaisms Third Edition – John J. Uicker, Jr. Gordon R. Pennock, Josph E. Shigley, Oxford Publisher.
3. Theory of Machines - J.K. Gupta and R.S. Khurmi – S Chand Publications

**Reference Books:**

1. Mechanism and Machine Theory – J. S Rao, R.V.D Dukkipati, New age Publishers.
2. Theory of Machines, - III rd Edition Sadhu Singh, Pearson Publishers.

**Outcomes:**

- Application of principles in the formation of mechanisms and their kinematics.
- Able to understand the effect of friction in different machine elements.
- Can analyze the forces and toques acting on simple mechanical systems

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## (R17A0367)EXPERIMENTAL STRESS ANALYSIS
## (CORE ELECTIVE – I)

**Objectives:**

- To bring awareness on experimental method of finding the response of the structure to different types of load.
- How to calibrate of different machines with various techniques.
- NDT applications in experimental stress analysis

**UNIT I**

**MEASUREMENTS:** Principles of measurements, Accuracy, Sensitivity and range of measurements.

**UNIT II**

**EXTENSOMETERS:** Mechanical, Optical, Acoustical and Electrical extensometers and their uses. Advantages and disadvantages.

**UNIT III**

**ELECTRICAL RESISTANCE STRAIN GAUGES:** Principle of operation and requirements of electrical strain gauges. Types and their uses, Materials for strain gauge. Calibration and temperature compensation, cross sensitivity, Rosette analysis. Wheatstone bridge and potentiometer circuits for static and dynamic strain measurements, strain indicators.

**UNIT IV**

**PHOTOELASTICITY:** Two dimensional photo elasticity, Concept of light – photoelastic effects, stress optic law, Interpretation of fringe pattern, Compensation and separation techniques, Photoelastic materials. Introduction to three dimensional photo elasticity.

**UNIT V**

**NON–DESTRUCTIVE TESTING:** Fundamentals of NDT. Radiography, ultrasonic, magnetic particle inspection, Fluorescent penetrant technique, Eddy current testing, Acoustic Emission Technique, Fundamentals of brittle coating methods, Introduction to Moiré techniques, Holography, ultrasonic C- Scan, Thermograph, Fiber – optic Sensors. 161.

**Text Books:**

1. Experimental Stress Analysis , Srinath, L.S., Raghava, M.R., Lingaiah, K., Garagesha, G., Pant B., and Ramachandra, K.,Tata McGraw-Hill, New Delhi, 1914.

**Reference Books:**

1. Experimental Stress Analysis, Dally, J.W., and Riley, W.F.,McGraw-Hill Inc., New York,1991.
2. Hand book of Experimental Stress Analysis, Hetyenyi, M., John Wiley and Sons Inc., New York, 1972.
3. Acoustic Emission in Acoustics and Vibration Progress, Pollock A.A., Ed. Stephens R.W.B.,Chapman and Hall, 1993.

**Outcomes:**

- Accurately measures the displacement/deflection with precision.
- Distribution stress on a three point bens specimen.
- Use of MEMS/NEMS and sensors to find temperature and strain accurately.

# OPEN ELECTIVES - II

| OPEN ELECTIVE II | | |
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| **S.NO** | **SUBJECT CODE** | **SUBJECT** |
| **1** | **R17A0452** | **INDUSTRIAL ELECTRONICS** |
| **2** | **R17A0453** | **COMMUNICATION NETWORKS** |
| **3** | **R17A0552** | **INTRODUCTION TO JAVA PROGRAMMING** |
| **4** | **R17A1251** | **INTRODUCTION TO SCRIPTING LANGUAGES** |
| **5** | **R17A1252** | **SOFTWARE PROJECT MANAGEMENT** |
| **6** | **R17A0353** | **ENTERPRISE RESOURCE PLANNING** |

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## OPEN ELECTIVE II
## (R17A0452) INDUSTRIAL ELECTRONICS

**COURSE OBJECTIVES:**

1. To get an overview of semi-conductor devices (such as PN junction diode & Transistor) and their switching characteristics.
2. To understand the characteristics of AC to DC converters.
3. To understand about the practical applications Electronics in industries.

**UNIT I**

Scope of industrial Electronics, Semiconductors, Merits of semiconductors, crystalline structure, Intrinsic semiconductors, Extrinsic semiconductors, current flow in semiconductor, Open-circuited p-n junction, Diode resistance, Zener diode, Photoconductors and junction photo diodes, Photo voltaic effect, Light emitting diodes (LED)

**UNIT II**

Introduction, The junction transistor, Conventions for polarities of voltages and currents, Open circuited transistor, Transistor biased in the active region, Current components in transistors, Currents in a transistor, Emitter efficiency, Transport factor and transistor-α, Dynamic emitter resistance, Transistor as an amplifier, Transistor construction, Letter symbols for semiconductor Devices, Characteristic curves of junction transistor in common configuration, static characteristic curves of PNP junction transistor in common emitter configuration, The transistor in common collector Configuration.

**UNIT III**

AC to DC converters- Introduction, Classification of Rectifiers, Half wave Rectifiers, Full wave Rectifiers, Comparison of Half wave and full wave rectifiers, Bridge Rectifiers, Bridge Rectifier meter, Voltage multiplying Rectifier circuits, Capacitor filter, LC Filter, Metal Rectifiers, Regulated Power Supplies, Classification of Voltage Regulators, Short period Accuracy of Regulators, Long period .Accuracy of Voltage Regulator, Principle of automatic voltage Regulator, Simple D.C. Voltage stabilizer using Zener diode, D.C. Voltage Regulators, Series Voltage Regulators, Complete series voltage regulator circuit, Simple series voltage regulator.

**UNIT IV**

**Resistance welding controls:** Introduction, Resistance welding process, Basic Circuit for A.C. resistance welding, Types of Resistance welding, Electronic welding control used in Resistance welding, Energy storage welding. **Induction heating:** Principle of induction heating, Theory of Induction heating merits of induction heating, Application of induction heating, High frequency power source of induction heating. **Dielectric heating**: Principle of dielectric heating, theory of dielectric heating, dielectric properties of typical materials, electrodes used in dielectric heating, method of coupling of electrodes to the R.F. generator, Thermal losses in Dielectric heating, Applications.

**UNIT V :**

**Ultrasonics:** Introduction, Generation of Ultrasonic waves, Application of Ultrasonic waves, Ultrasonic stroboscope, ultrasonic as means of communication, ultrasonic flaw detection,

Optical image on non-homogeneities, ultrasonic study of structure of matter, Dispersive study of structure of matter, Dispersive and colloidal effect of Ultrasonic, Coagulating action of Ultrasonic, separation of mixtures by ultrasoni8c waves, cutting and machining of hard materials by ultrasonic vibrations, Degassing of liquids by ultrasonic waves, Physico-chemical effects of ultrasonics, chemical effects of ultrasonics, Thermal effects of Ultrasonics, soldering and welding by ultrasonics, Ultrasonic Drying

**TEXT BOOKS:**

1. G. K. Mithal, "Industrial Electronics", Khanna Publishers, Delhi, 2000.
2. J.Gnanavadivel, R.Dhanasekaran, P.Maruthupandi, "Industrial Electronics", Anuradha Publications, 2011.

**REFERENCE BOOKS:**

1. F. D. Petruzulla, "Industrial Electronics", McGraw Hill, Singapore, 1996.
2. M. H. Rashid, "power Electronics Circuits, Devices and Application", PHI, 3rd edition, 2004.
3. G. M. Chute and R. D. Chute, "Electronics in Industry", McGraw Hill Ltd, Tokyo, 1995.

**COURSE OUTCOMES**

After completion of the course the students will be able to

1. Get an overview of semi-conductor devices (such as PN junction diode & Transistor) and their switching characteristics.
2. Understand the characteristics of AC to DC converters.
3. Understand about the practical applications Electronics in industries.

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## OPEN ELECTIVE II
## (R17A0453) COMMUNICATION NETWORKS

**COURSE OBJECTIVES**

1. To understand the concept of computer communication.
2. To learn about the networking concept, layered protocols.
3. To understand various communications concepts.
4. To get the knowledge of various networking equipment.

**UNIT – I: Overview of Computer Communications and Networking:** Introduction to Computer Communications and Networking, Introduction to Computer Network, Types of Computer Networks, Network Addressing, Routing, Reliability, Interoperability and Security, Network Standards, The Telephone System and Data Communications.

**UNIT – II: Essential Terms and Concepts:** Computer Applications and application protocols, Computer Communications and Networking models, Communication Service Methods and data transmission modes, analog and Digital Communications , Speed and capacity of a Communication Channel, Multiplexing and switching, Network architecture and the OSI reference model.

**UNIT – III: Analog and Digital Communication Concepts:** Representing data as analog signals, representing data as digital signals, data rate and bandwidth reduction, Digital Carrier Systems.

**UNIT – IV: Physical and Data Link Layer Concepts:** The Physical and Electrical Characteristics of wire, copper media, fiber optic media, Wireless communications. Introduction to data link layer, logical link control and medium access control sub-layers.

**UNIT – V: Network Hardware Components:** Introduction to Connectors, Transreceivers and media convertors, repeaters, network interference cards and PC cards, bridges, switches, Switches vs Routers.

**TEXT BOOKS:**

1. Computer Communications and Networking Technologies, Michel A.Gallo and William H.Hancock, Thomson Brooks/Cole.
2. Data Communications and Networking – Behrouz A Forouzan, Fourth Edition, McGraw Hill Education, 2006.

**REFERENCE BOOKS:**

1. Principles of Computer Networks and Communications, M Barry Dumas, Morris Schwartz, Pearson.
2. Computer Networking: A Top-Down Approach Featuring the Internet, James F.Kurose, K W Ross, 3rd Edition, Pearson Education.

**COURSE OUTCOMES**

1. The student can get the knowledge of networking of computers, data transmission between computers.
2. Will have the exposure about the various communication concepts.
3. Will get awareness about the structure and equipment of computer network structures.

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**OPEN ELECTIVE II**

**(R17A0552) INTRODUCTION TO JAVA PROGRAMMING**

**COURSE OBJECTIVES:**

This subject aims to introduce students to the Java programming language. Upon successful completion of this subject, students should be able

1) to create Java programs that leverage the object-oriented features of the Java language, such as encapsulation, inheritance and polymorphism;
2) use data types, arrays and strings;
3) implement error-handling techniques using exception handling,
4) create and event-driven GUI using AWT components.

**UNIT I: OOP Concepts:** Data abstraction, encapsulation, inheritance, Polymorphism, classes and objects, Procedural and object oriented programming paradigms.

**Java Basics** History of Java, Java buzzwords, data types, variables, constants, scope and life time of variables, operators, expressions, control statements, type conversion and casting, simple java programs, concepts of classes, objects, arrays, strings, constructors, methods, access control, this keyword, garbage collection, overloading methods and constructors, parameter passing, recursion, BufferedReader class, Scanner class, StringTokenizer class, inner class.

**UNIT II: Inheritance** – Types of Inheritance, super keyword, and preventing inheritance: final classes and methods.

**Polymorphism –** Dynamic binding, method overriding, abstract classes and methods.

**Interfaces-** Interfaces Vs Abstract classes, defining an interface, implement interfaces, extending interface.

**Packages-** Defining, creating and accessing a package, importing packages.

**UNIT III: Exception handling** - Concepts of exception handling, benefits of exception handling, exception hierarchy, usage of try, catch, throw, throws and finally, checked exceptions and unchecked exceptions, built in exceptions.

**Multi threading**: Differences between multi threading and multitasking, thread life cycle, creating threads, synchronizing threads, inter thread communication.

**UNIT IV: Applets** – Concepts of Applets, differences between applets and applications, life cycle of an applet, types of applets, creating applets, passing parameters to applets.

**Event Handling:** Events, Handling mouse and keyboard events, Adapter classes.

**Files-** Streams- Byte streams, Character streams, Text input/output.

**UNIT V: GUI Programming with Java** – AWT class hierarchy, component, container, panel, window, frame, graphics.

**AWT controls:** Labels, button, text field, check box, and graphics.

**Layout Manager –** Layout manager types: border, grid and flow.

**Swing** – Introduction, limitations of AWT, Swing vs AWT.

**TEXT BOOKS:**

1. Java- the complete reference, 7th editon, Herbert schildt, TMH.
2. Understanding OOP with Java, updated edition, T. Budd, pearson eduction.
3. Core Java an integrated approach, dreamtech publication, Dr. R.Nageswara Rao.

**REFERENCE BOOKS:**

1. Java for Programmers, P.J.Deitel and H.M.Deitel, PEA (or) Java: How to Program , P.J.Deitel and H.M.Deitel, PHI
2. Object Oriented Programming through Java, P. Radha Krishna, Universities Press.
3. Thinking in Java, Bruce Eckel, PE
4. Programming in Java, S. Malhotra and S. Choudhary, Oxford Universities Press.

**COURSE OUTCOMES:**

1) An understanding of the principles and practice of object oriented programming and design in the construction of robust, maintainable programs which satisfy their requirements;
2) A competence to design, write, compile, test and execute straightforward programs using a high level language;
3) An appreciation of the principles of object oriented programming;
4) An awareness of the need for a professional approach to design and the importance of good documentation to the finished programs.
5) Be able to implement, compile, test and run Java programs comprising more than one class, to address a particular software problem.
6) Be able to make use of members of classes found in the Java API.
7) Demonstrate the ability to employ various types of selection constructs in a Java program. Be able to employ a hierarchy of Java classes to provide a solution to a given set of requirements.
8) Able to develop applications using Applet, awt and GUI Programming.

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## OPEN ELECTIVE II
## (R17A01251) INTRODUCTION TO SCRIPTING LANGUAGES

**COURSE OBJECTIVES:**

1) Learning the basics of scripting languages like PERL, JAVASCRIPT, PYTHON
2) Understanding the requirements and uses of Scripting.
3) In-depth knowledge of programming features of Perl and Python.
4) Knowing the implementation model for scripting and design of applications.

**UNIT I**

**Introduction** to PERL and Scripting Scripts and Programs, Origin of Scripting, Scripting Today, Characteristics of Scripting Languages, Uses for Scripting Languages, Web Scripting, and the universe of Scripting Languages. PERL- Names and Values, Variables, Scalar Expressions, Control Structures, arrays, list, hashes, strings, pattern and regular expressions, subroutines.

**UNIT II**

**HTML:** HTML basics, Elements, Attributes and Tags, Basic Tags, Advanced Tags, Frames, Images.

**Cascading style sheets:** Adding CSS, CSS and page layout.

**JavaScript:** Introduction, Variables, Literals, Operators, Control structure, Conditional statements, Arrays, Functions, Objects, Predefined objects, Object hierarchy, Accessing objects.

**UNIT III**

**JavaScript programming of reactive web pages elements:** Events, Event handlers, multiple windows and Frames, Form object and Element, Advanced JavaScript and HTML, Data entry and Validation, Tables and Forms.

**Introduction to Python Programming:** History of Python, Need of Python Programming, Running Python Scripts, Variables, Assignment, Keywords, Input-Output, Indentation, Types - Integers, Strings, Booleans.

**UNIT IV**

**Operators and Expressions:** Operators- Arithmetic Operators, Comparison (Relational) Operators, Assignment Operators, Logical Operators, Bitwise Operators, Membership Operators, Identity Operators, Expressions and order of evaluations.

**Data Structures:** Lists - Operations, Slicing, Methods; Tuples, Sets, Dictionaries, Sequences.

**UNIT V**

**Control Flow** - if, if-else, for, while, break, continue, pass

**Functions** - Defining Functions, Calling Functions, Passing Arguments, Default Arguments, Variable-length arguments, Fruitful Functions(Function Returning Values), Scope of the Variables in a Function - Global and Local Variables. Development of sample scripts and web applications.

**TEXT BOOKS:**

1. The World of Scripting Languages, David Barron, Wiley Publications.
2. Learning Python, Mark Lutz, Orielly
3. Web Programming, building internet applications, Chris Bates 2nd Edition, WILEY
4. Beginning JavaScript with Dom scripting and AJAX, Russ Ferguson, Christian Heilmann, Apress.
5. Python Web Programming, Steve Holden and David Beazley, New Riders Publications.

**REFERENCES:**

1. Open Source Web Development with LAMP using Linux, Apache, MySQL, Perl and PHP, J.Lee and B.Ware(Addison Wesley) Pearson Education.
2. Programming Python, M.Lutz, SPD.
3. Core Python Programming, Chun, Pearson Education.
4. Guide to Programming with Python, M.Dawson, Cengage Learning.
5. Perl by Example, E.Quigley, Pearson Education.
6. Programming Perl, Larry Wall, T.Christiansen and J.Orwant, O'Reilly, SPD.

**COURSE OUTCOMES:**

1. Analyze the differences between typical scripting languages and application programming languages.
2. Application of knowledge of scripting languages to design programs for simple applications.
3. Create software systems using scripting languages, including Perl and Python.

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## OPEN ELECTIVE II

## (R17A01252) SOFTWARE PROJECT MANAGEMENT

**COURSE OBJECTIVES:**

The Main goal of software development projects is to create a software system with a predetermined functionality and quality in a given time frame and with given costs. For achieving this goal, models are required for determining target values and for continuously controlling these values. This course focuses on principles, techniques, methods & tools for model-based management of software projects, assurance of product quality and process adherence (quality assurance), as well as experience - based creation & improvement of models (process management).

The Objectives of the course can be characterized as follows:

1) Understanding the specific roles within a software organization as related to project and process management
2) Understanding the basic infrastructure competences (e.g., process modeling and measurement)
3) Understanding the basic steps of project planning, project management, quality assurance, and process management and their relationships

**UNIT-I**

Conventional Software Management: The waterfall Model, Conventional Software Management Performance, evolution of Software Economics: software Economics. Pragmatic Software Cost Estimation. Improving Software Economics: Reducing Software Product Size, Improving Software Processes, Improving Team Effectiveness, Improving Automation, Achieving Required Quality, Peer Inspections.

**UNIT-II**

Conventional And Modern Software Management: Principles of Conventional Software Engineering, Principles of Modern Software Management, Transitioning to an interactive Process, Life Cycle Phases: Engineering and Production Stages Inception, Elaboration, Construction, Transition phases .

**UNIT-III**

Artifacts of the Process: The Artifact Sets. Management Artifacts, Engineering Artifacts, Programmatic Artifacts. Model Based Software Architectures: A Management Perspective and Technical Perspective.

**UNIT-IV**

Flows of the Process: Software Process Workflows. Inter Trans Workflows. Checkpoints of the Process: Major Mile Stones, Minor Milestones, Periodic Status Assessments. Interactive Process Planning: Work Breakdown Structures, Planning Guidelines, Cost and Schedule Estimating. Interaction Planning Process, Pragmatic Planning.

**UNIT-V**

Project Organizations and Responsibilities: Line-of-Business Organizations, Project Organizations, and Evolution of Organizations. Process Automation Building Blocks, the Project Environment. Project Control and Process Instrumentation: Server Care Metrics, Management Indicators, Quality Indicators, Life Cycle Expectations Pragmatic Software Metrics Automation.

**Text Books:**

1. Walker Royce, “Software Project Management”, 1998, PEA.
2. Henry, “Software Project Management”, Pearson.

**Reference Books:**

1. Richard H.Thayer.” Software Engineering Project Management”, 1997, IEEE Computer Society.
2. Shere K.D.: “Software Engineering and Management”, 1998, PHI.
3. S.A. Kelkar, “Software Project Management: A Concise Study”, PHI.
4. Hughes Cotterell, “Software Project Management”, 2e, TMH. 88 5. Kaeron Conway, “Software Project Management from Concept to D

**COURSE OUTCOMES:**

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

1) Describe and determine the purpose and importance of project management from the perspectives of planning, tracking and completion of project
2) Compare and differentiate organization structures and project structures.
3) Implement a project to manage project schedule, expenses and resource with the application of suitable project management tools

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## OPEN ELECTIVE II

## (R17A0353) ENTERPRISE RESOURCE PLANNING

**COURSE OBJECTIVES**

1) To know the basics of ERP
2) To understand the key implementation of ERP
3) To know the business modules of ERP
4) To evaluate the current and future trends in ERP

**UNIT 1**

**INTRODUCTION:** Overview and Benefits of ERP, ERP Related Technologies- Business Process Reengineering (BPR), Online Analytical Processing (OLAP), Supply chain Management (SCM). Applications of ERP.

**UNIT II**

**ERP IMPLEMENTATION:** Implementation and Product Lifecycle, Implementation Methodology, Planning Evaluation and selection of ERP systems, Organizing the Project Management and Monitoring. Case Study on Manufacturing.

**UNIT III**

**ERP MODULES:** Business modules in an ERP Package- Manufacturing, Human Resources, Plant Maintenance, Materials Management, Data Warehousing, Data Mining, Quality Management, Sales and Distribution. Case Study in Banking Sector.

**UNIT IV**

**POST IMPLEMENTATION:** Overview of ERP software solution. Maintenance of ERP-Organizational and Industrial impact; Success and Failure factors of ERP Implementation. Case Study of Success Story and Failure of Processing Sector.

**UNIT V**

**EMERGING TRENDS IN ERP:** Extended ERP system, ERP add–ons –Customer Relations Management (CRM), Customer satisfaction (CS). Business analytics etc- Future trends in ERP systems-web enabled, Wireless technologies. Case Study in Service Sector.

**TEXT BOOKS:**

1. Jagan Nathan Vaman, ERP in Practice, Tata McGraw-Hill, 2008
2. Alexis Leon, “ERP Demystified”, Tata McGraw Hill, New Delhi, 2000
3. Mahadeo Jaiswal and Ganesh Vanapalli, ERP Macmillan India, 2009.

**REFERENCE BOOKS**:

1. Alexis Leon, Enterprise Resource Planning, second edition, Tata McGraw-Hill, 2008.
2. Vinod Kumar Grag and N.K. Venkitakrishnan, ERP- Concepts and Practice, Prentice Hall of India,2 nd edition, 2006.
3. Joseph A Brady, Ellen F Monk, Bret Wagner, “Concepts in Enterprise Resource Planning”, Thompson Course Technology, USA, 2001.

**Course Outcomes:**

1) To know the strategic importance of Enterprise Resource Planning
2) To Understand and implement ERP in various Sectors.

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## (R17A2183)AERODYNAMICS AND PROPULSION LAB

**Objectives:**

- To know the experimental procedure to find aerodynamic characteristics and functioning of wind tunnel components .
- To familiarize students and to expose them practically to various aircraft piston and gas turbine Engines.

**AERODYNAMICS**

1. Calibration of Wind Tunnel.
2. Pressure Distribution over an symmetric Airfoil
3. Pressure Distribution on a cylinder
4. Pressure Distribution over a sphere
5. Estimation of aerodynamics characteristics of NACA0012 airfoil
6. Efficiency of Vanes in Centrifugal blower

**PROPULSION**

7. Performance estimation for single cylinder four stroke Petrol engines.
8. Performance estimation and heat balance test for single cylinder four stroke Diesel engines.
9. Determination of Port timing and sketching for two stroke petrol engine.
10. Determination of Valve timing and sketching for four stroke diesel engine.
11. Estimating the efficiency of centrifugal compressor.
12. Estimating the efficiency of axial flow compressor.

**Note:** Any 10 Experiments can be conducted minimum 5 from each section

**Equipment needed:**

1. Low Speed Wind-tunnel Test Rig with a test section of 1 meter X 1 meter with necessary accessories.
2. Test Rig for Axial flow Compressor
3. Test rig for centrifugal flow compressor.
4. Heat Engine Test Rig.
5. Balancing test Rig
6. Bomb Calorimeter apparatus
7. Piston Engine

**Reference Books:**

1. Low speed wind tunnel testing, W.E. Rae & Allen Pope, John Willey &sons
2. Fundamentals of Aerodynamics by John D Anderson TATA MC GRAW HILL
3. Internal Combustion Engines by RK Rajput Laxmi Publications.

**Outcomes**

- The student can analyze aerodynamic performance various geometries.
- Ability to understand details of piston and gas turbine engine
- Ability to characterize various aircraft fuels

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## (R17A2184) AEROSPACE STRUCTURES LAB

**Objectives:**

- To study the properties of materials used in Aircraft structure.
- To study the failure of different component under different loading condition

**LIST OF EXPERIMENTS:-**

1. Tensile testing using universal Testing Machine - Stress - strain curves and strength tests for various engineering materials.
2. Bending tests - Stress and deflection of beams for various end conditions
3. Verification of Maxwell's and Castigliano's theorems - Influence coefficients.
4. Compression tests on long columns - Critical buckling loads
5. Compression tests on short columns - Critical buckling loads
6. Test on riveted joints.
7. Test on bolted joints.
8. Test using NDT inspection method.
9. Study and use of a Seismic pickup for the measurement of vibration amplitude.
10. Shear Center of open and closed sections.
11. To calculate shear force of a Wagner beam
12. Deflection of a simply supported beam with varying load conditions.

**Note:** Any10 Experiments should be conducted

**Equipment needed**

1. UTM – 20 / 40 Tons with. Jigs and Fixtures
2. Deflection test rig (Fabricated hardware + precession dial gauge)
3. NDT Equipment. a) Ultrasonic apparatus, b) Magnetic Particle test rig, c) Dye penetration test.
4. Various Hardware rigs desired in the lab for specific test.
5. Photo and magnetic speed setup
6. Vibration beam setup
7. Shear Center of open and closed section setup.

**Reference Books:**

1. Megson, T.M.G., Aircraft Structures for Engineering Students, Edward Arnold, 1985.
2. Bruhn. E.H, Analysis and Design of Flight Vehicles Structures, tri -state off set company, USA, 1965

**Outcomes:**

- Ability to perform non-destructive testing to predict the properties of metabolic materials used in aircraft application

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## (R17A2112) FINITE ELEMENT ANALYSIS

**Objectives:**

- It covers the fundamental theoretical approach beginning with a review of differential equations, boundary conditions, integral forms, interpolation, parametric geometry, numerical integration, and matrix algebra.
- Next, engineering applications to field analysis, stress analysis and vibrations are introduced. Time dependent problems are also treated.
- Students are also introduced, by means of selected tutorials, to the commercial finite element system SolidWorks which is similar to one they could be expected to use upon graduation. Graduate students will also be introduced to the more powerful (and difficult to use) Ansys system.

**UNIT – I**

Introduction to Finite Element Method for solving field problems. Stress and Equilibrium. Strain – Displacement relations. Stress – strain relations. One Dimensional problems: Finite element modeling coordinates and shape functions. Potential Energy approach: Assembly of Global stiffness matrix and load vector. Finite element equations, Treatment of boundary conditions, Quadratic shape functions.

**UNIT – II**

**Analysis of Beams**: Element stiffness matrix for two node, two degrees of freedom per node beam element.

**Analysis of Trusses**: Stiffness matrix for plain truss elements, stress calculations and problems.

**UNIT – III**

Finite element modelling of two dimensional stress analysis with constant strain triangles and treatment of boundary conditions. Finite element modelling of Axisymmetric solids subjected to Axisymmetric loading with triangular elements. Two dimensional four noded isoparametric elements and numerical integration.

**UNIT – IV**

Steady state heat transfer analysis: one dimensional analysis of a fin and two dimensional analysis of thin plate.

**UNIT-V**

Dynamic Analysis: Formulation of finite element model, element matrices, evaluation of Eigen values and Eigen vectors for a stepped bar and a beam.

**Text Books:**

1. Introduction to Finite Elements in Engineering / Chandraputla, Ashok and Belegundu /Prentice – Hall.
2. The Finite Element Methods in Engineering / SS Rao / Pergamon.
3. The Finite Element Method for Engineers – Kenneth H. Huebner, Donald L. Dewhirst, Douglas E. Smith and Ted G. Byrom / John Wiley & sons (ASIA) Pte Ltd.

**Reference Books:**

1. An introduction to Finite Element Method / JN Reddy / Me Graw Hill
2. Finite Element Methods/ Alavala/TMH
3. Finite Element Analysis/ C.S.Krishna Murthy

**Outcomes:**

- Upon completion of the course students should be able to correlate a differential equation and its equivalent integral form.
- Understand parametric interpolation and parametric geometry enforce essential boundary conditions to a matrix system.

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## (R17A2113) CONTROL THEORY FOR AIRCRAFT

**OBJECTIVES OF THE COURSE**

To enable students to understand:

1. Method of mathematical modeling of physical systems,
2. Performance analysis and design of aircraft control system and
3. Modern control design methods using computer software(MATLAB)

**UNIT I: CONTROL SYSTEM MODELING AND FEEDBACK CONTROL**

Basic components of control system, open loop system, closed loop system. Linear Vs Nonlinear system, Time-invariant Vs time varying systems. Transfer function definition. Transfer function of single-input-single-output and multi-input-multi-output system. Reduction of block diagrams for complex systems - rules and conventions.

**UNIT-II: TIME DOMAIN & FREQUENCY DOMAIN ANALYSIS**

Time domain description- output response to control inputs of first and second order systems. Transient and steady state response. Frequency domain analysis, specification: resonant peak, resonant frequency and band width. Bode Plot, Polar plot.

**UNIT-III: DESIGN OF CONTROL SYSTEM**

Control system performance requirements, specifications (transient and steady state specification). Examples for first and second order systems, Method of determining stability- Routh-Hurwitz Criterion, Design of controllers: active, passive, series, feed forward, feedback controller. Lead, lag, lead-lag, wash-out, notch filters: properties and transfer functions. Root Locus method of analysis and design, Nyquist Criterion, gain margin and phase margin.

**UNIT-IV:DESIGN OF AIRCRAFT CONTROLLER, FLYING QUALITIES, STABILITY AND CONTROL AUGMENTATION, AUTO PILOTS**

Approximation to aircraft transfer functions, Flying qualities of aircraft, relation to airframe transfer function. Pilot opinion rating. Design of Stability Augmentation System(SAS) using displacement & rate feed-back, Control augmentation system, Full authority fly-by-wire control, need for automatic control. Auto pilots- purpose, functioning, displacement auto pilot, pitch, yaw, bank, altitude and velocity hold auto pilot. Auto pilot design by feedback& PID Controller- Zeigler and Nichols method.

**UNIT-V:MODERN CONTROL THEORY**

Limitations of classical control system modeling for multi input multi output systems. State space modeling of dynamical systems, state variable-definition-state equations. Canonical transformation of state equations, Eigen values, real distinct, repeated. Controllability and Observability- definition-significance.

**OUTCOMES**

1. The student should be able to model and analyze control system components.
2. He should be able to design aircraft controller to meet the specified performance criterion. Including aircraft flight control system.
3. He should be able to apply modern software tools in the design of controller.

**TEXT BOOKS:**


1. KUO, BC. Automatic Control systems, prentice hall India, 1992 ISBN 0-87692-B3-0
2. Nelson R.C. Flight Stability and Automatic control, second edition, tata McGraw-hill2007 ISBN 0-07-666110-3
3. Yechout, T.R, Introduction to flight Mechanics, AIAA,2003,ISBN 1-56347-577-4


**REFERENCE BOOK:**


1. Mc Lean, D. Automatic flight Control Systems, prentice hall, 1990

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## (R17A2114) FLIGHT VEHICLE DESIGN

**OBJECTIVES OF THE COURSE:**

1. To help students acquire knowledge of design process of an aircraft
2. To enable student to complete conceptual design to meet specified system requirements.

**UNIT I: DESIGN PROCESS OVERVIEW, AIRFOIL AND GEOMETRY SELECTION, THRUST TO WEIGHT RATIO, WING LOADING**

Overview of aircraft design, Phases of aircraft design. Aircraft conceptual design process, Sizing from conceptual sketch, Empty weight & fuel fraction estimation, Mission profiles, Mission segment weight fractions. L/D estimation. Take-off weight estimation. Airfoil and geometry selection, Airfoil design, Design lift coefficient, Stall, Airfoil thickness ratio, Airfoil considerations. Wing geometry (aspect ratio, wing sweep, tapper ratio and wing vertical location, wing tip shapes. Tail geometry and arrangements. Thrust to weight ratio & Wing loading- statistical estimation, thrust matching. Wing loading (for take-off, instantaneous/sustained turn rate, loiterer endurance, cruise range).

**UNIT II: INITIAL SIZING & CONFIGURATION LAYOUT**

Sizing with fixed engine and with rubber engine. Refined sizing equations/ methods. Geometry sizing of fuselage, Wing, Tail, Control surfaces. Development of configuration lay out from conceptual sketch. The inboard profile drawing, Wetted area, Volume distribution and fuel volume plots, Lofting- definition, significance and methods, flat wrap lofting. Special consideration in configuration lay out. Isobar tailoring Sears-Haack volume distribution, structural load paths. Radar, IR, visual detect ability, aural signature considerations.

**UNIT III: CREW STATION,PASSENGERS &PAYLOAD, LANDING GEAR &SUBSYSTEMS, STRUCTURES,WEIGHT & BALANCE**

Fuselage design- crew station, passenger compartment, cargo provisions, weapons carriage, gun installation, Landing gear arrangements, guidelines for lay out. Shock absorbers – types, sizing, stroke determination, gear load factors. Gear retraction geometry. Aircraft subsystems, significance to configuration lay out. Airworthiness requirements - loads, safety margins, material properties, methods of estimation- construction, operation, maintenance, training- procedures, Aircraft materials- mechanical properties- design data- allowable, allowable bases. Failure theory. Flight loads- atmospheric, maneuver- construction of flight envelope. Wing loads, Empennage loads, Fuselage loads.

**UNIT IV: PERFORMANCE AND CONSTRAINT ANALYSIS REFINED SIZING & TRADE STUDIES**

The aircraft operating envelope. Take off analysis, Balanced field length Landing analysis. Fighter performance measures of merit. Effects of wind on aircraft performance. Initial technical report of baseline design analysis and evaluation. Refined baseline design and report of specifications. Elements of life cycle cost, cost estimating method, RDT&E and production costs, operation and maintenance costs, fuel and oil costs, crew salaries Refined conceptual sizing methods. Sizing matrix plot and carpet plot. Trade studies - design trades, requirement trades, growth sensitivities. Measures of merit Determination of final baseline design configuration, preparation of type specification report

**UNIT V: STABILITY, CONTROL & HANDLING QUALITIES**

Longitudinal static stability and control, aerodynamic center estimation, wing and tail lift and elevator, Estimation of wing, fuselage and nacelle pitching moment, thrust effect, trim analysis, take-off rotation, velocity stability, Lateral & directional stability and control, lateral-directional derivatives, aircraft dynamic characteristics, steady roll, pull up, inertia coupling, Introduction to handling qualities(Cooper harper rating scale), Spin recovery.

**OUTCOMES**

1. Students can complete conceptual design of a transport and fighter aircraft and estimate its performance including handling qualities against given requirements.

**TEXT BOOK:**

1. Raymer,D.P., Aircraft Design: A Conceptual Approach, 3rd edition., AIAA Education series, AIAA, 1999,ISBN: 1-56347-281-0

**REFERENCE BOOK:**

1. Howe, D., Aircraft Conceptual Design Synthesis, Professional Engineering Publishing, London,2000, ISBN:1-86058-301-6

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## (R17A2115) AIRCRAFT SYSTEMS

**OBJECTIVES OF THE COURSE**: Student will be introduced to various aircraft system and their integration.

**UNIT-I: INTRODUCTION TO AIRCRAFT SYSTEM**:

Types of aircraft system-airframe, vehicle, avionics, mission and their subsystems. Specifications of requirements (mission and performance requirements). Operating environmental conditions. Need for integration. Enumeration of aircraft systems and some subsystems-purpose and very brief description.

**UNIT-II: HYDRAULIC SYSTEM.**

Function, merits and system loads. Principle components, pumps, reservoir and accumulator. Flight control actuation, need for redundancy. Hydraulic fluid properties requirements. Operating fluid pressures and flow rates. Landing gear and brake management system.

**UNIT-III: ELECTRICAL SYSTEMS AND FLIGHT CONTROL SYSTEMS**:

Electrical loads in aircraft, Electrical power generation and control-DC,AC. Power conversion and batteries. Load protection. Variable speed constant frequency(VSCF) Cyclo- converter, 27V DC system. Flight control systems-primary and secondary flight control. Flight control actuation systems in brief.

**UNIT-IV: PNEUMATIC AND ENVIRONMENTAL CONTROL SYSTEMS**:

Engine as a source of high pressure air-engine bleed air and its users. Wing and engine anti-ice system. Engine starting system. Pitot-static system. Principal heat sources in aircraft. Method of cooling-ram air, fuel cooling. Cooling system-air cycle refrigeration-types-turbo fan, bootstrap,reverse bootstrap systems. Cabin pressurisation. g-tolerance and protection. Molecular-Sieve oxygen concentrator.

**UNIT-V: ENGINE CONTROL AND FUEL SYSTEM**:

Principle of operation of aircraft gas turbine engine. Engine-airframe interface. Control of fuel flow, air flow, exhaust gas flow- need, means, system parameters, basic input and outputs. Limited authority and full authority engine control systems. Engine monitoring sensors and indicators. Power offtakes-need, types and effect on engine performance.Fuel system- components, fuel tank safety-fuel inerting system.

**OUTCOMES:**

1. The student will be able to appreciate the operation of various aircraft systems/subsystems and their integrated operation.

**TEXT BOOKS**

1. Moir, I. and Seabridge, A., Aircraft Systems: mechanical, Electrical and Avionics sub -systems Integration, 3 rd edition, John Wiley 2008, ISBN 978-0-470-05996-8

2. Moir, I. and Seabridge, A., Design and development of aircraft systems-an introduction, AIAA education series, AIAA,2004.

**REFERENCES:**

Aircraft systems by David A Lambro tata Mc Graw Hill. Ed;2009.

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## (R17A2116)WIND TUNNEL TECHNIQUES
## (CORE ELECTIVE-II)

**UNIT- I AERODYNAMIC EXPERIMENTS- HISTORY, MODEL TESTNG** Forms of aerodynamic experiments- Model testing- wind tunnel- principles-scaling laws, scale parameters- significance. low speed wind tunnels - types, description. High speed tunnels- transonic, supersonic, hypersonic, shock tubes, special tunnels- low turbulence, high Re, environmental, automobile- function, distinctive features, application. Major wind tunnel facilities- description, details.

**UNIT- II LOW SPEED WIND TUNNELS- CONSTRUCTION, COMPONENTS, PERFORMANCE** Low speed wind tunnel- principal components- working section, diffuser, corners, turning vanes, fan, straighteners, honeycombs, screens, contraction cone, fan, motor- function, description, design requirements, constraints, construction, performance- loss coefficients. Wind tunnel performance- flow quality, power losses.

**UNIT- III WIND TUNNEL CORRECTIONS & LOAD MEASUREMENTS** Wind tunnel corrections. Sources of inaccuracies- buoyancy, solid blockage, wake blockage, streamline curvature causes, estimation, correction. Total correction on airspeed, dynamic pressure, zero lift drag. wind tunnel balances Load measurements-wind tunnel balances, types, description, application.

**UNIT- IV FLOW MEASUREMENTS- INSTRUMENTATION** Steady and unsteady pressure measurements and various types of pressure probes and transducers, errors in pressure measurements; measurement of temperature using thermocouples, resistance thermometers, temperature sensitive paints and liquid crystals; measurement of airspeed, flow direction, boundary layer profile using Pitot static tubes, 5 hole probes, total head rake- function, working principle, types, details of design and construction, use. Hot Wire Anemometry, Laser Doppler Anemometry, Particle Image Velocimetry- working principles, description of equipment, experimental setup, settings, calibration, measurement, data processing , applications.

**UNIT- V FLOW VISUALISATION TECHNIQUES** Flow visualization- need, types- tufts, china clay, oil film, smoke- working principle, description, setting up, operation, observation, recording, interpretation of imagery, relative merits, applications. High speed flows- optical methods of shadowgraphy, Schleiren, interferometry.

**TEXT BOOKS**

1. Low Speed Wind Tunnel Testing, Barlow, J.B., Rae, W.H., Pope, A., Wiley 1999.
2. High Speed Wind Tunnel Testing, Pope, A. and Goin, K.L., Wiley, 1965.
3. Yang, W.J., Handbook of Flow Visualization, 2nd edition, Taylor and Francis, 2001.

# MALLA REDDY COLLEGE OF ENGINEERING & TECHNOLOGY

| III Year B. Tech, ANE-II Sem | L | T/P/D | C |
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## (R17A2117) AIR TRANSPORTATION SYSTEMS
## (CORE ELECTIVE – II)

**Objectives:**

- The subject will introduce the air transportation systems in detail.
- To study the basic governing bodies of ATS, its laws and regulations
- To understand the Airspace sectors, setting up Airport, Airlines and economic considerations involved in it

**UNIT-I**

**Aviation industry & its regulatory authorities:** Introduction, history of aviation-evolution, development, growth, challenges. Air transportation industry-economic impact- types and causes. The breadth of regulation- ICAO, IATA, national authorities (DGCA, FAA). Safety regulations-risk assessment-human factors and safety, security regulations, environmental regulations.

**UNIT-II**

**Airspace:** Airspace and air traffic management, Categories of airspace-separation minima, airspace sectors-capacity, demand and delay. Evolution of air traffic control system-procedural ATC system, procedural ATC with radar assistance, first generation 'automated' ATC system, current generation radar and computer-based ATC systems. ICAO future air-navigation system.

**UNIT-III**

**Aircraft:** Costs-project cash-flow, aircraft price. Compatibility with the operational infrastructure. Direct and indirect operating costs. Balancing efficiency and effectiveness-payload-range, fuel efficiency, technical contribution to performance, operating speed and altitude, aircraft field length performance. Effectiveness-wake-vortices, cabin dimensions, flight deck.

**UNIT- IV**

**Airlines:** Setting up an airline-modern airline objectives. Structure of Airline Industry (Domestic & International) Route selection and development, annual utilization and aircraft size, seating arrangements. Aircraft- buy or lease. Revenue generation and yield management. Airline scheduling, Factors in Fleet Planning-Hub-and-Spoke System.

**UNIT-V**

**ENVIRONMENTAL CONTROL**

Noise, Characteristics, Evaluation of Noise in the Vicinity of Airports, Aircraft Noise Measurement, Short Term Measurement, Long-term Noise Monitoring, Prediction of Air Transport Noise, Airport Noise Mitigation and Noise Abatement Procedures , Control of Gaseous Emissions, Bird Control, Bird Strike Statistics.

**Text Books:**

1. Hirst, M., The Air Transport System,Wood head Publishing Ltd,Cambridge, England, 2008.
2. Antonin Kazda, Robert E Caves , Airport design and operation, Second edition, Elseiver, 2007.

**Reference Books:**

1. Wensven, J.G.,AirTransportion:A Management Perspective, Ashgate, 2007.
2. Belobaba,P.,Odoni,A.andBarnhart,C.,Global Airline Industry, Wiley,2009.
3. M.Bazargan,M., Airline operations and Scheduling Ashgate, 2004.
4. Nolan,M.s., Fundamentals of Air Traffic Control,fourthedn., Thomson Learning, 2004.
5. Wells, A. and young, S.,Airport Planning and Management, fifth edn., McGraw-Hill, 1986.

**Outcomes:**

- The operational structure of the Airport, its establishing, working strategies in detail
- The economic and the business outcomes of the operations of ATS
- The student with acquire operational knowledge of air transport system

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## (R17A2118) SPACE MECHANICS
## (CORE ELECTIVE – II)

**OBJECTIVES OF THE COURSE:**

1. Students will able to learn about various orbits, positioning of satellite in an orbit and consequences in flight dispersions.

**UNIT-I: BASIC CONCEPTS**

Kepler's Laws of motion, the solar system-Reference frames and coordinate systems-The celestial sphere- The Elliptic-Motion of vernal equinox-Sidereal Time-Solar Time-Standard Time-The earth's atmosphere

**UNIT-II: THE GENERAL N-BODY PROBLEM**

The many body problem-Lagrange-Jacobi identity-The circular restricted three- body problem-Liberation Points-Relative Motion in the N-body problem

**UNIT-III: THE TWO-BODY PROBLEM**

Equations of motion-General characteristics of motion for different orbits-Relations between position and time for different orbits-Expansions in elliptic motion-Orbital Elements-Relation between orbital elements and position and velocity

**UNIT-IV: THE LAUNCHING OF A SATELLITE**

Launch vehicle ascent trajectories-General aspects of satellite injection-Dependence of orbital parameters on in-plane injection parameters-Launch vehicle performances- Orbit deviations due to injection errors, perturbed satellite orbits, Special and general perturbations- Cowell's Method-Encke's method-Method of variations of orbital elements-General perturbations approach

**UNIT-V: INTERPLANETARY TRAJECTORIES**

Two-dimensional interplanetary trajectories-Fast interplanetary trajectories-Threedimensional interplanetary trajectories-Launch of interplanetary spacecraft-Trajectory about the target planet
Ballistic missile trajectories- The boost phase-The ballistic phase-Trajectory Geometry-Optimal flights-Time of flight-Re-entry phase-The position of the impact point-Influence coefficients.Low-thrust trajectories- Equations of Motion-Constant radial thrust acceleration-Constant tangential thrust(Characteristics of the motion, Linearization of the equations of motion- Performance analysis

**OUTCOMES**

1. Students will be able to analyze the trajectory requirements for launching a vehicle or missile.

**TEXT BOOKS:**

1. J.W.Cornelisse, H.F.R. Schoyer, and K.F. Wakker, Pitman, 1979, Rocket Propulsion and Spaceflight Dynamics,
2. William Wiesel, McGraw-Hill, 1997, Spaceflight Dynamics.

**REFERENCE BOOKS:**

1. Spacecraft Mission Design, Charles D.Brown, AIAA Education Series, Published by AIAA, 1998
2. "Orbital Mechanics, Vladimir A. Chobotov, AIAA Education Series, AIAA Education Series, Published by AIAA, 2002
3. Fundamentals of Astrodynamics and Applications,David.A. Vellado, Microcosm and Kluwer, 2001
4. Fundamentals of Astrodynamics", Rodger R. Bate, Donald.D. Muller 1971

# OPEN ELECTIVE - III

| OPEN ELECTIVE III | | |
|---|---|---|
| **S.NO** | **SUBJECT CODE** | **SUBJECT** |
| **1** | **R17A0454** | **ROBOTICS & AUTOMATION** |
| **2** | **R17A0354** | **NANO TECHNOLOGY** |
| **3** | **R17A0519** | **WEB TECHNOLOGIES** |
| **4** | **R17A0355** | **TOTAL QUALITY MANAGEMENT** |
| **5** | **R17A0553** | **DATA STRUCTURES** |
| **6** | **R17A1253** | **MANAGEMENT INFORMATION SYSTEMS** |

# MALLA REDDY COLLEGE OF ENGINEERING AND TECHNOLOGY

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## OPEN ELECTIVE III
## (R17A0454) ROBOTICS & AUTOMATION

**COURSE OBJECTIVES:**

1. This introductory course is valuable for students who wish to learn about robotics through a study of industrial robot systems analysis and design.
2. This course is suited to students from engineering and science backgrounds that wish to broaden their knowledge through working on a subject that integrates multi-disciplinary technologies.

**UNIT – I**

**Introduction & Basic Definitions:** History pf robots-robot anatomy, Coordinate Systems, Human arm Characteristics, Cartesian, Cylindrical, Polar, coordinate frames, mapping transform.

**UNIT – II**

**Kinematics – Inverse Kinematics:** Kinematics, Mechanical structure and notations, description of links and joints, Denavit Hatenberg notation, manipulator transformation matrix, examples inverse kinematics.

**UNIT – III**

**Differential Motion – Statics – Dynamic Modeling:** Velocity Propagation along links, manipulator Jacobian – Jacobian singularities – Lagrange Euler formulation Newton Euler formulation basics of trajectory planning.

**UNIT – IV**

**Robot Systems :** Actuators Sensors and Vision: Hydraulic and Electrical Systems Including Pumps, valves, solenoids, cylinders, stepper motors, Encoders and AC Motors Range and use of sensors, Micro switches, Resistance Transducers, Piezo-electric, Infrared and Lasers Applications of Sensors : Reed Switches, Ultrasonic, Barcode Readers and RFID – Fundamentals of Robotic vision.

**UNIT – V**

**Robots and Applications:** Industrial Applications – Processing applications – Assembly applications, Inspection applications, Non Industrial applications.

**TEXTBOOKS**

1. Robotics and Control: R.K. Mittal and I.J. Nagarath, TMH 2003.
2. Introduction to Robotics – P.J. Mckerrow, ISBN: 0201182408

**REFERENCES**

1. Robotics – K.S. Fu, R.C. Gonzalez and C.S.G. Lee, 2008, TMH.
2. Introduction to Robotics – S. Nikv, 2001, Prentice Hall,
3. Mechatronics and Robotics: Design & Applications – A. Mutanbara, 1999, CRC Press.

**COURSE OUTCOMES:**

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

1. Describe the various elements that make an industrial robot system
2. Discuss various applications of industrial robot systems
3. Analyze robot manipulators in terms of their kinematics, kinetics, and control

4. Model robot manipulators and analyze their performance, through running simulations using
   a MATLAB-based Robot Toolbox
5. Select an appropriate robotic system for a given application and discuss the limitations of such a system
6. Program and control an industrial robot system that performs a specific task.

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## OPEN ELECTIVE III
## (R17A0519) WEB TECHNOLOGIES

**COURSE OBJECTIVES:**

1) Giving the students the insights of the Internet programming and how to design and implement complete applications over the web.
2) It covers the notions of Web servers and Web Application Servers, Design Methodologies with concentration on Object-Oriented concepts, Client-Side
3) Programming, Server-Side Programming, Active Server Pages, Database Connectivity to web applications, Adding Dynamic content to web applications,
4) Programming Common Gateway Interfaces, Programming the User Interface for the web applications.

**UNIT I:**

**Web Basics and Overview:** Introduction to Internet, World Wide Web, Web Browsers, URL, MIME, HTTP, Web Programmers Tool box.

**HTML Common tags:** List, Tables, images, forms, frames, Cascading Style Sheets (CSS) & its Types. Introduction to Java Script, Declaring variables, functions, Event handlers (onclick, onsubmit, etc.,) and Form Validation.

**UNIT II:**

**Introduction to XML:** Document type definition, XML Schemas, Presenting XML , Introduction to XHTML, Using XML Processors: DOM and SAX.

**PHP:** Declaring Variables, Data types, Operators, Control structures, Functions.

**UNIT III:**

**Web Servers and Servlets:** Introduction to Servlets, Lifecycle of a Servlet, JSDK, Deploying Servlet, The Servlet API, The javax. Servlet Package, Reading Servlet parameters, Reading Initialization parameters. The javax.servlet HTTP package, Handling Http Request & Responses, Cookies and Session Tracking.

**UNIT IV:**

**Database Access:** Database Programming using JDBC, JDBC drivers, Studying Javax.sql.* package, Connecting to database in PHP, Execute Simple Queries, Accessing a Database from a Servlet. Introduction to struts frame works.

**UNIT V:**

**JSP Application Development:** The Anatomy of a JSP Page, JSP Processing. JSP Application Design and JSP Environment, JSP Declarations, Directives, Expressions, Scripting Elements, implicit objects. **Java Beans:** Introduction to Beans, Deploying java Beans in a JSP page.

**TEXT BOOKS:**

1. Web Programming, building internet applications, Chris Bates 2nd edition, WILEY Dreamtech (UNITs 1, 2)
2. Core SERVLETS ANDJAVASERVER PAGES VOLUME 1: CORE TECHNOLOGIES By Marty Hall and Larry Brown Pearson (UNITs 3, 4, 5)

**REFERENCE BOOKS:**

1. Programming world wide web-Sebesta, Pearson Education, 2007.
2. Internet and World Wide Web – How to program by Dietel and Nieto PHI/ Pearson Education Asia.
3. Jakarta Struts Cookbook, Bill Siggelkow, S P D O' Reilly for chap 8.
4. March's beginning JAVA JDK 5, Murach, SPD
5. An Introduction to WEB Design and Programming – Wang-Thomson
6. PHP: The Complete Reference Steven Holzner Tata McGraw-Hill.

**COURSE OUTCOMES:**

1) Understand the insights of the Internet programming and how to design and implement complete applications over the web.
2) Understands the notions of Web servers and Web Application Servers, Design Methodologies with concentration on Object-Oriented concepts, Client-Side
3) Understand Programming, Server-Side Programming, Active Server Pages, Database Connectivity to web applications, Adding Dynamic content to web applications,
4) Understand Programming Common Gateway Interfaces, Programming the User Interface for the web applications.

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**OPEN ELECTIVE III**

**(R17A0553) DATA STRUCTURES**

**COURSE OBJECTIVES:**

1) Exploring basic data structures such as stacks and queues.
2) Introduces a variety of data structures such as hash tables, search trees, heaps, graphs.
3) Introduces sorting algorithms

**UNIT - I**

Introduction to Data Structures: Data types, data structures basics, abstract data types, the running time of a program, the running time and storage cost of algorithms, complexity, asymptotic complexity, big O notation, obtaining the complexity of an algorithm.

Searching- Linear Search, Binary Search.

Sorting-Insertion Sort, Selection Sort, bubble sort, Quick sort, Merge sort, Comparison of Sorting methods.

**UNIT - II**

Linear list – singly linked list implementation, insertion, deletion and searching operations on linear list, Stacks-Operations, array and linked representations of stacks, stack applications, Queues-operations, array and linked representations, queue applications

**UNIT – III**

Dictionaries: linear list representation, skip list representation, operations - insertion, deletion and searching. Hash table representation: hash functions, collision resolution-separate chaining, open addressing- linear probing, quadratic probing, double hashing, and rehashing, extendible hashing.

**UNIT - IV**

Graphs – Introduction, Definition, Terminology, Graph Representations-Adjacency matrix, Adjacency lists, Graph traversals- DFS and BFS. Trees – Terminology, Representation of Trees, Properties of Binary Trees, Binary Tree Representations-array and linked representations, Binary Tree traversals.

**UNIT - V**

Priority Queue ,Different Types , Heap-Definition, types, insertion and Deletion operation on heaps. Search Trees: Binary Search Trees, Definition, Implementation, Operations-Searching,

Insertion and Deletion. AVL Trees, Definition, Height of an AVL Tree, Operations – Insertion, Deletion and Searching.

**TEXTBOOKS**

1. Fundamentals of data structures in C, 2 nd edition, E.Horowitz, S.Sahni and Susan Anderson
Freed, Universities Press.
2. Data structures using c – A.S.Tanenbaum, Y. Langsam, and M.J. Augenstein, PHI/pearson education.

**REFERENCES**

1. Data structures: A Pseudo code Approach with C, 2 nd edition, R.F.Gilberg and B.A.Forouzan,
Cengage Learning.
2. Introduction to data structures in c, 1/e Ashok Kamthane.

**COURSE OUTCOMES:**

1. Ability to select the data structures that efficiently model the information in a problem.
2. Ability to assess efficiency trade-offs among different data structure implementations or Combinations.
3. Implement and know the application of algorithms for sorting.
4. Design programs using a variety of data structures, including hash tables, binary and general
tree structures, search trees, heaps, graphs, and AVL-trees.

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## OPEN ELECTIVE III

## (R17A0354) NANO TECHNOLOGY

**COURSE OBJECTIVES:**

1) To learn about basis of Nano Materials.
2) In this course we focus on synthetic aspects for the design of nanostructured materials.
3) We describe different approaches including both the bottom-up(includes both chemical and physical methods) and the top-down methods(mainly physical methods) for the synthesis of nanostructured materials.
4) The course will then focus on different type of nanostructures with a special emphasis on carbon nanotubes(CNT), metal and metal oxide nanoparticles, core-shell nanostructures and self assembly of these nanostructures.
5) The dependence of various properties (dielectric, magnetic and optical) with size will be discussed.

**UNIT-I**

**General Introduction:** Basics of Quantum Mechanics, Harmonic oscillator, magnetic Phenomena, band .structure in solids, Mossbauer and Spectroscopy, optical phenomena bonding in solids, Anisotropy.

**Silicon Carbide:** Application of Silicon carbide, nano materials preparation, Sintering of SiC, X-ray Diffraction data, electron microscopy sintering of nano-particles,nano particles of Alumina and Zirconia: Nano materials preparation, Characterization, Wear materials and nano-composites,

**UNIT-II**

**Mechanical properties:** Strength of nano crystalline SiC, Preparation for strength measurements, Mechanical properties, Magnetic properties.

**Electrical properties:** Switching glasses with nanoparticles, Electronic conduction with nano-particles.

**Optical properties:** Optical properties, special properties and the coloured glasses.

**Magnetic Properties:** Soft magnetic Nanocrystalline alloy, Permanent magnetic Nanocrystalline materials, Giant Magnetic Resonance, Electrical Properties, Optical Properties, Thermal Properties, and Mechanical Properties.

**UNIT–III Synthesis Routes:** Top &Bottom up approaches: Physical Vapor Deposition, Micromulsion, Laser Ablation, Chemical Vapor Deposition, Molecular Beam Epitaxy, Solgel method, Spray Pyrolysis, Template Based synthesis, Lithography.

**UNIT–IV Tools to Characterize Nanomaterials:** X-Ray Diffraction (XRD), Small Angle X-ray scattering (SAXS), Scanning Electron Microscopy (SEM), Transmission Electron Microscopy (TEM), Atomic Force Microscopy (AFM), Scanning Tunneling Microscope (STM), Field Ion Microscope (FEM), Three-dimensional Atom Probe (3DAP), Nanoindentation

**UNIT–V Applications of Nanomaterials:** Nano-electronics, Micro- and Nano-electromechanical systems (MEMS/NEMS), Nanosensors, Nanocatalysts, Cosmetic and Consumer Goods, Structure and Engineering, Automotive Industry, Water Treatment and the environment, Nano-medical applications, Textiles, Paints, Energy, Defence and Space Applications.

**TEXT BOOKS:**

1) Text Book of Nano Science and Nano Technology – B.S. Murthy, P. Shankar, Baldev Raj, B.B. Rath and James Munday, University Press-IIM.
2) Introduction to Nanotechnology – Charles P. Poole, Jr., and Frank J. Owens, Wiley India Edition, 2012.
3) Guozhong Cao, Nanostructures and Nano-materials:Synthesis, Properties and Applications, Imperial College Press 2004.

**REFERENCES BOOKS:**

1) Nano: The Essentials by T. Pradeep, McGraw- Hill Education.
2) Nanomaterials, Nanotechnologies and Design by Michael F. Ashby, Paulo J. Ferreira and Daniel L. Schodek.
3) Transport in Nano structures- David Ferry, Cambridge University press 2000
4) Nanofabrication towards biomedical application: Techniques, tools, Application and impact – Ed. Challa S.,S. R. Kumar, J. H. Carola.
5) Carbon Nanotubes: Properties and Applications- Michael J. O'Connell.
6) Electron Transport in Mesoscopic systems – S. Dutta, Cambridge University press.
7) Nanomaterials Synthesis, Properties and Applications Edited by A S Edelstein and R C Cammarata, IOP Publishing Ltd 1996.

**COURSE OUTCOMES**:

1) Will familiarize about the science of Nano Technology.
2) Will demonstrate the preparation of Nano Technology.
3) Will develop knowledge in characteristic Nano Technology & Nano Materials.

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## OPEN ELECTIVE III
## (R17A0355) TOTAL QUALITY MANAGEMENT

**COURSE OBJECTIVES:**

1) To facilitate the understanding of Quality Management principles and process.
2) To understand Customer focus, Employee focus and their involvement and Supplier Management.

**UNIT – I**

Introduction, The concept of TQM, Quality and Business performance, attitude, and involvement of top management, communication, culture and management systems. Management of Process Quality: Definition of quality, Quality Control, a brief history, Product Inspection vs. Process Control, Statistical Quality Control, Control Charts and Acceptance Sampling.

**UNIT -II**

Customer Focus and Satisfaction: internal customer conflict, quality focus, Customer Satisfaction, role of Marketing and Sales, Buyer – Supplier relationships. Bench Marking: Evolution of Bench Marking, meaning of bench marking, benefits of bench marketing, the bench marking procedure, pitfalls of bench marketing.

**UNIT- III**

Organizing for TQM: The systems approach, organizing for quality implementation, making the transition from a traditional to a TQM organization, Quality Circles, seven Tools of TQM: Stratification, check sheet, Scatter diagram, Kepner &Tregoe Methodology.

**UNIT- IV**

**The Cost of Quality:** Definition of the Cost of Quality, Quality Costs, Measuring Quality Costs, use of Quality Cost information, Accounting Systems and Quality Management.

**UNIT –V**

**ISO9000:** Universal Standards of Quality: ISO around the world, The ISO9000 ANSI/ASQC Q-90. Series Standards, benefits of ISO9000 certification, the third party audit, Documentation ISO9000 and services, the cost of certification implementing the system.

**TEXT BOOK:**

- Total Quality Management / Joel E. Ross/Taylor and Franscis Limited
- Total Quality Management/P. N. Mukherjee/PHI

**REFERENCE BOOKS:**

- Beyond TQM / Robert L.Flood
- Total quality management by Paneer Selvam
- Statistical Quality Control / E.L. Grant.
- Total Quality Management:A Practical Approach/H. Lal
- Quality Management/Kanishka Bedi/Oxford University Press/2011
- Total Engineering Quality Management/Sunil Sharma/Macmillan

**COURSE OUTCOMES:**

1) The student would be able to apply the tools and techniques of quality management to manufacturing and services processes.
2) To give the students an overview of TQM, various Quality aspects and importance of Top Management Commitment in any organization for maintaining product / services quality.

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## OPEN ELECTIVE III
## (R17A1253)MANAGEMENT INFORMATION SYSTEMS

**COURSE OBJECTIVE**:

1) To understand the competitive advantage of using information systems in the organization for the needful assistance in decision making and management.
2) To learn how to plan for information systems &implementation
3) To study about security aspects of information systems

**UNIT-I:**

Introduction : MIS importance, definition, nature and scope of MIS, Structure and Classification of MIS, Information and Systems Concept, Types of Information, Information systems for competitive advantage.

Case Study: MIS at any business establishment.

**UNIT-II:**

Business Applications of Information Systems : E-Commerce, ERP Systems, DSS, Business Intelligence and Knowledge Management System.

Case Study: Knowledge Management Systems at an Enterprise.

**UNIT-III:**

Management of IS: Information system planning, system acquisition, systems implementation, evaluation & maintenance of IS, IS Security and Control.

Effectiveness of MIS: A Case Study.

**UNIT-IV:**

Building of Information Systems: System Development Stages, System Development Approaches.

Systems Analysis and Design- Requirement Determination, Strategies for Requirement Determination.

Structured Analysis Tools, System Design – Design Objectives, Conceptual Design, Design Methods. Detailed system design.

**UNIT-V:**

Introduction to Cyber Crime : Cyber Crime Defination and orgin of the word,cyber crime and information security, cyber criminals. Classification of cyber criminals-Legal Perspectives-Indian Perspectives-Cyber crimes and indian ITA 2000,Global perspective on cybercrime-Cybercrime era.(Refer : Nina Godbole et al)

**TEXT BOOK**

1) D P Goyal, Management Information Systems–Managerial Perspective, MacMillan, 3rd Edition, 2010.

**REFERENCE:**

1. Nina Godbole & Sunit Belapure " Cyber Security" Wiley india 2012.
2. Jawadekar, MIS Text and Cases, TMH, 2012.
3. Dr Milind M Oka "Cases in Management Information system 'Everest, 2012.
4. A K Gupta, Sharma "Management of Systems" Macmillan, 2012.

5. Sandra Senf “Information Technology Control and Audit” 3e, CRC Press, 2012.
6. Apache OFBiz for Ecommerce and ERP - https://ofbiz.apache.org/
7. Magneto for Ecommerce (B2B Commerce) - https://magento.com/
8. Adempiere – ERP : http://www.adempiere.net/web/guest/welcome
9. Analytica – DSS - http://www.lumina.com
10. OpenRules – Business Rules and Decision Management system - http://openrules.com/

**COURSE OUTCOME**:

1) Ability to apply Concepts & applications of Management Information Systems.
2) Ability to perform Information Systems Planning & Implementations.
3) Ability to adapt Cyber crime and information security procedures.

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## (R17A0007) TECHNICAL COMMUNICATION AND SOFT SKILLS

**(A Mandatory Course)**

**INTRODUCTION:**

In view of the growing importance of English as a tool for global communication and the consequent emphasis on training students to acquire communicative competence, the syllabus has been designed to develop linguistic and communicative competencies of Engineering students.

In the English classes, the focus should be on the skills of reading, writing, listening and speaking and for this the teachers should use the text prescribed for detailed study. For example, the students should be encouraged to read the texts/selected paragraphs silently. The teachers can ask comprehension questions to stimulate discussion and based on the discussions students can be made to write short paragraphs/essays etc.

**Objectives:**

- To improve the language proficiency of the students in English with emphasis on LSRW skills.
- To equip the students to approach academic subjects more professionally using the theoretical and practical components of the English syllabus.
- To develop the professional skills and communication skills in formal and informal situations and hone the required professional ethics.

**Unit- 1:**Factors affecting information and document design, Principles of effective writing , Technical Writing, Grammar and Editing- Technical writing process, Writing drafts and revising, Collaborative writing, technical writing style and language.

**Unit- 2:** Basics of grammar, study of advanced grammar, editing strategies to achieve appropriate technical style. Introduction to advanced technical communication.

**Unit-3:** Communication and Technical Writing- Public speaking, Group discussion, Oral; presentation, Interviews, Graphic presentation, Presentation aids. Writing reports, Email writing, official notes, business letters, memos, progress reports, minutes of meetings, event report.

**Unit- 4:** Self Development and Assessment- Self assessment, Awareness, Perception and Attitudes, Values and belief, Personal goal setting, career planning, self esteem.

**Unit- 5:**Ethics- Business ethics, , Personality Development in social and office settings, netiquettes, Telephone Etiquettes, Engineering ethics, Managing time, Role and responsibility of engineer, Work culture in jobs, Rapid reading, Complex problem solving, Creativity, leadership skills ,cubicle Etiquettes, team building.

**Text Books:**

1. David F. Beer and David Mc Murrey, Guide to writing as an Engineer, John Willey. New York, 2004
2. Diane Hacker, Pocket Style Manual, Bedford Publication, New York, 2003. (ISBN 0312406843)

**Reference Books:**

1. Dale Jung k, Applied Writing for Technicians, McGraw Hill, New York, 2004. (ISBN: 07828357-4)
2. Sharma, R. and Mohan, K. Business Correspondence and Report Writing, TMH New Delhi 2002.
3. Xebec, Presentation Book, TMH New Delhi, 2000. (ISBN 0402213)

**Outcomes:**

- The student will become proficient in LSRW skills.
- They develop formal LSRW skills approach to different situations.
- They hone professional ethics and learn to be proficient formally.

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| **(R17A2185) FLIGHT VEHICLE DESIGN & INSTRUMENTATION LAB** | - | -/3/- | 2 |

**Objectives:**

1. To learn conceptual aircraft design of a typical civil transport and fighter aircraft.
2. To use various tools (software) in flight vehicle design to meet given system requirements (performance and flying qualities).

**LIST OF EXPERIMENTS:**

1. Aircraft Conceptual sketching based on given system requirements. System requirements for a hypothetical transport and fighter aircraft will be formulated and given to the students.
2. Weight estimation of the fighter and transport aircraft defined in experiment number 1.
3. Estimating Wing Loading of transport and fighter aircraft identified in experiment no 1.
4. Wing design and estimation of aerodynamic (lift and Drag) and stability parameters to meet the system requirements defined in experiment number 1.
5. Design of Horizontal and vertical tail and control surfaces to meet system requirements.
6. Design of Crew and passenger cabin for the hypothetical aircraft identified in experiment no one.
7. Engine Sizing and performance estimation.
8. Design of landing gear for transport and military aircraft specified in experiment no 1.
9. Estimation of Nozzle characteristics
10. Demonstration of Hydraulic Test Rig.
11. Demonstration of Pneumatic Test Rig.
12. Estimation of flying qualities of designed aircraft in flight simulation.

**Note:** Minimum 10 experiments should be conducted.

**Software Required:** Microsoft Excel,MATLAB/SIMULINK Programming or Equivalent software

**TEXT BOOKS:**

1. AIRCRAFT DESIGN: A Conceptual Approach AIAA Book ISBN:0-930403-51-7 by Daniel P Raymer
2. MATLA/SIMULINK Users' Guide.

**Outcomes:**

1. Student will be able to develop preliminary design of a given aircraft (transport and fighter aircraft) to meet given performance requirements.
2. Able to use various software tools in design & analysis of aircraft.

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## (R17A2186)PROGRAMMING LANGUAGE FOR MATHEMATICAL MODELS LAB

**Objectives:**

The course should enable the students to:

1. Learn the mathematical programming language to solve problems related to modeling, analysis and design of aerospace vehicle and systems.

**LIST OF EXPERIMENTS:**

1. Introduction to modeling software, matrices.
2. Programs using mathematical functions and plotting functions.
3. Program to solve differential equations.
4. Program to solve system of equations using numerical methods.
5. Program to generate airfoil coordinates.
6. Program to find critical Mach number of an airfoil and to generate drag polar graph.
7. Program to find flow characteristics across shock waves.
8. Program to calculate the performance of turbofan.
9. Program to find the flow characteristics of a CD nozzle.
10. Program to calculate the deflection, bending moment, shear force in a beam.
11. Determine the buckling load of a column with different end conditions.
12. Find out displacements of a uniform bar/stepped bar subjected to mechanical/thermal loads.
13. Programs for modeling and analysis (state space equations) of aircraft longitudinal and lateral motion.

**Note:** Any 10 Experiments can be conducted.

**EQUIPMENT NEEDED**

1. **Computers**: Core 2 duo processor with 1 GB RAM
2. **Software:**MATLAB or SCILABor equivalent software

**REFERENCE BOOKS**

1. MATLAB an Introduction with Applications Fifth Edition AMOS GILAT by WILEY Publications
2. Programming in SCI lab by VINU V DAS NEW AGE INTERNATIONAL PUBLICATIONS
3. Control system tool box in MATLAB, User's Guide.
4. Fundamentals of Aerodynamics by John D Anderson

**Outcomes:**

1. The student should be able to
2. Modeling and analysis of aerospace problems using computer software (MATLAB or others).
3. Design controller for automatic control of aircraft or other aerospace vehicle.

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## (R17A2119)COMPUTATIONAL AERODYNAMICS

**Objectives:**

The course should enable the students to:

- Application of CFD to various engineering problems.
- Understand the physics of mathematical equations governing aerodynamic flows.
- Numerical methods to solve fluid flow problems

**UNIT-I - INTRODUCTION TO COMPUTATIONAL FLUID DYNAMICS**

CFD and its importance as research and design tool, General procedure of CFD, Application of CFD to various Engineering problems. Models of fluid flow- Finite Control Volume, Infinitesimal Fluid Element. substantial derivatives, divergence of Velocity.

**UNIT-II - GOVERNING EQUATIONS OF FLUID DYNAMICS**

The continuity equation, momentum equation, energy equation, physical boundary conditions. Form of Governing equation suited for CFD - Conservation form - shock fitting and shock capturing. Impact of partial differential equations on CFD. Classification of Quasi-Linear Partial differential equation, The Eigen value method, General behavior of different classes of Partial differential equation – elliptic, parabolic and hyperbolic with examples.

**UNIT-III – DISCRETIZATION TECHNIQUES**

Introduction, Finite differences and formulas for first and second derivatives, difference equations, Explicit and implicit approaches. Basis of finite volume method- conditions on the finite volume selections- approaches - Cell-centered and cell-vertex. Definition of finite volume discretization general formulation of a numerical scheme.

**UNIT-IV - GRID GENERATION**

Need for grid generation. Structured grids- Cartesian grids, body fitted structured grids, Multi-block grids - overset grids with applications. Unstructured grids- triangular/ tetrahedral cells, hybrid grids, quadrilateral/hexahedra cells. Grid Generation techniques - Delaunay triangulation, Advance font method. Grid quality parameters.

**UNIT-V – CFD TECHNIQUES**

Lax-Wendroff technique, MacCormack's technique, Crank Nicholson technique, Relaxation technique, Alternating-Direction-Implicit (ADI) Technique. Pressure correction technique Numerical procedures- SIMPLE algorithm. Boundary conditions for the pressure correction method.

**TEXT BOOKS**

1. John .D. Anderson "Computational Fluid Dynamics", McGraw Hill

2. Charles Hirsch "Numerical computation of internal and external flows" Second Edition Butterworth-Heinemann is an imprint of Elsevier

**REFERENCES**

1. Hoffmann, K.A: Computational Fluid Dynamics for Engineers, Engineering Education System, Austin, Tex., 1989

2. J Blazek "Computational Fluid Dynamics: Principles and Applications" Elsevier.

3. Introduction to Computational Fluid Dynamics, Chow CY, John Wiley, 1979

**Outcomes:**

The student should be able to

- Solve differential equations governing fluid flow problems.
- Generation of grid according to geometry of flow.
- Application of CFD techniques for aerospace problems.

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## (R17A2120) AIRFRAME STRUCTURAL DESIGN

**Objectives**:

- To know about detailed structural components present in aircraft
- To acquire the knowledge about the design parameters how why and where they will be used in manufacturing
- Students can acquire the knowledge about the loading conditions done on the structure

**UNIT I**

**INTRODUCTION**

Principal structural components of aircraft. Design requirements- structural integrity, stiffness, service life. Baseline aerodynamic configuration, external loading, weight, operating conditions, conformity to government regulations. Design procedure- structural lay out, structural modeling, design criteria, load estimation, stress analysis, choice of materials, sizing- estimation of strength, stiffness, mass . optimization, trade-off. Structural index- use in design. Idealization of structures, materials- constitutive relations- equilibrium, compatibility conditions significance. Sizing of structural elements of given geometry and loading Analysis of box beams- single cell, multi cell- in bending, shear, torsion- normal stresses, shear flow, deformation- restraint against warping, secondary stresses.

**Unit II**

**FASTENERS AND STRUCTURAL JOINTS**

Fasteners and fittings- role, significance, general design considerations, criteria for allowable strength. Margine of safety. Fastener systems, types, fastener information, dimensions, materials, allowable strength- tensile, shear, bending. Rivets, bolts and screws, nuts-detail design consideration. Fastener selection. fittings- lugs, bushings and bearings-loading design and analysis. Joints – splices, eccentric, gusset, welded, brazed, bonded- types, methods of joining, failure modes. Fatigue design considerations. Stress concentration- causes, methods of reduction. Fastener load distribution and by pass load-severity factor, structural joint life prediction. Shim control and requirement

**UNIT III**

**DESIGN OF WING AND TAIL STRUCTURES**

The wing- role- summary of wing loads, structural components- wing box, leading and trailing edges. Wing layout- location of spars, ailerons and flaps, rib spacing and direction, root rib bulkhead, span wise stiffeners, wing covers- skin-stringer panels, integrally stiffened panels, access holes, attachment of leading edge and trailing edge panels Spars- general rules of spar design. Ribs and bulkheads- rib spacing and arrangement .Wing root joints, carry through structure. Fighter wing design- problems with swept wings Wing box- loads, stress .Wing box,root bulkhead-estimation of loads, stress analysis, design parameters, optimization, sizing, margin of safety.. Leading and trailing edge assembly- control surfaces, flaps- structure. Tail unit- horizontal, vertical tail, elevator, rudder-configuration, structural layout, design considerations.

**UNIT IV**

**DESIGN OF FUSELAGE AND LANDING GEAR**

Function of fuselage- loading, general requirements. Ultimate strength of stiffened cylindrical structure. Principal structural components –skin and stringers, frame and floor beam, pressure bulkheads, wing & fuselage intersection- layout, stress analysis, sizing. Forward fuselage, aft, fuselage structures, fuselage openings- windows, doors- design considerations. Landing gear- purpose, types, general arrangement, loads- design considerations- ground handling, take-off, landing, braking, pavement loading, support structure. stowage and retraction, gear lock- kinematic design Shock absorbers- function, types, components, operation, loads, materials, design. Wheels and brakes, tire selection .

**UNIT V**

**FATIGUE LIFE, DAMAGE TOLERANCE, FAIL SAFE- SAFE DESIGN-WEIGHT CONTROL AND BALANCE**

Catastrophic effects of fatigue failure- examples- modes of failure- design criteria- fatigue stress, fatigue performance, fatigue life. Fatigue design philosophy- fail-safe, safe life. Service behaviour of aircraft structures- effect of physical and load environment design and of detail of fabrication Structural life- methods of estimation- the scatter factor- significanceFail-safe design- the concept, requirements, damage tolerance- estimation of fatigue strength

**Text Books:**

1. NIU.M.C. Airframe Structural Design, second edition, Hongkong Conmlit Press, 1988, ISBN: 962-7128-09-0
2. NIU.M.C. Airframe Stress Analysis And Sizing, second edition, Hongkong Conmlit Press, 1987, ISBN: 962-7128-08-2

**Out comes:**

- Students will be acquainted with design criteria of aircraft component
- Students will be acquainted with manufacturing procedure from the design criteria
- Students will easily design their own components based on the design criteria they have learned

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## (R17A0368) MECHANICAL VIBRATIONS AND STRUCTURAL DYNAMICS

**Objectives:**

- To gain fundamental knowledge on vibration and related systems in the context of Aircraft Structures
- To give Exposure on damped and undamped vibratory systems.
- Basic knowledge on dynamic balancing of rotor system

**UNIT-I**

**FUNDAMENTALS OF VIBRATION:** Brief history of vibration, Importance of the study of vibration, basic concepts of vibration, classification of vibrations, vibration analysis procedure, spring elements, mass or inertia elements, damping elements, harmonic analysis.

**FREE VIBRATION OF SINGLE DEGREE OF FREEDOM SYSTEMS:** Introduction, Free vibration of an undamped translational system, free vibration of an undamped torsional system, Raleigh's energy method, free vibration with viscous damping, free vibration with coulomb damping, free vibration with hysteretic damping.

**UNIT-II**

**HARMONICALLY EXITED VIBRATIONS:** Introduction, Equation of motion, response of an undamped system under harmonic force, Response of a damped system under harmonic force, forced vibration with coulomb damping, forced vibration with hysteresis damping.

**UNIT-III**

**VIBRATION UNDER GENERAL FORCING CONDITIONS:** Introduction, Response under a general periodic force, Two Degree of Freedom Systems: Introduction, Equation of motion for forced vibration, free vibration analysis of an undamped system, Torsional system, forced vibration analysis.

**UNIT-IV**

**MULTIDEGREE OF FREEDOM SYSTEMS:** Introduction, Modeling of Continuous systems as multi degree of freedom systems, Using Newton's second law to derive equations of motion, Determination Of Natural Frequencies and Mode Shapes: Introduction, Dunkerley's formula, Rayleigh's method, Holzers method, Matrix iteration method, Jacobi's method.

**UNIT-V**

**CONTINUOUS SYSTEMS:** Transverse vibration of a spring or a cable, longitudinal vibration of bar or rod, Torsional vibration of a bar or rod, Lateral vibration of beams.

**Text Books:**

1. Mechanical Vibrations by S.S.Rao.
2. Mechanical Vibrations by V.P.Singh

**Reference Books**:

1. Mechanical Vibrations by G.K. Grover
2. Mechanical Vibrations by W.T. Thomson
3. Mechanical vibrations: theory and application to structural dynamics, Michel Géradin, Daniel Rixen, John Wiley, 1997

**Outcomes:**

- Fundamental frequency of Multi- DOF systems can estimate by various methods.
- Effect of unbalance in rotating masses has been studied.
- How to determine eigenvalues and eigenvectors for a vibratory system has analysed

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## (R17A2121) AVIONICS

**Objectives :**

To introduce the students with functioning and principle of operation of various avionics systems including sensors installed on a modern passenger and fighter aircraft.

**UNIT I: INTRODUCTION TO AVIONICS**

Importance and role of Avionics in modern aircraft-systems which interface directly with pilot-aircraft state sensor systems, outside world sensor systems, task automation systems. The avionics equipment and system requirement- environmental, weight, reliability. Standardization and specification of avionics equipment and systems- ARINC and MIL specification. Electrical and optical data bus systems. Integrated modular avionics architectures.

**UNIT II: DISPLAY &MAN-MACHINE INTERACTION AND COMMUNICATION SYSTEM**

Introduction to displays-head-up displays(HUD)-basic principles, Helmet mounted displays, Head tracking systems. Head down displays-Civil cockpit, Military cockpit, Solid state standby display systems, Data fusion in displays-Intelligent display systems. Introduction to voice and data communication systems- HF,VHF,UHF and Satellite communications, Flight data recorders.

**UNIT III: INERTIAL SENSORS, ATTITUDE DERIVATION AND AIR DATA SYSTEMS**

Basic principles of gyroscope and accelerometers. Introduction to optical gyroscope- ring laser gyros-principles. Stable platform system-strap down systems- error in inertial systems and corrections.Air data Information and its use, derivation of Air Data Laws and relationship- altitude-static pressure relationship, variation of ground pressure, Speed of sound, Mach Number, CAS, TAS, Pressure error. Air data sensors and computing

**UNIT IV: NAVIGATION (INS AND GPS) AND LANDING SYSTEM**

Principles of Navigation,Types of Navigation systems-. Inertial Navigation System-Initial alignment and Gyro compassing, Strap down INS computing. Landing System- localizer and glide-slope-marker systems. Categories of ILS.Global navigation satellite systems-GPS-description and basic principles. Integration of GPS and INS, Differential GPS.

**UNIT V: SURVEILLANCE AND AUTO FLIGHT SYSTEMS**

Traffic alert and collision avoidance systems(TCAS)-Enhanced ground proximity warning system.Weather radar. Autopilots-Basic principle, height control, heading control, ILS coupled autopilot control, satellite landing system, speed control and auto throttle. Flight management systems-principles-flight planning-navigation and Guidance, performance prediction and flight path optimization.

**TEXT BOOKS**

1. Collinson, R.P.G., Introduction to Avionics Systems, second edition, Springer,2003,ISBN 978-81-8489-795-1
2. Moir, I. and Seabridge, A., Civil Avionics Systems, AIAA education Series, AIAA, 2002, ISBN 1-56347589-8

**REFERENCE BOOKS**

1. Kayton, M., & Fried, W.R, Avionics Navigation Systems, Wiley, 1997,ISBN 0-471-54795-6Z

**Outcomes:**

**1.** The student would gain understanding of the basic principles of avionics system

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## (R17A2122) AIRCRAFT MAINTENANCE ENGINEERING
## (CORE ELECTIVE - III)

**Objectives:**

- To introduce the knowledge of the maintenance and repair procedures followed for overhaul of aero engines.
- To impart the standards of FAA for documentation.

**UNIT – I**

**NECESAITY & DEVELOPMENT OF MAINTENANCE PROGRAMS**

Definition of maintenance, role of the engineer, role of the mechanic, two types of maintenance, reliability, establishing a maintenance program. Goals and objectives of maintenance. Maintenance steering group(MSG) Approach, process – Oriented maintenance, task- oriented maintenance, current MSG process – MSG – 3, maintenance program documents.

**UNIT – II**

**AVIATION CERTIFICATION REQUIREMENTS AND DOCUMENTATION FOR MAINTENANCE & ENGINEERING**

Aircraft certification, delivery inspection, operator certification, certification of personnel, aviation industry interaction; types of documentation. Manufacturer`s documentation, regulatory documentation. Airline generated documentation. ATA document standards. Objectives of a maintenance program, outline of aviation maintenance program, summary of FAA requirements, additional maintenance program requirements; organization of maintenance and engineering, organization structure, M&E organization chart, general groupings, managerial level functions-technical services, aircraft maintence, overhaul shops, material.

**UNIT – III**

**TECHNICAL SERVICES**

Engineering: makeup of engineering, mechanics and engineers, engineering department functions, engineering order preparation; production planning & control – forecasting, production planning, production control , Organization of PP&C; technical publications- functions of technical publications, airline libraries, control of publications,; Technical Training-organization, training for aviation maintenance, airframe manufacturer`s training courses,

**UNIT – IV**

**MAINTENANCE AND MATERIAL SUPPORT**

Line maintenance(on – aircraft), functions that control maintenance, MCC responsibilities, general line maintenance operations, aircraft logbook, ramp and terminal operations, maintenance crew requirement, morning meeting; Hangar Maintenance (on-aircraft)-organization of hangar maintenance, problem areas in hangar maintenance, maintenance support shops, ground support equipment, typical C – check: Shop data collection; Material support –organization and function of material. Material directorate, M&E support functions

**UNIT – V**

**OVERSIGHT FUNCTIONS, ART & SCIENCE OF TROUBLE SHOOTING**

Quality Assurance , quality audits, ISO 9000 quality standard, technical records, Quality control-quality control organization, FAA and JAA QC inspector qualifications. Basic inspection policies,;

Reliability – definition and types of reliability, elements of a reliability program, Maintenance safety – safety regulations, maintenance safety program, general safety rules, accident and injury reporting . Human factors in maintenance, Trouble shooting, knowledge of malfunctions, Basic concepts of trouble shooting.

**Text Books:**

1. Kinnison, H.A , Aviation Maintenance Manageent, Mc Graw – Hill – 2004.
2. Mc Kinley, J.L. Bent, R.D ., Maintenance and Repair of Aerospace Vehicles, Northrop Institute of Technology, Mc Graw Hill, 1967.

**Reference Books:**

**1.** Friend, C.H., Aircraft maintence Management . Longman, 1992.
**2.** Kroes, M., Watkins. W., and Delp. F. Aircraft Maintenance and Repair, Tata Mc Graw – Hill. 2010

**Outcomes:**

- Ability to maintain and repair the areo engines.
- Ability to prepare aircraft maintenance manuals.
- Ability to know the standards of quality, FAA

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## (R17A2123)FLIGHT SCHEDULING AND OPERATIONS
## (CORE ELECTIVE – III)

**Objectives:**

- Students will able to know about the operations of an airline
- Will analyze how the scheduling is done for flights
- Will know about crew duties and passengers boarding procedures

**UNIT I**

**AIRLINE NETWORK AND AIRCRAFT ROUTING**

Complexity of airline planning, operations and dispatch- need for optimization- Networks-definitions, network flow models shortest path problem, minimum cost flow problem maximum flow problem, multi-commodity problem. Integer programming models- set covering/ partitioning problems, traveling salesman problem- mathematical formulation- decision variables, objective function, constraints. Goal of aircraft routing- maintenance requirements, other constraints Routing cycles, route generators Mathematical models of routing- decision variables, objective functions, alternatives, constraints- flight coverage and aircraft available Example problems and solutions

**UNIT II**

**FLIGHT AND FLEET SCHEDULING**

Significance of flight scheduling. The route system of the airlines- point-to-point flights, hub and spoke flights Schedule construction- operational feasibility, economic viability Route development and flight scheduling process- load factor and frequency Case study. Purpose of fleet assignment. Fleet types, fleet diversity, fleet availability- performance measures Formulation of the fleet assignment problem- decision variables, objective function, constraints, solution Scenario analysis, fleet assignment models.

**UNIT III**

**CREW AND MANPOWER SCHEDULING**

Crew scheduling process- significance Development of crew pairing- pairing generators-mathematical formulation of crew pairing problem- methods of solution. Crew rostering- rostering practices .The crew rostering problem-formulation, solutions. Man power scheduling- modeling, formulation of the problem, solutions.

**UNIT IV**

**GATE ASSIGNMENT AND AIRCRAFT BOARDING STRATEGY**

Gate assignment- significance- the problem- levels of handling-passenger flow, distance matrix-mathematical formulation, solution Common strategies for aircraft boarding process, mathematical model, interferences, model description, aisle interferences.

**UNIT V**

**AIRLINE IRREGULAR OPERATION, DISRUPTION OF SCHEDULE AND RECOVERY COMUTATIONAL COMPLEXITY-CASE STUDIES**

The problem statement, the time band approximation model formulation of the problem the scenarios- solution.Complexity theory, heuristic procedures Case studies of airline operation and scheduling study through simulation modeling- use of available software.

**Text Books:**

1. Bazargan,M.,'Airline Operations and Scheduling'2nd edn., Ashgate Publishing ltd, 2010

**Outcomes:**

- Students can schedule different operations done by airport authorities.
- Students can schedule different operations done by airlines authorities.
- They will be getting a knowledge about the functioning of airports

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## (R17A2124) CIVIL AVIATION RULES AND REGULATIONS (CORE ELECTIVE - III)

**Objectives:**

- civil aircraft rules
- Regulations pertaining to DGCA.
- Various Log Books maintained by civil operators.

**UNIT I: AIRCRAFT RULES AND CATEGORIES OF AME LICENCE**

Knowledge of Aircraft Rules as far as they relate to airworthiness and safety of aircraft. Knowledge of Privileges and responsibilities of the various categories of AME License and approved persons.

**UNIT II: CIVIL AIRWORTHINESS REQUIREMENT**

Knowledge of "Civil Airworthiness Requirements", "Aero nautical Information Circulars (relating to airworthiness)", "Advisory Circulars" and AME Notices issued by DGCA. Knowledge of various mandatory documents like Certificate of Registration, Certificate of Airworthiness, Flight Manual, Export Certificate of Airworthiness. Method of identifying approved material on Aircraft.

**UNIT III: LOG BOOKS AND STORES.**

Knowledge of various documents/ certificates issued to establish airworthiness of Aircraft parts. Various logbooks required to be maintained for Aircraft. Method of maintaining the logbook. Procedure for making entries in logbooks; Journey logbook, Technical logbook etc. Use of schedules, its certification, preservation, Stores, Bonded and Quarantine stores, storage of various aeronautical products including rubber goods, various fluids.

**UNIT IV: CERTIFICATE OF FLIGHT**

Knowledge of various terms such as Certificate of Flight Release, Certificate of Maintenance, Approved Certificates. Condition under which Aircraft is required to be test flown; Certificate to be issued by AME for test flight. Circumstances under which C of A is suspended. Ferry Flight, MEL, CDL. Minimum equipments, instruments required for various types of operation.

**UNIT V: AIRCRAFT MODIICATIONS AND TYPE APPROVAL**

Modification, concession, Airworthiness Directive, Service Bulletins.Approval of Organisation. Documents required to be carried on board.Issue of Type Approval. Registration markings. Human performance and limitations relevant to the duties of an aircraft maintenance engineer, license holder.

**Text books:**

2. Aircraft Act, 1934
3. Aircraft Rules
4. DGCA CAR Section 1 and Section 2

**Reference Books:**

1. Aeronautical information Circular

**Outcomes:**

- Student will have good knowledge of Civil Aircraft rules.
- Student can write civil AME license.
- He will be familiar with procedures for operation and certification of civil aircraft.

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## (R17A0323) CAD/CAM
## (CORE ELECTIVE – IV)

**Objectives:**

- To provide an overview of how computers are being used in design, development of manufacturing plans and manufacture
- To get effective knowledge on the usage of mathematical equations in model development through the computer.
- To understand different functions of computers in design and manufacturing.
- To understand the need for integration of CAD and CAM
- Study of different types of production, Knowledge of group technology (GT).
- Detailed study of Computer Aided Quality Control.

**UNIT–I**

**Introduction:** Computers in Industrial Manufacturing, Product cycle, CAD / CAM Hardware, Basic structure.

**Computer Graphics:** Raster scan graphics coordinate system, database structure for graphics modeling, transformation of geometry, 3D transformations, clipping.

**UNIT–II**

**Geometric modeling:** Requirements, geometric models, geometric construction models, curve representation methods, surface representation methods, modeling facilities desired.

**UNIT–III**

**Numerical control:** NC, NC modes, NC elements, NC machine tools, structure of CNC machine tools, features of Machining center, turning center, CNC Part Programming fundamentals, manual part programming methods, Computer Aided Part Programming.

**UNIT–IV**

**Group Technology:** Part family, coding and classification, production flow analysis, advantages and limitations, Computer Aided Processes Planning, Retrieval type and Generative type.

**UNIT–V**

**Computer Aided Quality Control:** Terminology in quality control, the computer in QC, contact inspection methods, noncontact inspection methods-optical, noncontact inspection methods-nonoptical, computer aided testing, integration of CAQC with CAD/CAM.

**Computer integrated manufacturing systems:** Types of Manufacturing systems, Machine tools and related equipment, material handling systems, computer control systems, human labor in the manufacturing systems, CIMS benefits.

**TEXT BOOKS:**

1. CAD / CAM Theory and Practice / Ibrahim Zeid / TMH Publishers
2. CAD / CAM /A Zimmers & P.Groover/PE/PHI Publishers
3. Automation, Production systems & Computer integrated Manufacturing/ Groover/ Pearson Education

**REFERENCE BOOKS:**

1. CAD / CAM / CIM / Radhakrishnan and Subramanian / New Age Publishers
2. Principles of Computer Aided Design and Manufacturing / Farid Amirouche / Pearson Edu
3. CAD/CAM: Concepts and Applications/Alavala/ PHI Publishers Computer Numerical Control Concepts and programming / Warren S Seames / Thomson Publishers
4. CAD / CAM – P N RAO McGraw Hill Publications

**OUTCOMES:** Student will be able to:

- Understand the applications of computer in the design and manufacturing.
- Understand and develop the Mathematical representations of curves used in geometric construction.
- Understand the concept and working principle of NC, CNC, and DNC and can develop a program using G and M codes.
- Make use of GT, FMS and CAPP concepts and are able to apply these concepts in bringing the benefits of mass production in real working environment.
- Plan the computer integrated production planning in working environment and able to analyze the quality of a product through computer aided quality control

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## (R17A2125) HYPERSONIC AERODYNAMICS
## (CORE ELECTIVE – IV)

**Objectives:**

The course should enable the students to:

- Formulate and apply appropriate aerodynamic models to predict the forces on and performance of realistic three-dimensional configurations in hypersonic flows.
- Understand about current aerospace problems like Aerodynamic heating.
- Know about experimental methods for hypersonic flows.

**UNIT-I - FUNDAMENTALS OF HYPERSONIC FLOWS AND APPROXIMATIONS**

Importance/properties of hypersonic flow-Basic equations boundary conditions for inviscid flow, concept of equilibrium and nonequilibrium flows, transport properties. Basic conservation equations and species continuity equation, hypersonic shock and expansion relations, hypersonic similarity parameters. Newtonian, modified Newtonian.

**UNIT-II - HYPERSONIC SMALL DISTURBANCE THEORY**

Flow over a wedge and a cone- Blast wave analogy,-Newtonian impact theory- Busemann centrifugal correction -Shock expansion method- Tangent cone and tangent wedge methods Pressure distribution in separated regions and in reacting flows.

**UNIT-III - BASIC ASPECTS OF HYPERSONIC VISCOUS FLOWS AND AERODYNAMIC HEATING**

Introduction to viscous flow and pressure interactions over flat plate- Boundary layers Reference temperature method-Entropy layer effects on aerodynamic heating.

**UNIT-IV - HYPERSONIC VEHICLE DESIGN**

Supersonic Inlet design Strong and weak interactions-Shock wave/ boundary layer interactions Concept of SERN, Design aspects of various Hypersonic vehicles like X-43, HSTDV, Hyshot

**UNIT-V - EXPERIMENTAL METHODS FOR HYPERSONIC FLOWS:**

Arc Jet facilities, Impulse facilities, hypersonic wind tunnels, shock tunnels, gun tunnels, freepiston shock tunnels, expansion tubes etc. Flow visualization techniques, model testing.

**Text Books**

1. “Hypersonic and High Temperature Gas Dynamics”, Anderson, J.D,McGraw-Hill, 1989.
2. “Hypersonic Aerothermodynamics”, Bertin, J.J., AIAA, 1994.

**Reference Books:**

1. “Introduction to Hypersonic flow”, Cherni C G, Academic Press,1961
2. “Hypersonic Flow Theory”, Hayes W D and Problein R F, Academic Press 1959
3. “Elements of Hypersonic Aerodynamics”, Cox R N and Crabtree L P, London 1965

**Outcomes:**

The student should be able to

- Estimation of aerodynamic characteristics of different geometries in hypersonic conditions.
- Application aerodynamic theories in the design hypersonic vehicles.
- Validation of experimental results with analytical results.

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## (R17A2126) ANALYSIS OF COMPOSITE STRUCTURES

## (CORE ELECTIVE – IV)

**UNIT-I**

**Properties of Constituent Materials and Composite Laminates:** Introduction to laminated composite plates, Mechanical Properties of constituent materials such as Matrix and Filaments of different types.

Netting analysis of composite materials, determination of properties of laminates with fibers and matrices.

**UNIT-II**

Stress-Strain relations of Isotropic, Orthotropic and Anisotropic materials, transformation of material properties for arbitrary orientation of fibers.

**UNIT-III**

Methods of Analysis: Mechanics of materials approach to determine Young‘s modulus, Shear Modulus and Poisson‘s ratio, brief mention of elasticity approach and Macro mechanics of laminates

Anisotropic elasticity, stress –strain relations in material coordinates - Transformation of geometric axes, strength concepts, Biaxial strength theories, Maximum stress and Maximum strain.

**UNIT-IV**

Analysis of laminated plates: Classical plate theory, Classical lamination theory – Special cases of single layer, symmetric, anti-symmetric & unsymmetric composites with cross ply, angle ply layup. Deflection analysis of laminated plates, Analysis laminated beam and plates.

**UNIT-V**

Shear deformation theories for composite laminated beams, plates-first, second and third order theories, nth Order theory.

Buckling analysis of laminated composite plates with different orientation of fibers, Tsai-wu criteria and Tsai – Hill Criteria.

**Text Books**

1. Agarwal B. D., Broutman. L. J., *Analysis and performance of fiber composites,* John wiley and sons-New York, 1980.

2. Lubin. G, *Hand Book on Advanced Plastics and Fiber Glass,* Von. Nostrand, Reinhold Co. New York, 1989.

**REFERENCES**

1. Gupta, L., *Advanced composite Materials,* Himalayan Books, New Delhi, 1998.
2. Jones, R. M., *Mechanics of Composite Materials,* McGrawHill, Kogakusha, ltd. Tokyo.
3. Reddy J.N., Mechanics of Composite Materials.

**Outcome:** The students will be able to select appropriate composite materials and analyzes for different elastic properties by using various methods.

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## (R17A2187)COMPUTATIONAL AERODYNAMICS LAB

**Objectives:**

- To develop an understanding for the major theories, approaches and methodologies used in CFD.
- To build up the skills in the actual implementation of CFD methods (e.g. boundary conditions, turbulence modeling etc.) in using commercial CFD codes.
- To gain experience in the application of CFD analysis to real engineering designs.

**LIST OF EXPERIMENTS:**

1. Numerical simulation of Flow over an airfoil using commercial software
2. Numerical simulation of Supersonic flow over a wedge using commercial Software
3. Numerical simulation of Flat plate boundary layer using commercial software
4. Numerical simulation of Laminar flow through pipe using commercial software
5. Numerical simulation of Flow past cylinder using commercial software
6. Numerical simulation of flow through nozzle using commercial software
7. Numerical simulation of flow over wing using commercial software
8. Numerical simulation of combustion using commercial software
9. Solution for the one dimensional wave equations using explicit method of lax using finite Difference method (code development)
10. Solution for the one dimensional heat conduction equation using explicit method using finite difference method (code development)
11. Generation of the Algebraic Grid (code development)
12. Generation of the Elliptic Grids (code development)

**Note:** Any 10 Experiments can be conducted.

**Equipment Needed:**

1. **Computers**: Core 2 duo processor with 1 GB RAM
2. **Softwares:** Matlab or scilab and Ansys or equivalent softwares

**Reference Books:**

1. MATLAB an Introduction with Applications Fifth Edition AMOS GILAT by WILEY Publications
2. Programming in SCI lab by VINU V DAS New Age International Publications
3. ANSYS FLUENT and CFX Tutorials

**Outcomes:**

- Students will develop a better intuition of Aerodynamics more quickly than is possible with traditional analytical approaches.
- Ability to undertake problem identification, formulation and solution and apply knowledge of basic science and engineering fundamentals.
- Developing a geometrical model of the flow, applying appropriate boundary conditions, specifying solution parameters, and visualizing and analyzing the results.

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## (R17A2188)COMPUTATIONAL STRUCTURES LAB

**Objectives:**

- To obtain an understanding of the fundamental theory of the FEA method;
- To understand the use of the basic finite elements for structural applications using truss, beam, frame, and plane elements; and
- To understand the application and use of the FE method for Aerospace problems.

**LIST OF EXPERIMENTS:-**

1. Stress Analysis of Thickened Thin Walled Open Section Panel.
2. Torsional Strength and Shear Force of Thin Walled Closed Section Panel.
3. Computational Analysis of Rectangular Stiffened Panel.
4. Static Analysis of Cantilever Beam.
5. Computational Analysis of Truss Structure.
6. Computational Analysis of Landing Gear.
7. Computational Analysis of Nose Cone.
8. Computational Analysis of Tapered Wing Structure.
9. Computational Analysis of Fuselage Structure
10. Computational Analysis of Nozzle.

**Note:** Total 10 experiments are to be conducted.

**Equipment Needed:**

1. **Computers**: Core 2 duo processor with 1 GB RAM
13. **Softwares:** Ansys or NASTRAN or equivalent

**Reference Books:**

1. Aircraft STRUCTURES for Engineering Students 4th Edition by THG MEGHSON
2. Finite Element Simulations with ANSYS by Huei-Huang Lee

**Outcomes:**

- The ability to create models for trusses, frames, plate structures, machine parts, and components using ANSYS general-purpose software;
- To demonstrate the ability to evaluate and interpret FEA analysis results for design and evaluation purposes;
- To develop a basic understanding of the limitations of the FE method and understand the possible error sources in its use.

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## (R17A2127) HELICOPTER ENGINEERING
## (CORE ELECTIVE - V)

**Objectives:**

- To understand the basic concepts of Helicopter flying, different configurations
- To understand the difference between Aircraft and Helicopter principles, mechanisms
- To understand the principles, theories and stability and control pertaining to it

**UNIT I**

**INTRODUCTION.**

Historical Development of Helicopters, Helicopter Configuration, Control Requirements, Types of Rotor Systems, Basic Power Requirements.

**UNIT II**

**INTRODUCTION TO HOVERING THEORY.**

Momentum Theory, Blade Element Theory, Combined Blade Element and Momentum theories for non-uniform inflow calculation, Ideal Rotor vs. Optimum Rotor.

**UNIT III**

**VERTICAL FLIGHT.**

Various flow states of Rotor, Autorotation in Vertical Descent, Ground Flight.

**UNIT IV**

**FORWARD FLIGHT.**

Momentum Theory, Variable Inflow Models, Blade Element Theory, Rotor Reference Planes, Hub Loads, Power variation with forward speed, Rotor Blade flapping Motion: Simple Model.

**UNIT V**

**HELICOPTER TRIM AND STABILITY.**

Equilibrium condition of helicopter, Trim analysis, Basics of helicopter stability.

**Text Books:**

1. Gessow.A and Meyers G.C. Aerodynamics of Helicopter,Macmillan& co ., N.Y.1987
2. Johnson W Helicopter theory, Princeton University pres 1980
3. MccormickB.W.Aerodynamics,Aeronautics& Flight mechanics ,John Wiley ,1995
4. Gupta. L Helicopter Engineering, Himalayan Books 1996
5. Bramwell A.R.S Helicopter Dynamics Edward Arnold Publications London 1976
6. Stepniewski W.Z Rotary Rotary wing Aerodynamics Vol 1 & 2 Dover publications 1984

**Outcomes:**

- The student will be able to identify the key differences between Aircraft and Helicopter
- The analyze the basic concepts, theories regarding forward and hovering Flight
- The significance of Stability and Control in different conditions

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## (R17A2128) ADVANCED COMPUTATIONAL AERODYNAMICS (CORE ELECTIVE – V)

**Objectives:**

- Application of panel methods to find aerodynamic characteristics of flow over geometries.
- Understand method of characteristics governing aerodynamic flows.
- Numerical methods to solve fluid flow problems

**UNIT - I**

**PANEL METHODS**

Introduction to panel method, Basic aspects of uniform source and vortex flows, Source panel method – Non-lifting flows over arbitrary two-dimensional bodies. Vortex panel method – Lifting flows over arbitrary two-dimensional bodies.

**UNIT – II**

**METHOD OF CHARACTERISTICS**

Introduction to numerical techniques for steady supersonic flows, Philosophy of method of characteristics. Determination of characteristic lines – Two-dimensional irrotational flow. Determination of the compatibility equation and unit processes. Regions of influence and Domains of dependence.

**UNIT – III**

**TRANSONIC RELAXATION METHOD**

Theoretical aspects of transonic flows, Small Perturbation flows - Transonic small perturbation equations - Central and Backward difference schemes, Shock capturing vs. shock fitting techniques: Conservation vs. non conservation forms of governing equations, Line relaxation techniques.

**UNIT - IV**

**BOUNDARY LAYER EQUATION**

Introduction to boundary layer equations and their solutions. Description of the boundary layer equations. Transformation of boundary layer equations and the numerical solution method. Choice of discretization model and the generalized Crank- Nicholson Scheme. Discretization of boundary layer equations and illustration of solutions of a tridiagonal system of linear algebraic equations.

**UNIT - V**

**TIME DEPENDENT METHODS**

Stability of Solution, Explicit time dependent methods - Euler, Backward Euler, One step trapezoidal, Backward differencing, methods, Leap Frog method.

**Text Books:**

1. John .D. Anderson “Computational Fluid Dynamics”, McGraw Hill
2. Anderson, Dale A., John C. Tanhill and Richard H.P Letcher, “Computational Fluid Mechanics and Heat transfer”, McGraw Hill, New York 1984, Volumes I & II.

**Reference Books:**

1. Hoffmann, K.A: Computational Fluid Dynamics for Engineers, Engineering Education System, Austin, Tex., 1989
2. Kreyszig, E., Advanced Engineering Mathematics, Wiley, New York
3. Introduction to Computational Fluid Dynamics, Chow CY, John Wiley, 1979
4. Bose, T.K., Computation Fluid Dynamics, Wiley Eastern Ltd., 1988.

**Outcomes:**

- Solve differential equations governing fluid flow problems.
- CFD Techniques for boundary layer problems.
- Application of Time dependent techniques for transient aerospace problems.

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## (R17A0321) HEAT TRANSFER

***Note:** Heat and Mass Transfer data books are permitted

**Objectives:**

- The objective of this subject is to provide knowledge about Heat transfer through conduction, convection and radiation.
- Student able to learn different modes of Heat Transfer.
- Student able to learn about the dimensional analysis .

**UNIT-I**

**Introduction**: Basic modes of heat transfer- Rate equations- Generalized heat conduction equation in Cartesian, Cylindrical and Spherical coordinate systems. Steady state heat conduction solution for plain and composite slabs, cylinders and spheres- Critical thickness of insulation- Heat conduction through fins of uniform and variable cross section- Fin effectiveness and efficiency.

**Unsteady state Heat Transfer conduction**- Transient heat conduction- Lumped system analysis, and use of Heisler charts.

**UNIT-II**

**Convection**: Dimensional analysis- Continuity, momentum and energy equations - Boundary layer theory concepts- Free, and Forced convection- Approximate solution of the boundary layer equations- Laminar and turbulent heat transfer correlation- Application of dimensional analysis to free and forced convection problems- Empirical correlation.

**UNIT-III**

**Radiation**: Black body radiation- radiation field, Kirchhoff’s laws- shape factor- Stefan Boltzman equation- Heat radiation through absorbing media- Radiant heat exchange, parallel and perpendicular surfaces- Radiation shields.

**UNIT-IV**

**Heat Exchangers**: Types of heat exchangers- Parallel flow- Counter flow- Cross flow heat exchangers- Overall heat transfer coefficient- LMTD and NTU methods- Fouling in heat exchangers- Heat exchangers with phase change.

**Boiling and Condensation**: Different regimes of boiling- Nucleate, Transition and Film boiling. Condensation: Laminar film condensation- Nusselt's theory- Condensation on vertical flat plate and horizontal tubes- Drop wise condensation.

**UNIT-V**

**Mass Transfer**: Conservation laws and constitutive equations- Isothermal equimass, Equimolal diffusion- Fick's law of diffusion- diffusion of gases, Liquids- Mass transfer coefficient.

**TEXT BOOKS**:

1. Heat Transfer, by J.P.Holman, Int.Student edition, McGraw Hill Book Company.
2. Fundamentals of Heat and Mass Transfer- Sachdeva.
3. Heat transfer by Arora and Domakundwar, Dhanpat Rai & sons, New Delhi..

**REFERENCE BOOKS**:

1. Heat Transfer by Sukhatme.
2. Heat and Mass Transfer by R.K.Rajput, Laxmi Publications, New Delhi.
3. Heat transfer by Yunus A Cengel.

**OUTCOMES:**

- Knowledge and understanding how heat and energy is transferred between the elements of a system for different configurations.
- Solve problems involving one or more modes of heat transfer**.**
- Student gets the exposure of different modes of Heat Transfer.

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## (R17A2129)AEROELASTICITY
## (CORE ELECTIVE – VI)

**Objectives:**

The course should enable the students to:

- To elucidate the aero elastic Phenomena and formulations
- Find solution techniques for aerospace vehicles in flight and to incorporate the spin off benefits.
- Understand the application of aero elasticity and its effect on aircraft components.

**UNIT-I INTRODUCTION TO AEROELASTICITY**

Definition and historical background, Static and dynamic aeroelastic phenomenon, integretion of aerodynamic, elastic and inertia forces, influence of aeroelstic phenomenon on air craft design, Comparison of critical speeds.

**UNIT-II DIVERGENCE OF LIFTING SURFACE**

The phenomenon of divergence, divergence of 2-D wing section, divergence of an idealized cantilever wing, solution based on semi-rigid assumptions, solution to generalized co-ordinates Method of successive approximation, use of Numerical Methods.

**UNIT-III STEADY STATE AERO-ELASTICITY PROBLEMS IN GENERAL**

Loss and reversal of aileron Control: 2D case, aileron reversal general case. Lift distribution on a rigid and elastic wing. Effect on Static Longitudinal stability of airplane.

**UNIT-IV INTRODUCTION TO FLUTTER AND BUFFETING**

The phenomenon of flutter, flutter of a cantilever wing. Approximate determination of critical speed by Galerkin's Method, buffeting and stall flutter.

**UNIT-V NON AERONAUTICAL PROBLEMS**

Some typical example in civil engineering, Flow around an oscillating circular cylinder applications to H-shaped sections, Prevention of aero-elastic instabilities.

**Text Books:**

1. Fung Y.C. an introduction to the Theory of Aeroelasticity John Wiley and Sons, New York, 1985.
2. Bisphlinghoft R. C. Ashlay. H and Halfmam. R Aero-elasticity – Addition Werley Publishing Company.
3. Scnlan R.H. and Rosenbaum. R Introduction to the study of Aircraft Vibrations and Flutter McGraw Company New York 1981.

**Reference Books:**

Bisphlinghoft R. C. and Ashely, Principles of Aeroelasticity Johnwiley Company. 1998.

**Outcomes:**

The student should be able to:

- Understand the formation of Aileron reversal, flutter and wing divergence.
- Control aero elastic problems on fight stability and control.
- Application Aero elastic theories to Non aeronautical problems.

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## (R17A0370)FATIGUE AND FRACTURE MECHANICS
## (CORE ELECTIVE – VI)

**Objectives:**

- To study the concepts of estimation of the endurance and failure mechanism of components
- Failure investigation has been based on Fatigue and fracture mechanics.
- To predict the critical loads that will cause catastrophic failure in a structure.

**UNIT I**

**FATIGUE OF STRUCTURES:** S.N. curves - Endurance limits - Effect of mean stress, Goodman, Gerber and Soderberg relations and diagrams - Notches and stress concentrations - Neuber's stress concentration factors - Plastic stress concentration factors - Notched S.N. curves.

**UNIT II**

**STATISTICAL ASPECTS OF FATIGUE BEHAVIOUR:** Low cycle and high cycle fatigue - Coffin - Manson's relation - Transition life - cyclic strain hardening and softening - Analysis of load histories - Cycle counting techniques –Cumulative damage - Miner's theory - Other theories.

**UNIT III**

**PHYSICAL ASPECTS OF FATIGUE:** Phase in fatigue life - Crack initiation - Crack growth - Final Fracture - Dislocations – fatigue fracture surfaces.

**UNIT IV**

**FRACTURE MECHANICS:** Strength of cracked bodies - Potential energy and surface energy - Griffith's theory - Irwin - Orwin extension of Griffith's theory to ductile materials - stress analysis of cracked bodies – Effect of thickness on fracture toughness - stress intensity factors for typical geometries.

**UNIT V**

**FATIGUE DESIGN AND TESTINIG:** Safe life and Fail-safe design philosophies - Importance of Fracture Mechanics in aerospace structures - Applica¬tion to composite materials and structures.

**Text Books:**

1. Elements of fracture mechanics by Prasanth Kumar –– Wheeter publication, 1999.
2. Fatigue of aircraft structure by Barrois W, Ripely, E.L., Pergamon press. Oxford, 1913.

**Reference Books:**

1. Mechanics of fracture Vol. I by Sin, C.G., Sijthoff and w Noordhoff International Publishing Co., Netherlands, 1919.

2. Fundamentals of Fracture Mechanics by Knott, J.F., Buterworth & Co., Ltd., London, 1913

**Outcomes:**

- Application of fracture mechanics to engineering issues.
- The subjects covered by this special collection include the fatigue life of structural elements.
- Exposure on nonlinear fracture-mechanics parameters, such as the J and T integrals.

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## (R17A2130) AIRPORT MANAGEMENT
## (CORE ELECTIVE – VI)

**Objectives:**
To understand and acquire a sound understanding on basic management aspect of airport and airlines system such as airports layout, air traffic control, landing procedure, scheduling, flight planning and other economic and commercial activities.

**UNIT-I**
**AIRPORTS AND AIRPORT SYSTEMS**
Introduction-Airport Management on an international level- Rules that govern airport management-Airport ownership and organization-Airport organization chart-Airport manager and public relations
**THE AIRFIELD**
Components of an airport-The airfield-Navigation aids(NAVAIDS)located on airfields-Air traffic Control and surveillance facilities located on the airfield-Weather reporting facilities located on airfields-security infrastructure on airfields

**UNIT-II**
**AIRPORT TERMINALS AND GROUND ACCESS**
Historical development of airport terminals-Components of airport terminal-Airport ground access
**AIRPORT SECURITY**
Transportation Security Administration-Security at commercial service airports-Security at general aviation airports

**UNIT-III**
**AIRPORT OPERATIONS MANAGEMENT**
Pavement management-Aircraft rescue and fire fighting(ARFF)=Snow and ice control-Safety inspection programs-Bird and wildlife hazard management

**UNIT-IV**
**AIRPORT FINANCIAL MANAGEMENT**
Airport financial accounting-Revenue strategies at commercial airports-Pricing of airport facilities and services-Variation in the sources of operating revenues-Rise in airport financial burdens-Airport funding-Airport financing-Private investment-Sale of the airport

**UNIT-V**
**AIRPORT CAPACITY AND DELAY**
Defining capacity-Factors affecting capacity and delay-estimating capacity-Simulation Models-Defining delay-Estimating delay-Analytical estimates of delay: queuing diagram-Approaches to reducing delay-administrative and demand management

**TEXT BOOK**

Alexander T. Wells and Seth B. Young, “Airport Planning and Management”, (Fifth Edition), McGraw-Hill,2004

**REFERENCE BOOKS**

1. Norman Ashford and H. P. Martin Stanton, “Airport Operations”, Mc-Graw-Hill, 1999
2. Anne Graham, “Managing Airports: An International Perspective”, Butterworth-Heinemann, 2003
3. Rigas Doganis, “The Airport Business”, Routledge, 1992
4.Richard D Neufville, “Airport Systems: Planning, Design and Management”, McGraw-Hill, 2002

**Outcomes:**

- The student can get an broad overview and functioning of the airports. It focuses on the underlying marketing, financial, operational and competitive factors that influence airline viability.
- The student can investigate how the requirements for the establishment of new airports according to the demand