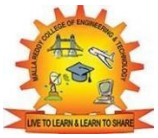

MALLA REDDY COLLEGE OF ENGINEERING & TECHNOLOGY
(Autonomous Institution – UGC, Govt. of India)
Sponsored by CMR Educational Society
(Affiliated to JNTU, Hyderabad, Approved by AICTE - Accredited by NBA & NAAC – 'A' Grade - ISO 9001:2015 Certified)
Maisammaguda, Dhulapally (Post Via. Kompally), Secunderabad – 500100, Telangana State, India.
Contact Number: 040-23792146/64634237, E-Mail ID: mrcet2004@gmail.com, website: www.mrcet.ac.in

BACHELOR OF TECHNOLOGY
AERONAUTICAL ENGINEERING

COURSE STRUCTURE & SYLLABUS
(Batches admitted from the academic year 2018 - 2019)

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 the 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 with principal of the college, without presumptions, to avoid unwanted subsequent inconveniences and embarrassments. The cooperation of all the stakeholders 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)

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.
Contact Number: 040-23792146/64634237, E-Mail ID: mrcet2004@gmail.com, website: www.mrcet.ac.in

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

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 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 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 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 To educate the students to disseminate research findings with good soft skills and become a successful entrepreneur.
PEO5: HUMAN RESOURCE DEVELOPMENT 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.

MALLA REDDY COLLEGE OF ENGINEERING AND TECHNOLOGY

AERONAUTICAL ENGINEERING

COURSE STRUCTURE

I Year B. Tech – I Semester

S.NO	SUBJECT CODE	SUBJECT	L	T	P	C	MAX. MARKS	
							INT	EXT
1	**R18A0001**	English	2			2	30	70
2	**R18A0021**	Mathematics – I	3	1		4	30	70
3	**R18A0013**	Engineering Chemistry	3			3	30	70
4	**R18A0261**	Basic Electrical and Electronics Engineering	3			3	30	70
5	**R18A0501**	Programming for Problem Solving	3			3	30	70
6	**R18A0082**	Engineering/IT Workshop	-		4	2	30	70
7	**R18A0581**	Programming for Problem Solving Lab	-		3	1.5	30	70
8	**R18A0289**	Basic Electrical and Electronics Engineering Lab	-		3	1.5	30	70
9*	**R18A0003**	Human Values & Societal Perspectives	2		-	0	100	-
		TOTAL	**16**	**1**	**10**	**20**	**340**	**560**

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

I Year B. Tech – II Semester

S.NO	SUBJECT CODE	SUBJECT	L	T	P	C	MAX. MARKS	
							INT	EXT
1	**R18A0002**	Professional English	2			2	30	70
2	**R18A0022**	Mathematics – II	3	1		4	30	70
3	**R18A0012**	Engineering Physics	3			3	30	70
4	**R18A0502**	Object Oriented Programming	3			3	30	70
5	**R18A0302**	Engineering Graphics	1		4	3	30	70
6	**R18A0083**	Engineering Physics/Chemistry Lab	-		4	2	30	70
7	**R18A0582**	Object Oriented Programming Lab	-		3	1.5	30	70
8	**R18A0081**	English Language Communication Skills Lab	-		3	1.5	30	70
		TOTAL	**12**	**1**	**14**	**20**	**240**	**560**

B. Tech (ANE) – III Semester (II Year – I Semester)

(5 Professional core courses+1 Eng Science course+1 mandatory course+2 Labs)

S.NO	SUBJECT CODE	SUBJECT	L	T	P	C	MAX. MARKS	
							INT	EXT
1	**R18A2101**	Mechanics of Fluids	3	0	0	**3**	**30**	**70**
2	**R18A2102**	Applied Mechanics	3	0	0	**3**	**30**	**70**
3	**R18A2103**	Engineering Thermodynamics	2	1	0	**3**	**30**	**70**
4	**R18A2104**	Introduction to Aeronautical Engineering	3	0	0	**3**	**30**	**70**
5	**R18A2105**	Aircraft Production Technology	3	0	0	**3**	**30**	**70**
6	**R18A2106**	Aerospace materials and composites	3	0	0	**3**	**30**	**70**
7	**R18A2181**	Aircraft Production Technology Lab	0	0	3	**1.5**	**30**	**70**
8	**R18A2182**	Aircraft Engineering Drawing Lab	0	0	3	**1.5**	**30**	**70**
9	**R18A0014**	*Environmental Sciences	2	0		**-**	**100**	**-**
		TOTAL	**21**	**1**	**6**	**21**	**340**	**560**

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

B. Tech (ANE) – IV Semester (II Year – II Semester)

(4 Professional core courses+ 1 Basic Science Course+1 Open Elective+ 1 Mandatory Course+2 Labs)

S.NO	SUBJECT CODE	SUBJECT	L	T	P	C	MAX. MARKS	
							INT	EXT
1	**R18A2107**	Aerodynamics	2	1	0	**3**	**30**	**70**
2	**R18A2108**	Mechanics of Solids	2	1	0	**3**	**30**	**70**
3	**R18A2109**	Air Breathing Propulsion	3	0	0	**3**	**30**	**70**
4	**R18A2110**	Aircraft Performance	3	0	0	**3**	**30**	**70**
5	**R18A0024**	Probability and Statistics	3	0	0	**3**	**30**	**70**
6	**OE – I**	**OPEN ELECTIVE – I**	3	0	0	**3**	**30**	**70**
7	**R18A0391**	Mechanics of Solids and Mechanics of Fluids Lab	0	0	3	**1.5**	**30**	**70**
8	**R18A0392**	CAD Lab	0	0	3	**1.5**	**30**	**70**
9	**R18A0004** **R18A0005**	* Foreign Language: French **or** * Foreign Language German	2	-	-	**0**	**100**	**-**
		TOTAL	**18**	**2**	**6**	**21**	**340**	**560**

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

OPEN ELECTIVE - I

1. **R18A0451**	Digital Electronics	4. **R18A0351**	Intellectual PropertyRights
2. R18A0551	Database Systems	5. **R18A0352**	Green Energy Systems
3. R18A0553	Data Structures Using Python	6. R18A0555	Data Visualization

B. Tech (ANE) – V Semester (III Year – I Semester)

(3 Professional core courses+1 H & S course+1 Professional Elective course+1 Open Elective+2 Labs)

S.NO	SUBJECT CODE	SUBJECT	L	T	P	C	MAX. MARKS	
							INT	EXT
1	**R18A2111**	Aircraft Vehicle Structures	2	1	0	3	**30**	**70**
2	**R18A2112**	Aircraft Stability and Control	3	0	0	3	**30**	**70**
3	**R18A0061**	Managerial Economics and Financial Analysis	3	0	0	3	**30**	**70**
4	**R18A2113**	High Speed Aerodynamics	2	1	0	3	**30**	**70**
5	**R18A2131** **R18A2132** **R18A2133**	**PROFESSIONAL ELECTIVE – I** 1. Introduction to Space Technology 2. Mechanisms and Machine Design 3. Wind Tunnel Techniques	3	0	0	3	**30**	**70**
6	**OE – II**	**OPEN ELECTIVE – II**	3	0	0	3	**30**	**70**
7	**R18A2183**	Aerodynamics and Propulsion Lab	0	0	3	1.5	**30**	**70**
8	**R18A2184**	Aircraft Structures Lab	0	0	3	1.5	**30**	**70**
9	**R18A0521**	*Cyber Security	2	0	0	0	**50**	**-**
		TOTAL	**18**	**2**	**6**	**21**	**340**	**560**

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

OPEN ELECTIVE - II

1. **R18A1251** Management Information Systems
2. **R18A0552** Introduction to JAVA Programming
3. **R18A1252** Software Project Management
4. **R18A0353** Enterprise Resource Planning
5. **R18A0354** Nano Technology

B. Tech (ANE) – VI Semester (III Year – II Semester)

(3 Professional Core courses+ 1 Professional Elective course+ 1 Open Elective course+2 Labs)

S.NO	SUBJECT CODE	SUBJECT	L	T	P	C	MAX. MARKS	
							INT	EXT
1	**R18A2114**	Finite Element Analysis	2	1	0	3	**30**	**70**
2	**R18A2115**	Aerospace Propulsion Systems	3	0	0	3	**30**	**70**
3	**R18A1205**	Artificial Intelligence	2	1	0	3	**30**	**70**
4	**R18A2134** **R18A2135** **R18A2136**	**PROFESSIONAL ELECTIVE – II** 1. Flight Scheduling Operations 2. Air Transportation systems 3. Airframe Structural Design	3	0	0	3	**30**	**70**
5	**OE – III**	**OPEN ELECTIVE – III**	3	0	0	3	**30**	**70**
6	**R18A2185**	Computational Structures Lab	0	0	3	1.5	**30**	**70**
7	**R18A2186**	Programming Language for Mathematical Models Lab	0	0	3	1.5	**30**	**70**
8	**R18A2190**	Mini Project	0	0	6	3	**30**	**70**
9	**R18A0006**	*Technical Writing	0	0	0	0	**100**	**-**
		TOTAL	**16**	**2**	**12**	**21**	**340**	**560**

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

OPEN ELECTIVE – III

1. **R18A0452** Robotics & Automation
2. **R18A0453** IOT and Application
3. **R18A1253** Software Testing Techniques
4. **R18A0355** Total Quality Management
5. **R18A0251** Electrical systems & applications
6. **R18A0554** **O**perating system concepts

B. Tech (ANE) – VII Semester (IV Year – I Semester)
(4 Professional core courses+ 1 Professional Elective courses+ 2 Labs)

S.NO	SUBJECT CODE	SUBJECT	L	T	P	C	MAX. MARKS	
							INT	EXT
1	**R18A2116**	Computational Aerodynamics	2	1	0	3	**30**	**70**
2	**R18A2117**	Mechanical Vibrations	2	1	0	3	**30**	**70**
3	**R18A2118**	Flight Vehicle Design	3	0	0	3	**30**	**70**
4	**R18A2119**	Avionics	3	0	0	3	**30**	**70**
5	**R18A2137** **R18A2138** **R18A0318**	**PROFESSIONAL ELECTIVE – III** 1. CAD/CAM 2. Aircraft systems 3. Heat Transfer	3	0	0	3	**30**	**70**
6	**R18A2187**	Computational Aerodynamics Lab	0	0	3	1.5	**30**	**70**
7	**R18A2188**	Flight Vehicle Design Lab	0	0	3	1.5	**30**	**70**
8	**R18A2191**	**Project – I**	-	-	6	3	**30**	**70**
		TOTAL	**13**	**2**	**12**	**21**	**240**	**560**

B. Tech (ANE) – VIII Semester (IV Year – II Semester)
(1 Professional Core Course + 2 Professional Elective Courses + Major Project)

S.NO	SUBJECT CODE	SUBJECT	L	T	P	C	MAX. MARKS	
							INT	EXT
1	**R18A2120**	Aircraft Maintenance Engineering	3	0	0	3	**30**	**70**
2	**R18A2139** **R18A2140** **R18A2141**	**PROFESSIONAL ELECTIVE – IV** 1. Helicopter Engineering 2. Advanced Computational Aerodynamics 3. Analysis of Composite Structure	3	0	0	3	**30**	**70**
3	**R18A2142** **R18A2143** **R18A2144**	**PROFESSIONAL ELECTIVE – V** 1. Airline and Airport Management 2. Aero-elasticity 3. Hypersonic Aerodynamics	3	0	0	3	**30**	**70**
4	**R18A2192**	**Project – II**	0	0	12	6	**60**	**140**
		TOTAL	**9**	**0**	**12**	**15**	**150**	**350**

MALLA REDDY COLLEGE OF ENGINEERING & TECHNOLOGY

B. TECH- I- YEAR- I- SEM -ANE **L T/P/D /C**
2/ - / - / - / 2

(R18A0001)ENGLISH

INTRODUCTION:

English is a global language which is a means to correspond globally. Keeping in account of its vital role in the global market, emphasis is given to train the students to acquire language and communication skills. The syllabus is designed to develop and attain the competency in communicative skills.

The lectures focus on the communication skills and the selected act as resources for the teachers to develop the relevant skills in the students. The lessons stimulate discussions and help in comprehending the content effectively. The focus is on skill development, nurturing ideas and practicing the skills.

OBJECTIVES:

1. To enable students to enhance their lexical, grammatical and communicative competence.
2. To equip the students to study the academic subjects with better perspective through theoretical and practical components of the designed syllabus.
3. To familiarize students with the principles of writing to ensure error-free writing.
4. To know to use sentence structure effectively and to understand how to convert ideas logically within a sentence.
5. To expose students to various techniques of reading skills which hone their comprehensive skills.

SYLLABUS:

Unit –I

Chapter entitled "***The Road Not Taken****" by* Robert Frost (8 hrs)
Grammar –Tenses and Punctuation (Sequences of Tenses)
Vocabulary –Word Formation - Prefixes and Suffixes
Writing – Paragraph writing –I (Focusing on Tenses and Punctuations)
Reading – Techniques for effective reading-Reading Exercise –Type 1

Unit – II

Chapter entitled "***Abraham Lincoln's Letter to His Son's Teacher***" (7 hrs)
Grammar – Voices, Transitive and Intransitive Verbs

Vocabulary – Synonyms, Antonyms
Writing – E-mail Writing, Letter Writing (complaints, requisitions, apologies).
Reading – Skimming, scanning- Reading Exercise –Type 2

Unit – III

Chapter entitled "***War***" by L. Pirandello (6 hrs)
Grammar –Degrees of Comparison, Prepositions
Vocabulary – Phrasal Verbs
Writing – Essay Writing (Introduction, body and conclusion)
Reading – Comprehension- Reading Exercise – Type 3

Unit – IV

Chapter entitled "***J K Rowling's Harvard Speech***" (6 hrs)
Grammar – Articles, Misplaced Modifiers
Vocabulary – One-Word Substitutes
Writing – Précis Writing
Reading – Intensive and Extensive reading - Reading Exercise – Type 4

Unit –V

Sentence Structures (phrases and clauses) (7 hrs)
Grammar – Subject-Verb Agreement, Noun-Pronoun Agreement
Vocabulary – Commonly Confused Words
Writing – Memo Writing
Reading – Identifying Errors - Reading Exercise – Type 5

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

REFERENCE BOOKS:

1. Practical English Usage. Michael Swan. OUP. 1995.
2. Remedial English Grammar. F.T. Wood. Macmillan.2007
3. On Writing Well. William Zinsser. Harper Resource Book. 2001
4. Study Writing. Liz Hamp-Lyons and Ben Heasly. Cambridge University Press. 2006.
5. Communication Skills. Sanjay Kumar and PushpLata. Oxford University Press. 2011.
6. Exercises in Spoken English. Parts. I-III. CIEFL, Hyderabad. Oxford University Press

OUTCOMES:

Students will be able to:

1. write formal or informal letters and applications for different purposes.
2. select and extract relevant information through skimming and scanning.
3. utilize the strategy of brainstorming in preparing analytical, argumentative and expository essays.
4. draft concise emails following professional email etiquette.
5. enhance their grammatical competency by spotting errors.

MALLA REDDY COLLEGE OF ENGINEERING & TECHNOLOGY

B. TECH- I- YEAR- I- SEM -ANE

L	T/P/D	C
3	1/-/-	4

(R18A0021) MATHEMATICS -I

Course Objectives: To learn

1. The concept of rank of a matrix which is used to know the consistency of system of linear equations and also to find the eigen vectors of a given matrix.
2. Finding maxima and minima of functions of several variables.
3. Applications of first order ordinary differential equations. (Newton's law of cooling, Natural growth and decay)
4. How to solve first order linear, non linear partial differential equations and also method of separation of variables technique to solve typical second order partial differential equations.
5. Solving differential equations using Laplace Transforms.

UNIT I: Matrices

Introduction, types of matrices-symmetric, skew-symmetric, Hermitian, skew-Hermitian, orthogonal, unitary matrices. Rank of a matrix - echelon form, normal form, consistency of system of linear equations (Homogeneous and Non-Homogeneous). Eigen values and Eigen vectors and their properties (without proof), Cayley-Hamilton theorem (without proof), Diagonalisation.

UNIT II:Functions of Several Variables

Limit continuity, partial derivatives and total derivative. Jacobian-Functional dependence and independence. Maxima and minima and saddle points, method of Lagrange multipliers, Taylor's theorem for two variables.

UNIT III: Ordinary Differential Equations

First order ordinary differential equations: Exact, equations reducible to exact form. Applications of first order differential equations - Newton's law of cooling, law of natural growth and decay.

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.

UNIT IV: Partial Differential Equations

Introduction, formation of partial differential equation by elimination of arbitrary constants and arbitrary functions, solutions of first order Lagrange's linear 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

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, 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.

TEXT BOOKS:

i) Higher Engineering Mathematics by B V Ramana ., Tata McGraw Hill.

ii) Higher Engineering Mathematics by B.S. Grewal, Khanna Publishers.

iii) Advanced Engineering Mathematics by Kreyszig, John Wiley & Sons.

REFERENCE BOOKS:

i) Advanced Engineering Mathematics by R.K Jain & S R K Iyenger, Narosa Publishers.

ii) Advanced Engineering Mathematics by Michael Green Berg, Pearson Publishers .

iii) Engineering Mathematics by N.P Bali and Manish Goyal.

Course Outcomes: After learning the concepts of this paper the student will be able to

1. Analyze the solution of the system of linear equations and to find the Eigen values and Eigen vectors of a matrix.
2. Find the extreme values of functions of two variables with / without constraints.
3. Solve first and higher order differential equations.
4. Solve first order linear and non-linear partial differential equations.
5. Solve differential equations with initial conditions using Laplace Transform.

MALLA REDDY COLLEGE OF ENGINEERING & TECHNOLOGY

B. TECH- I- YEAR- I- SEM -ANE

L	T/P/D	C
3	-/-/-	3

(R18A0013) ENGINEERING CHEMISTRY

COURSE OBJECTIVES:

1. To apply the electrochemical principles in batteries, understand the fundamentals of corrosion and development of different techniques in corrosion control.
2. To analyze microscopic chemistry in terms of atomic and molecular orbitals.
3. To analyze water for its various parameters and its significance in industrial and domestic applications.
4. To impart the knowledge of organic reaction mechanisms which are useful for understanding the synthesis of organic compounds.
5. To analyze different types of fuels and their applications in various engineering fields.

Unit-I: Electrochemistry and Corrosion (12 lectures)

Electrochemistry: Introduction to electrochemistry; Electrochemical cells - electrode potentials, construction and working of a galvanic cell, EMF and its applications - potentiometric titration; Nernst equation and its applications; Batteries - classification of batteries, primary cell - lithium cells and secondary cells - lead acid battery and lithium ion battery; Fuel cells - H_2-O_2 fuel cell, its applications and advantages.

Corrosion: Introduction, causes and effects of corrosion; Theories of corrosion- chemical (oxidation corrosion) and electrochemical corrosion, mechanism of electrochemical corrosion; Corrosion control methods - cathodic protection - sacrificial anodic protection & impressed current cathodic protection; Methods of application of metallic coatings - hotdipping - galvanizing & tinning, electroplating (Cu plating) and electroless plating (Ni plating) - advantages and applications of electroplating/electroless plating.

Unit -II: Atomic and Molecular Structure (8 lectures)

Atomic and molecular orbitals; Postulates of molecular orbital theory - Linear Combination of Atomic Orbitals (LCAO); Molecular orbitals of diatomic molecules, molecular orbital energy level diagrams of N_2 and O_2; Metallic bonding, limitations of Valence Bond Theory (VBT).

Crystal field theory (CFT) – Salient features of CFT, crystal field splitting of transition metal ion d-orbitals in tetrahedral and octahedral geometries.

Unit -III: Water and its Treatment (**6 lectures**)

Hardness of water- Types and units of hardness; Estimation of hardness of water by EDTA method; Softening of water by Ion exchange process; Potable water- specifications, methods of disinfectation-chlorination and ozonization; Desalination of water by Reverse Osmosis.

Unit-IV: Organic Reactions (10 lectures)

Introduction to Organic Reactions - Types of reactions; Substitution - Nucleophilic substitution reactions, mechanism of S_N1 and S_N2; Addition - electrophilic and nucleophilic addition reactions; addition of HBr to propene - Markownikoff and Anti-Markownikoff's additions; Elimination reactions - dehydrohalogenation of alkyl halides; Oxidation reactions - oxidation of alcohols using $KMnO_4$ and chromic acid; Reduction reactions - reduction of carbonyl compounds using $LiAlH_4$ and $NaBH_4$.

Unit-V: Energy Sources (8 lectures)

Fuels- Definition, classification (solid, liquid & gaseous fuels) - characteristics of a good fuel; Coal - analysis of coal - proximate and ultimate analysis and their significance; Petroleum - refining, knocking - octane and cetane number, cracking - fluid bed catalytic cracking; Natural gas, LPG, CNG - constituents, characteristics and uses.

Suggested Text Books:

1. Engineering Chemistry by P.C. Jain & M. Jain, Dhanpat Rai Publishing Company (P) Ltd, 16thEdition, New Delhi.
2. Engineering Chemistry by Prasanta Rath, B. Rama Devi, C. H. Venkata Ramana Reddy, Subhendu Chakroborty, Cengage Learning Publication, India Private Limited , 2018.

Reference Books:

1. University Chemistry by B. H. Mahan, Pearson, IV Edition.
2. Engineering Chemistry by Shashi Chawla, Dhanpat Rai Publishing Company (P) Ltd, New Delhi.
3. Reactions, Rearrangements and Reagents by S.N. Sanyal, Bharati Bhavan Publishers.

COURSE OUTCOMES: The basic concepts included in this course will help the student to:

1. 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.
2. Achieve basic concepts of atomic, molecular and electronic changes related to conductivity and magnetism.
3. Familiarize the student with the fundamentals of the treatment technologies and the considerations for its design and implementation in water treatment plants.
4. Gain knowledge on synthesis of organic compounds by using different reaction mechanisms.

5. Comprehend the types of fuels, characteristics and combustion systems with emphasis on engineering applications.

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B. TECH- I- YEAR- I- SEM -ANE

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(R18A0261) BASIC ELECTRICAL AND ELECTRONICS ENGINEERING

OBJECTIVES:

1. To introduce the concept of electrical circuits and its components.
2. To introduce the concepts of diodes & transistors, and
3. To impart the knowledge of various configurations, characteristics and applications.

UNIT –I:

Introduction to Electrical Circuits: Concept of Circuit and Network, Types of elements, R-L-C Parameters, Independent and Dependent sources, Source transformation and Kirchhoff's Laws. (Simple Problems).

UNIT –II:

Network Analysis: Network Reduction Techniques- Series and parallel connections of resistive networks, Star–to-Delta and Delta-to-Star Transformations for Resistive Networks and meshanalysis

Network Theorems: Thevenin's Theorem, Norton's Theorem and Superposition Theorem.

UNIT-III:

Electrical Machines (elementary treatment only):

DC.Generator: principle of operation, constructional features, emf equation. DC Motor: principle of operation, Back emf, torque equation.

Single phase transformer: principle of operation, constructional features and emf equation.

UNIT –IV:

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

UNIT –V:

Bipolar Junction Transistor (BJT): Construction, Principle of Operation, Amplifying Action, Common Emitter, Common Base and Common Collector configurations. (elementary treatment only)

TEXT BOOKS:

1. Basic Electrical and electronics Engineering –M S Sukija TK Nagasarkar Oxford University.
2. Basic Electrical and electronics Engineering-D P Kothari. I J NagarathMcGraw Hill Education.
3. Electric Circuits - A. Chakrabarhty, Dhanipat Rai & Sons.

REFERENCE BOOKS:

1. Electronic Devices and Circuits – R.L. Boylestad and Louis Nashelsky, PEI/PHI, 9th Ed, 2006.
2. Millman's Electronic Devices and Circuits – J. Millman and C. C. Halkias, Satyabratajit, TMH, 2/e, 1998. 3. Engineering circuit analysis- by William Hayt and Jack E. Kemmerly, McGraw Hill Company, 6th edition.
3. Linear circuit analysis (time domain phasor and Laplace transform approaches)- 2 nd edition by Raymond A. DeCarlo and Pen-Min-Lin, Oxford University Press-2004.
4. Network Theory by N. C. Jagan& C. Lakshminarayana, B.S. Publications.
5. Network Theory by Sudhakar, Shyam Mohan Palli, TMH.

OUTCOMES: After this course, the student will be able

1. To analyze and solve electrical circuits using network laws and theorems.
2. To identify and characterize diodes and various types of transistors.
3. Design and analyse the DC bias circuitry of BJT
4. Fundamentals Of Constructional Details And Principle Of Operation Of DC Machines And Transformers

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B. TECH- I- YEAR- I- SEM –ANE

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(R18A0501) PROGRAMMING FOR PROBLEM SOLVING

COURSE OBJECTIVES

1. To understand the various steps in Program development.
2. To understand the basic concepts in C Programming Language.
3. To learn how to write modular and readable C Programs
4. To learn to write programs (using structured programming approach) in C to solve problems.

UNIT - I

Introduction to Computing – Computer Systems-Hardware and Software, Computer Languages, Algorithm, Flowchart, Representation of Algorithm and Flowchart with examples.

Introduction to C– History of C, Features of C, Structure of C Program, Character Set, C Tokens-Keywords, Identifiers, Constants, Variables, Data types, Operators.

UNIT-II

Statements-Selection statements (Decision Making)- if and switch statements with examples, Repetition statements (loops)- while, for, do-while statements with examples, Unconditional statements- break, continue, goto statements with examples.

UNIT – III

Functions-Designing Structured Programs, Types of Functions-User defined functions, Standard functions, Categories of functions, Parameter Passing techniques, Storage classes, Recursion.

UNIT-IV

Arrays- Declaration and Initialization, One dimensional Arrays, Two dimensional Arrays.

Strings- Declaration and Initialization, String Input / Output functions, String manipulation functions.

UNIT-V

Pointers- Introduction, Definition and Declaration of pointers, address operator, Pointer variables, Pointers with Arrays.

Structures- Introduction, Declaration and Initialization, Array of Structures, Unions.

TEXT BOOKS:

1. Computer Programming with C, 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.

COURSE OUTCOMES:

1. Demonstrate the basic knowledge of computer hardware and software.
2. To formulate simple algorithms for arithmetic and logical problems.
3. To translate the algorithms to programs (in C language).
4. To test and execute the programs and correct syntax and logical errors.
5. Ability to apply solving and logical skills to programming in C language and also in other languages.

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(R18A0082)ENGINEERING WORKSHOP/IT WORKSHOP

COURSEOBJECTIVES:

1. Student able to learn about different tools used in the lab
2. Student able to learn about foundry, welding, plumbing, house wiring and Tin smithy operations
3. Student able to learn about different Carpentry and Fitting tools

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

2. 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.
   Workshop Manual / Venkat Reddy/ BS Publications/Sixth Edition

COURSE OUTCOMES:

1. Students can understand different machine shop operations
2. Students can understand Foundry, welding, plumbing, house wiring and Tin smithy operations
3. Student learned about metal cutting processes

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B. TECH- I- YEAR- I- SEM -ANE

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(R18A0083) IT WORKSHOP LAB

OBJECTIVES:

1. 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
2. PC Hardware introduces the students to a personal computer and its basic peripherals, the process of assembling a personal computer, installation of system software like MS Windows; In addition hardware and software level troubleshooting process, tips and tricks would be covered.
3. Internet & World Wide Web module introduces the different ways of hooking the PC on to the internet from home and workplace and effectively usage of the internet. Usage of web browsers, email, newsgroups and discussion forums would be covered. In addition, awareness of cyber hygiene, i.e., protecting the personal computer from getting infected with the viruses, worms and other cyber attacks would be introduced.
4. Productivity tools module would enable the students in crafting professional word documents, excel spread sheets, power point presentations and personal web sites using the Microsoft suite of office tools.
5. HTML introduction for creating static web pages

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:

Assembling and disassembling of PC

Week 3:

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

Week 4: Hardware Troubleshooting

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

Week 5: INTERNET & WEB BROWSERS

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 6: MICROSOFT WORD

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.

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.

Week 7: MICROSOFT EXCEL

Excel Orientation: The importance of MS office 2007/10 tool Excel as a Spreadsheet tool, Accessing, overview of toolbars, saving excel files, Using help and resources.

Creating a Scheduler - Features to be covered:- Gridlines, Format Cells, Summation, auto fill, Formatting Text

Calculating GPA - .Features to be covered:- Cell Referencing, Formulae in excel – average, std. deviation, Charts, Renaming and Inserting worksheets, Hyper linking, Count function, LOOKUP/VLOOKUP, Sorting, Conditional formatting .

Week 8: MICROSOFT POWER POINT

Basic power point utilities and tools which helpful to create basic power point presentation. Topic covered during this includes PPT Orientation, Slide Layouts, Inserting Text, Word Art, Formatting Text, Bullets and Numbering, Auto Shapes, Lines and Arrows in both Latex and Power point.

Create the presentation using the following tools:

Formatting: Color, font type, font size, font style etc.

Header and Footer

Bullets and Numbering

Drawing Toolbar: Auto shapes, Textboxes, etc

Design Template

Introduction to custom animation.

b) **Create a presentation to conduct a creativity session using the following tools**:

1. Slide transition
2. Master slide view
3. Insert picture – clipart, image
4. Action button
5. Drawing tool bar – lines, arrows
6. Hyperlink
7. Custom animation
8. Hide slide
9. Wash out

Week 9: **HTML**

Introduction to HTML & Basic HTML Tags: Understand what are the tasks used for creation of website

Designing a static web page: Understand how to create a webpage

OUTCOMES:

1. The Students are able to identify the major components of a computer and its basic peripherals. They are capable of assembling a personal computer, and can perform installation of system software like MS Windows and required device drivers.
2. Students can detect and perform minor hardware and software level troubleshooting.
3. The Students are capable of working on Internet & World Wide Web and can make effective usage of the internet for academics.
4. The Students develop ability to prepare professional word documents, excel spread sheets and power point presentations using the Microsoft suite of office tools.
5. The students are able to create a static webpage's using HTML.

Text Books:

1. Introduction to Information Technology,ITL Education Solutions limited,Pearson Education
2. PC Hardware and A+ Handbook-Kate J.Chase PHI(Microsoft)

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B. TECH- I- YEAR- I- SEM -ANE	L	T/P/D	C
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(R18A0581) PROGRAMMING FOR PROBLEM SOLVING LAB

OBJECTIVES:

1. Understand the basic concept of C Programming, and its different modules that include conditional and looping expressions, Arrays, Strings, Functions, Pointers, and Structures.
2. Acquire knowledge about the basic concept of writing a program.
3. Role of constants, variables, identifiers, operators, type conversion and other building blocks of C Language.
4. Use of conditional expressions and looping statements to solve problems associated with conditions and repetitions.
5. Role of Functions involving the idea of modularity.
6. 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.

Week 2:

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

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

c) Write a C program to check whether given number is Armstrong Number or not.

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 program to perform arithmetic operations 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 sum of integer array elements using pointers.

Week 13:

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

Week 14:

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:

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

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B. TECH- I- YEAR- I- SEM –ANE

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(R18A0289) BASIC ELECTRICAL AND ELECTRONICS ENGINEERING LAB

OBJECTIVES:

1. To Design Electrical Systems.
2. To Analyze A Given Network By Applying Various Network Theorems.
3. To Expose The Students To The Operation Of DC Generator.
4. To Expose The Students To The Operation Of DC Motor and Transformer.

CYCLE – 1

1. Verification of KVL and KCL.
2. Verification of Thevenin's theorem.
3. Verification of Norton's theorem.
4. Verification of Superposition theorem.
5. Swinburne's test on DC shunt machine.
6. OC & SC tests on single phase transformer.

CYCLE – 2

1. PN Junction diode characteristics.
2. Zener diode characteristics.
3. Half wave rectifier with and without filter.
4. Full wave rectifier with and without filter.
5. Transistor CB Characteristics (Input And Output)
6. Transistor CE Characteristics (Input And Output)

NOTE: Any 10 of Above Experiments Are To Be Conducted

OUTCOMES:

After successfully studying this course, students will:

1. Explain the concept of circuit laws and network theorems and apply them to laboratory measurements.
2. Be able to systematically obtain the equations that characterize the performance of an electric circuit as well as solving both single phase and DC Machines.

3. Acknowledge the principles of operation and the main features of electric machines and their applications.
4. Acquire skills in using electrical measuring devices.

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B. TECH- I- YEAR- I- SEM -ANE **L T/P/D C**

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(R18A0003) HUMAN VALUES AND SOCIETAL PERSPECTIVE
(Mandatory Course)

INTRODUCTION:

Human values are the virtues that guide us to take into account human element when one interacts with other human beings. It's both what we expect others to do for us and what we aim to give to other human beings. These human values give the effect of bonding, comforting and reassuring.

OBJECTIVES:

This introductory course input is intended:

1. to help the students appreciate the essential complementarily between 'VALUES' and 'SKILLS' to ensure sustained happiness and prosperity which are the core aspirations of all human beings.
2. 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 forms the basis of value based living in a natural way.
3. to highlight plausible implications of such a holistic understanding in terms of ethical human conduct, trustful and mutually satisfying human behaviour and mutually enriching interaction with Nature.

UNIT - I:

Course Introduction - Need, Basic Guidelines, Content and Process for Value Education: Understanding the need, basic guidelines, content and process for Value Education.

Self Exploration - what is it? - its content and process; 'Natural Acceptance' and Experiential Validation - as the mechanism for self exploration. 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:

Understanding 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 doer, seer and enjoyer).
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-astiva 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 Coexistence: 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-astitva) 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 Professional Ethics: Natural acceptance of human values, Definitiveness of Ethical Human Conduct, Basic for Humanistic Education, Humanistic Constitution and Humanistic Universal Order. Competence in professional ethics:

a. Ability to utilize the professional competence for augmenting universal human order.
b. Ability to identify the scope and characteristics of people-friendly and eco-friendly production systems.
c. Ability to identify and develop appropriate technologies and management patterns for above production systems.

TEXT BOOKS:

1. R. R. Gaur, R Sangal, G P Bagaria, 2009, A Foundation Course in Human Values and Professional Ethics.

2. Prof. K. V. Subba Raju, 2013, Success Secrets for Engineering Students, Smart Student Publications, 3rd Edition.

REFERENCE BOOKS:

1. Ivan IIlich, 1974, Energy & Equity, The Trinity Press, Worcester, and HarperCollins, USA
2. E. F. Schumancher, 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 Sansthan, Amarkantak.
4. Sussan George, 1976, How the Other Half Dies, Penguin Press, Reprinted 1986, 1991.
5. P. L. Dhar, R. R. 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. Donella H. Meadows, Dennis L. Meadows, Jorgen Randers, William W. Behrens III, 1972, Limits to Growth - Club of Rome's report, Universe Books.
9. E G Seebauer & Robert L.Berry, 2000, Fundamentals of Ethics for Scientists & Engineers, Oxford University Press.
10. M Govindrajan, S Natrajan & V. S Senthil kumar, Engineering Ethics (including Humna 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. Charle Chaplin, Modern Times, United Artists, USA
5. IIT Delhi, Modern Technology - the Untold Story

OUTCOMES:

1. The students will be able to obtain happiness and prosperity in their life.
2. They will develop harmony at all levels.
3. They can have satisfying human behavior throughout their life.

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B. TECH- I- YEAR- II- SEM -ANE

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(R18A0002) PROFESSIONAL ENGLISH

INTRODUCTION:

English is a tool for global communication and is the dominant language which is sweeping almost all the fields in the world. It has become a necessity for people to speak in English comfortably, if they want to enter the global workforce. Hence, the course is designed to help the students to meet the global standards. Each unit focuses on English skill-set to improve: Interview skills, giving presentations and professional etiquette.

OBJECTIVES:

1. To enrich students to express themselves appropriately and fluently in professional contexts.
2. To enhance their employability through regular participation in group discussions and interview skills.
3. To lay foundation with writing strategies for the future workplace needs.
4. To acquaint students with different components of professional presentation skills.
5. To equip students with necessary training in listening to comprehend dialects of English language.

SYLLABUS:

UNIT-I (7 hrs)

Listening - Bill Gate's TED talk on Solving Big Problems
Speaking - Description of Pictures, Places, Objects and Persons
Grammar - Finite and Non-finite verbs
Vocabulary - Business Vocabulary
Writing - Paragraph Writing

Unit –II (8 hrs)

Listening - Google CEO Sundar Pichai's Speech I/O 2017 Keynote
Speaking - Oral presentations
Grammar - Transformation of Sentences
Vocabulary - Idioms
Writing - Abstract Writing

Unit –III (8 hrs)

Listening - Sample Interviews (videos)

Speaking - Mock Interviews
Grammar - Direct and Indirect Speech
Vocabulary - Standard Abbreviations (Mini Project)
Writing - Job applications I (Cover Letter)

Unit – IV (6 hrs)

Listening - Telephonic Interviews
Speaking - Telephonic Expressions
Grammar - Auxiliary verbs
Vocabulary - Word Analogy-I
Writing - Job Application II (Resume)

Unit – V (5 hrs)

Listening - Tanmay Bhakshi's ITU interview
Speaking - Professional Etiquette
Grammar - Common Errors
Vocabulary - Word Analogy-II
Writing - Report Writing

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

REFERNCE BOOKS:

1. Practical English Usage. Michael Swan. OUP. 1995.
2. Remedial English Grammar. F.T. Wood. Macmillan.2007
3. On Writing Well. William Zinsser. Harper Resource Book. 2001
4. Study Writing. Liz Hamp-Lyons and Ben Heasly. Cambridge University Press. 2006.
5. Communication Skills. Sanjay Kumar and PushpLata. Oxford University Press. 2011.
6. Exercises in Spoken English. Parts. I-III. CIEFL, Hyderabad. Oxford University Press

OUTCOMES:

Students will be able to:

1. draft coherent and unified paragraphs with adequate supporting details.
2. demonstrate problem solving skills, decision-making skills, analytical skills.
3. comprehend and apply the pre-interview preparation techniques for successful interview.
4. achieve expertise in writing resume and cover letter formats.
5. understand the steps of writing 'Reports and Abstract'.

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B. TECH- I- YEAR- II- SEM -ANE

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(R18A0022)MATHEMATICS-II

OBJECTIVES:

1. 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.
2. To learn the concepts curve fitting, numerical integration and numerical solutions of first order ordinary differential equations.
3. Evaluation of improper integrals using Beta and Gamma functions.
4. Evaluation of multiple integrals.
5. 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: Solutions of algebraic, transcendental equations and Interpolation

Solution of algebraic and transcendental equations: Introduction, Bisection Method, Method of false position, Newton Raphson method and their graphical interpretations.
Interpolation: Introduction, errors in polynomial interpolation, Finite differences - Forward differences, backward differences, central differences. Newton's formulae for interpolation, Gauss's central difference formulae. Interpolation with unevenly spaced points - Lagrange's Interpolation.

UNIT – II: Numerical Methods

Numerical integration: Generalized quadrature - Trapezoidal rule, Simpson's $1/3^{rd}$ and Simpson's $3/8^{th}$ rules.
Numerical solution of ordinary differential equations: Solution by Taylor's series method, Euler's method, Euler's modified method, Runge-Kutta fourth order method.
Curve fitting: Fitting a straight line, second degree curve, exponential curve, power curve by method of least squares.

Unit III: Beta and Gamma functions

Introduction of improper integrals- Beta and Gamma functions - Relation between them, their properties, Evaluation of improper integrals using Beta and Gamma functions.

Unit IV: Double and Triple Integrals

Double and triple integrals (Cartesian and polar), change of order of integration in double integrals, Change of variables (Cartesian to polar).

Unit V: Vector Calculus

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

TEXT BOOKS:

i) Higher Engineering Mathematics by B V Ramana ., Tata McGraw Hill.
ii) Higher Engineering Mathematics by B.S. Grewal, Khanna Publishers.
iii) Mathematical Methods by S.R.K Iyenger, R.K.Jain, Narosa Publishers.

REFERENCE BOOKS:

i) Advanced Engineering Mathematics by Kreyszig, John Wiley & Sons.
ii) Advanced Engineering Mathematics by Michael Greenberg –Pearson publishers.
iii) Introductory Methods of Numerical Analysis by S.S. Sastry, PHI

Course Outcomes: After learning the contents of this paper the student must be able to

1. Find the roots of algebraic, non algebraic equations and predict the value of the data at an intermediate point from a given discrete data.
2. Find the most appropriate formula for a guesses relation of the data variables using curve fitting and this method of analysis data helps engineers to understand the system for better interpretation and decision making.
3. Find a numerical solution for a given differential equation.
4. Evaluate multiple integrals and to have a basic understanding of Beta and Gamma functions..
5. Evaluate the line, surface, volume integrals and converting them from one to another using vector integral theorems.

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(R18A0012) ENGINEERING PHYSICS

COURSE OBJECTIVES:

1. To understand the basic concepts of oscillations exhibited by various systems in nature.
2. To understand the basic concepts of light through interference and diffraction.
3. To understand band structure of the solids and classification of materials.
4. To understand dielectric and magnetic properties of the materials and enable them to design and apply in different fields.
5. To be able to distinguish ordinary light with a laser light and their applications in different fields.

UNIT – I
HARMONIC OSCILLATIONS (7Hours)

Mechanical and electrical simple harmonic oscillators, complex number notation and phasor representation of simple harmonic motion, damped harmonic oscillator: over, critical and lightly-damped oscillators; Energy decay in damped harmonic oscillator, Quality factor, forced damped harmonic oscillator.

UNIT – II
WAVEOPTICS (10Hours)

Huygen's principle, Interference: Superposition of waves, interference of light by division of wave front and amplitude, Newton's rings, Michelson interferometer, Diffraction: difference between Fresnel and Fraunhofer diffraction, Fraunhofer diffraction due to single slit, Diffraction grating: Grating spectrum and resolving power.

UNIT- III
INTRODUCTION TO SOLIDS (7 Hours)

Free electron theory, Fermi level, Density of states, Periodic potential, Bloch's theorem, Kronig – Penny modal , E – K diagram, Effective mass, Origin of energy bands in solids, Classification of materials : Metals, semi conductors and insulators.

UNIT – IV

DIELECTRICS AND MAGNETIC PROPERTIES OF MATERIALS (10 Hours)

Dielectrics: Introduction, Types of polarizations (Electronic and Ionic) and calculation of their polarizabilities, Internal fields in a solid, Clausius-Mossotti relation.

Magnetism: Introduction, Bohr magneton, classification of dia, para and ferro magnetic materials on the basis of magnetic moment, Properties of anti-ferro and ferri magnetic materials, Hysteresis curve based on domain theory, Soft and hard magnetic materials.

UNIT-V

LASERS (6Hours)

Characteristics of lasers, Absorption, Spontaneous and Stimulated emissions, Einstein's Coefficients, population inversion, meta stable state, types of pumping, lasing action, construction and working of Ruby Laser, Helium-Neon Laser, Applications of lasers.

COURSE OUTCOMES: After completion of studying Engineering Physics the student is able to,

1. Analyze the various oscillations made by different oscillating bodies in nature.
2. Learn to design a device to go to maximum accuracy in measuring the dimensions optically.
3. Get the knowledge of classification of materials which is used for various applications in material technology.
4. Learn dielectric, magnetic properties of the materials and apply them in material technology.
5. Learn the principles, production of LASER beam and application of LASER in various fields.

TEXT BOOKS:

1. Engineering Physics by Arumugam, Anuradha publications.
2. Engineering Physics- B.K.Pandey, S.Chaturvedi, Cengage Learning.

REFERENCES:

1. Engineering Physics – R.K. Gaur and S.L.Gupta, Dhanpat Rai Publishers.
2. Engineering Physics, S Mani Naidu- Pearson Publishers.
3. Engineering physics 2nd edition –H.K.Malik and A.K. Singh.
4. Engineering Physics – P.K. Palaniswamy, Scitech publications.
5. Physics by Resnick and Haliday.

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(R18A0502)OBJECT ORIENTED PROGRAMMING

OBJECTIVES

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

Unit I

Introduction to 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, C++ tokens, Identifiers, Variables, Constants, Operators, 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, Friend Functions.

Unit-III

Constructors, Destructors, Inheritance:

Introduction to Constructors, Default Constructors, Parameterized Constructors, Copy Constructors, Multiple Constructors in a Class, Destructors.

Inheritance :

Introduction to inheritance, Defining Derived Classes, Single Inheritance, Multiple Inheritance, Multi level Inheritance, Hierarchical Inheritance, Hybrid Inheritance.

Unit-IV

Pointers, Virtual Functions and Polymorphism:

Introduction to Memory management, new operator and delete operator, Pointers to objects, Pointers to Derived Classes, Polymorphism, Compile time polymorphism, Run time polymorphism, Virtual Functions, Overloading- Function Overloading, Operator overloading.

Unit-V

Templates and Exception handling:

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

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 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 Educ

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(R18A0302) ENGINEERING GRAPHICS

UNIT – I

Introduction To Engineering Drawing: Principles of Engineering Drawing/Graphics – Various Drawing Instruments – 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

Sections and developments of solids
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 of orthographic views to isometric views – simple objects

Basic Principles of ACAD – Demo Only.

TEXT BOOKS

1. Engineering Drawing, Special Edition-MRCET, McGrahill 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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(R18A0083) ENGINEERING PHYSICS / CHEMISTRY LAB

(Any 8 experiments compulsory)

OBJECTIVES

1. The engineering students are exposed in physics lab to understand physical parameters practically.
2. The list of experiments enables the students to know different branches like mechanics, optics and electronics.
3. The students are thoroughly trained in learning practical skills by completing all the experiments in physics lab.

This course on physics lab is designed with 10 experiments in an academic year. It is common to all branches of Engineering in B.Tech 1st year.

LIST OF EXPERIMENTS: (Any eight experiments compulsory)

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

Reference practical physics books:

1. Practical physics by **Dr. Aparna**, V.G.S.publications.
2. Engineering physics practical lab manual – **MRCET.**

OUTCOMES

1. The students learn the concepts of error, analyze and try to formulate new solutions to the problems related to engineering physics.

2. B.Tech students basically learning the mechanical behavior of the wire and practically determining the elastic constant. Transverse and longitudinal waves are practically studied. Variation of the magnetic fields along with terrestrial magnetism is practically studied.
3. Dispersion of the composite light is clearly observed by the students. Wavelengths of the source of light/laser are determined experimentally.
4. Opto electronic devices and their working are practically realized by the students. In addition the functioning of optical fiber is practically studied.
5. The students learn experimental skills to design new experiments suitable for requirements in different fields(industrial, medical, scientific fields etc.)

ENGINEERING CHEMISTRY LAB

(Any Eight Experiment Compulsory)

OBJECTIVES

This course on chemistry lab is designed with 10 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

1. Provide the students with a solid foundation in chemistry laboratory required to solve engineering problems.
2. Practical implementation of fundamental concepts.
3. The students are thoroughly trained in learning practical skills by completing all the experiments in chemistry lab.

List of Experiments

Titrimetry:

1. Estimation of hardness of water by EDTA method.

Instrumental Methods:

Colorimetry:

2. Determination of Ferrous iron in cement by Colorimetric method
3. Estimation of Copper by Colorimetric method.

Conductometry:

4. Estimation of HCl by Conductometric titrations.

5. Estimation of Acetic acid in a mixture of HCl and Acetic acid by Conductometric titrations.

Potentiometry:

6. Estimation of HCl by Potentiometric titrations.
7. Estimation of Fe^{2+} by Potentiometry using $KMnO_4$.

Preparation:

8. Preparation of Aspirin.

Physical properties:

9. Determination of Viscosity of sample oil by Redwood Viscometer.
10. Determination of Surface Tension of a given liquid by Stalagmometer.

Text Book:

1. Inorganic quantitative analysis, Vogel
2. A text book on experiments and calculation in Engineering Chemistry by S.S. Dara

Suggested Readings:

1. Practical Engineering Chemistry by K. Mukkanti, etal, B.S. Publications, Hyderabad.
2. Text Book of Engineering Chemistry by R. N. Goyal and Harrmendra Goel, Ane Books Private Ltd.

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

1. Estimate the total hardness present in a sample of water.
2. Select lubricants for various purposes and determine the surface tension of a given liquid.
3. Prepare synthetic drug molecule.
4. Determine the strength of an acid by conductometric and potentiometric methods.
5. Find the amount of Fe^{+2} and Cu^{2+} present in unknown substances using titrimetric and instrumental methods.

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(R18A0582)OBJECT ORIENTED PROGRAMMING LAB

Objectives:

1. To strengthen problem solving ability by using the characteristics of an object-oriented approach.
2. To design applications using object oriented features
3. To handle Exceptions in programs.
4. 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 a Program 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
ssign()	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.

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(R18A0081)ENGLISH LANGUAGE COMMUNICATION SKILLS LAB

The Language Lab focuses on phonetic knowledge of the English language and its use in everyday situations and contexts.

OBJECTIVES:

1. To expose students to a variety of self-instructional, learner-friendly modes of language learning
2. To enable students to learn accurate pronunciation through stress on word accent, intonation and rhythm.
3. To enable students to overcome public speaking anxiety and equip them to become employable.
4. To familiarize students with formal telephonic expressions by means of appropriate tone.
5. To foster sentence-level and holistic understanding of the context through active listening.

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- Greetings – Taking Leave – Introducing Oneself and Others.

UNIT –II

CALL Lab: Syllabification - Stress &Intonation- Rules of Stress Markings and Intonation
ICS Lab: Situational Dialogues/Role Plays - Making Requests and Seeking Permissions.

UNIT –III

CALL Lab: Listening Activities (Its Importance – Purpose- Process- Listening for General and Specific Details.)
ICS Lab: Communication at Work Place - Professional Etiquettes, Telephone Etiquette.

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

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:

Students will be able to:

1. understand the importance of learning phonetics.
2. learn how to pronounce words using phonetic transcription.
3. know the importance of speaking English with rhythm and intonation.
4. effectively participate in JAM session.
5. use polite expressions in all formal situations.
6. effectively communicate through telephone.

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II Year B. Tech, ANE-I Sem

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(R18A2101)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.

Hydrostatic forces on submerged bodies: Pressure at a point, Pascal's law, pressure variation with temperature and height, Center of pressure on vertical surfaces.

Manometers- simple and differential manometers, inverted manometers, micro manometers, Pressure gauges.

UNIT II

Fluid Kinematics: Stream line, path line, streak line, stream tube, Classification of flows: steady, unsteady, uniform, non uniform, laminar, turbulent flows. One dimensional & two dimensional approximation, 2-D flow in wind tunnel, Continuity equations for 1-D and 2-D flows both compressible and incompressible, Velocity potential function and stream function.

UNIT III

Fluid Dynamics: Surface & body forces, momentum equation, Euler equation, Bernoulli's equation for flow along a stream line.

Flow measurements: pressure, velocity and mass flow rate, viscosity, venturi meter and orifice meter.

Flow of through pipes: Darcy's Weisbach Equation, major and minor losses.

UNIT IV

Boundary Layer flows: Introductory concepts of boundary layer, Prandtl's boundary layer hypothesis, Boundary layer growth along a flat plate. Boundary layer thickness (Displacement, Energy and Momentum), Von Karman's Momentum Integral Equation, Drag forces due to laminar and turbulent boundary layer on flat plate.

Separation of boundary layer: Adverse pressure gradient and Sharp bending/turning of surface. Methods of preventing separation of boundary layer.

UNIT V

Dimensional and Model Analysis: Dimensional homogeneity, Methods of Dimensional Analysis, Buckingham's π-theorem, Model Analysis, Simiitude: Types of similarities, Dimensionless numbers, Similarity laws.

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
4. Fundamentals of Aerodynamics, Anderson, Jr., J.D., International edition, McGraw Hill, 2001, ISBN: 0-07-118146-6.

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.

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(R18A2102) APPLIED 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.

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

Unit – II

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

Unit – III

Moments of Inertia: Definition – Perpendicular and parallel axes theorems, Polar Moment of Inertia – Radius of gyration - Transfer formula for moment of inertia - 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 – mass moment of inertia of composite bodies.

Unit – IV

Kinematics: Analysis of Pin Jointed Plane Frames: Determination of Forces in members of plane, pin jointed, perfect trusses by (i) method of joints and (ii) method of sections. Analysis of various types of cantilever & simply supported trusses by method of joints, method of sections.

Kinetics of particles: D'Alemberts principle for plane motion and connected bodies.

Unit – V

Introduction to structural members: Introduction to different beams with end conditions and loadings with applications in aircraft, columns with different end conditions with applications in aircraft, Introduction to truss and frames, joints-pin, hinge etc, degrees of freedom for different structures.

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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(R18A2103)ENGINEERING 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, 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 - First law of Thermodynamics – applied to a process and system, Corollaries , Steady Flow Energy Equation.

UNIT - II

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

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 - Vander Waals Equation of State - Compressibility charts - variable specific Heats - Gas Tables - Dryness Fraction - Clausius - Clapeyron Equation Property tables.

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.

UNIT - V

Thermodynamic Cycles: Power cycles: Otto, Diesel, Dual Combustion cycles, 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.

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.

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L	T/P/D	C
3	-/-/-	3

(R18A2104) INTRODUCTION TO AERONAUTICAL ENGINEERING

Objective:

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

UNIT - I

History of Flight and Airspace 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

Airfoil- nomenclature and types, Aerodynamic forces on wings and bodies, Generation of lift, Sources of drag, moment coefficients; numericals, and centre of pressure.

Rotary wing aircraft concepts – Forces while hovering, Propeller Theory.

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 Missiles, similarities and differences with launch vehicle, controls for missiles, Airframe components of missiles

UNIT – IV

Aircraft Structures: History of airplane construction, Loads on aircraft, aircraft components, Monocoque and semi-monocoque structures, internal structural members and landing gear, wing and fuselage configurations, engine nacelle, empennage configurations.

UNIT – V

Elements of Aircraft Performance and Measurement Techniques:

Drag Polar, Equations of Motion, Thrust Required for level flight, unaccelerated flight, Thrust available and Maximum Velocity, Power required for Level and Unaccelerated flight. Power available and maximum Velocity. Altitude effects on Power required and available.

Sensors and instrumentation- Pitot-static tube, Primary Flight Instruments, 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.
3. V. Ganesan, Gas Turbines, Tata McGraw-Hill, 1999, ISBN, 0070681929

REFERENCES:

1. Turner, M.J.L., Rocket and Spacecraft Propulsion, Springer, 2001.

Outcome:

1. Students acquire knowledge with Aeronautical 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 aircraft vehicles.

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MALLA REDDY COLLEGE OF ENGINEERING & TECHNOLOGY

	L	T/P/D	C
II Year B. Tech, ANE-I Sem	**3**	**-/-/-**	**3**

(R18A2105) AIRCRAFT PRODUCTION TECHNOLOGY

Objectives:

Student can acquire knowledge on various production technologies involved in aircraft manufacturing.

UNIT - I

Casting and Welding Techniques: Various molding process employed in aircraft industry, Types of patterns, Casting Process involved in Sand casting, die-casting, centrifugal casting, investment casting and shell molding. Working Principles and equipment used with emerging trends in arc welding, gas welding, resistance welding, Laser welding, EBM, EDM, Soldering and brazing techniques.

UNIT - II

Machining and Forming: Classification of machining processes, Types of chips, working principles (with schematic diagram only) , types-lathe, shaper, milling machines, grinding (designation of grinding wheel), drilling m/c, CNC machining (overview of G-Codes, M-Codes). Sheet metal operations- shearing, punching, super plastic forming and diffusion bonding. Bending, Automation in bend forming and different operations in bending like stretch forming, spinning, drawing etc.

UNIT - III

Unconventional Machining: Principles of working and applications of abrasive jet machining, ultrasonic machining, electron beam, EDM, and plasma arc machining, Water jet machining, Ion beam machining.

UNIT - IV

Heat Treatment and Surface Finishing: Heat treatment of Aluminum alloys, titanium alloys, steels, case hardening, initial stresses and the stress alleviation procedures. Corrosion prevention, protective treatment for aluminum alloys, steels, anodizing of titanium alloys, organic coating, and thermal spray coatings.

UNIT - V

Jigs & Fixtures: Jigs, fixtures, stages of assembly, types and equipment for riveted joints, bolted joints (only). Aircraft Tooling Concepts.- types of tools used in A/C industry.

NDT and Other Inspection Techniques: comparison of NDT & DT, process involved in Dye Penetrate Test, X-ray, and magnetic particle and ultrasonic testing.

Text Books:

1. "Manufacturing Engineering and Technology" by Kalpajikau - Addison Wesley.

2. "Aircraft production techniques' Keshu S.C, Ganapathy K.K, Interline Publishing House, Bangalore-1993.

Reference Books:

1. "Production technology" - R.K. Jain - Khanna Publishers - 2002.
2. "Production technology" - O.P.Khanna and lal. M.Dhanpat rai publications - New delhi - 1997.

Outcomes:

- The Students can able to use different manufacturing process and use this in industry for component production.
- The student can correlate the various methods of manufacturing employed for different materials.

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MALLA REDDY COLLEGE OF ENGINEERING & TECHNOLOGY

	L	T/P/D	C
II Year B. Tech, ANE-I Sem	**3**	**-/-/-**	**3**

(R18A2106) AEROSPACE MATERIALS AND COMPOSITES

Objectives:

- To study the types of mechanical behavior of materials for aircraft applications.
- To make the student understand the analysis of composite laminates under different loading Conditions and different environmental conditions.
- To impart the knowledge in usage of composite materials in aircraft component design.

UNIT-I MECHANICAL BEHAVIOUR OF ENGINEERING MATERIALS

Linear and non linear elastic properties – Yielding, strain hardening, fracture, Bauschinger's effect – Notch effect testing and flaw detection of materials and components – creep and fatigue – Comparative study of metals, ceramics, plastics and composites.

UNIT-II HEAT TREATMENT OF METALS AND ALLOYS

Light Metal Alloys: Aluminum and its alloys, high strength and high corrosion alloys. Titanium and its alloys: applications, Classification of steels alloys, effect of alloying elements, magnesium alloys and their properties, maraging steels: properties and applications.

High Strength and Heat Resistant Alloys: Classification of heat resistant materials, iron, nickel and cobalt based alloys, refractory materials, silica based ceramics, properties of inconel, monel, nimonic and super alloys; application of heat resistant alloy in aerospace vehicles. Heat treatment of steel and its alloys. Case hardening, initial residual stresses and stress alleviation procedures, corrosion prevention and protective treatments.

UNIT-III INTRODUCTION T O F COMPOSITE M A T E R I A L S

Introduction, polymer matrix composites, metal matrix composites, ceramic matrix composites, carbon-carbon composites, fiber, reinforced composites and nature-made composites and applications.

Reinforcements: Fibers Glass, Silica, Kevlar, carbon, boron, silicon carbide, and born carbide, fibres. Particulate composites, Polymer composites, Thermoplastics, Thermosetting

UNIT-IV Hybrid Composites

Basic design concepts of sandwich construction - Materials used for sandwich construction. Failure modes of sandwich panels. Basic design of composite structure, Smart materials, Functionally Graded Materials (FGM)

Selection criteria for Aerospace Materials: Properties of flight vehicle materials, importance of strength/ weight ratio of materials for aerospace vehicles structures, importance of temperature variations, factors affecting the selection of material for different parts of airplanes.

UNIT-V Application and Testing

Classification of Aircraft Materials used for Aircraft Components-Application of Composite Materials-Super Alloys (Ni & Mg Alloys), Indigenes Alloys (Ti6AL4V, Si-Al-Cu). Emerging Trends in Aerospace Materials (Shape memory alloys). Latest techniques in testing and Flaw Detection of Material and Components by mechanical and NDT checks.

Text Books

1. G. F. Titterton, Aircraft Materials and Processes, 5/e, Sterling Book House,1998.
2. D. Agarwal, L.J. Broutman and K. Chandrasekhara, Analysis and Performance of Fibre Composites, Wiley, 3rd edition, 2015
3. Vijay K.Varadan, K.J.Vinoy, S.Gopalakrishnan, Smart Material Systems and MEMS: Design and Development Methodologies,Wiley

References

1. Martin, J.W., "Engineering Materials, Their properties and Applications", Wykedham Publications (London) Ltd., 1987.
2. G. E. Dieter, Mechanical Metallurgy, 1/e, McGraw Hill, 1976.
3. Nonlinear Approaches in Engineering Applications

Outcomes:

- Exposure to high temperature materials for space applications
- Understanding the mechanics of composite materials
- Knowledge gained in manufacture of composites

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MALLA REDDY COLLEGE OF ENGINEERING & TECHNOLOGY

II Year B. Tech, ANE-II Sem

L	T/P/D	C
-	-/3/-	1.5

(R18A2181)AIRCRAFT 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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MALLA REDDY COLLEGE OF ENGINEERING & TECHNOLOGY

	L	T/P/D	C
II Year B. Tech, ANE-I Sem	-	-/3/-	1.5

(R18A2182)AIRCRAFT ENGINEERING DRAWING LAB

OBJECTIVES:

- T o expose them to existing national standards related to technical drawings.
- It gives all the external and internal details of the machine component from which it can be manufactured. The machining symbols, tolerances, bill of material, etc. are specified on the drawing.
- The knowledge of machine drawing helps in designing the various parts of machine elements. The course content is designed in such a way that the balancing of part drawings (machine components) and assembly drawings of aircraft can be known.

Unit 1

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, webs, ribs.

Unit 2

Limits and tolerances: Limit System – Tolerances – Fits - Tolerances of Form and Position – Standards followed in Industry

Unit 3

Surface Roughness: Introduction – Surface Roughness – Machining Symbols – Indication of Surface roughness.

Unit 4

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

a) Popular forms of Screw threads, bolts, nuts, stud bolts, tap bolts, set screws.
b) Keys, cotter joints and knuckle joint.
c) Riveted joints for plates

Unit 5

Assembly Drawings:

Drawings of assembled views for the part drawings of the following using conventions and easy drawing proportions.

a) Engine parts – stuffing boxes, cross heads, Eccentric.
b) Other machine parts - Screws jacks, Machine Vices Plummer block, Tailstock.
c) Wing, Landing gear, horizontal stabilizer.

NOTE: First angle projection to be adopted. The student should be able to provide working drawings of actual parts

Outcomes:

On Completion of the course the student will be able to

- An Ability to understand and apply the knowledge of machine drawing as a system of Communication in which ideas are expressed clearly and all information fully conveyed.
- To produce detailed drawings of machines parts from assembly drawing

TEXT BOOK

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.

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MALLA REDDY COLLEGE OF ENGINEERING AND TECHNOLOGY

II Year B.Tech. ANE -I Sem

L	T/P/D	C
2	-	-

(R18A0014)ENVIRONMENTAL SCIENCES (MANDATORY COURSE)

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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MALLA REDDY COLLEGE OF ENGINEERING & TECHNOLOGY

	L	T/P/D	C
II Year B. Tech, ANE-II Sem			
	2	**1/-/-**	**3**

(R18A2107)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: Aerodynamic forces and Moments, Derivation of Lift, Drag and moment Coefficients with pressure distribution, Variation of pressure distribution with respect to angle of attack, Governing equations of flow- Continuity, momentum and Energy equations in differential form. Flow regimes based on Mach number.

UNIT - II

Inviscid Incompressible Flow over Airfoil: Governing Equation for incompressible and irrotational flow, Elementary flows and their combinations, Magnus effect, D'Alembert's Paradox, Kutta - Joukowsky theorem, kutta condition. Kelvin's circulation theorem & starting vortex, Thin airfoil theory, expressions for calculating the aerodynamic center and Center of pressure.

UNIT – III

Inviscid Incompressible Flow over Wings: Vortex filament statement of Helmholtz's vortex theorems, Biot - Savart Law, horse shoe vortex, Prandtl's Lifting line theorem - downwash and induced drag, Elliptic loading & wings of elliptic planforms, expression for induced drag.

UNIT IV

Applied Aerodynamics: Lift augmentation and Drag Reduction methods - Flaps, slats, slots, winglets, Leading edge root extensions, Large Eddy Breakup device, Co-flow jet, Cuffs and vortex generators. NACA Airfoils, Circulation control, strakes. Drag augmentation methods – spoilers, Air brakes.

UNIT – V

Experimental Aerodynamics

Wind tunnel and its Components, types of wind tunnels and Model testing in wind tunnels. Pressure, Temperature, Velocity measurements – Hotwire and Laser – Doppler anemometer. Force measurements – Wind tunnel balances. Flow visualization techniques-schileren and shadowgraph methods.

Text books:

1. Fundamentals of Aerodynamics, Anderson, Jr., J.D., International edition, McGraw Hill, 2001, ISBN: 0-07-118146-6.
2. Aerodynamics by L.J. Clancy
3. Compressible Aerodynamics, John D. Anderson

Reference Books:

1. Aerodynamics for Engineers, fourth edition, Bertin, J.J., Pearson Education, 2012, ISBN: 81-297-0486-2.
2. Kuchemann, D., The Aerodynamic Design of Aircraft, Pergamon, 1978.
3. Shevell, R.S., Fundamentals of Flight, Indian reprint, Pearson Education, 2004, ISBN: 81-297-0514-1.
4. 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.

MALLA REDDY COLLEGE OF ENGINEERING & TECHNOLOGY

II Year B. Tech, ANE-II Sem

L	T/P/D	C
2	1/-/-	3

(R18A2108) MECHANICS OF SOLIDS

Unit – I

Analysis of stress- Introduction to Solid Mechanics – Basic Concepts, Types of Stress, General State of Stress at a Point, State of stress at a point, Complimentary Shear stresses, Stresses on Oblique planes, Materials Subjected to pure shear, Material subjected to two mutually perpendicular direct stresses.

Unit – II

Members Subjected to Flexural Loads: Geometric Forms of beams, Classifications of beams, statistically determinate Beams, Concept of Shear Force and bending moment in beams, Cantilever Beam and Simply Supported Beam- Shear Force and Bending Moment Diagrams, Simple Bending theory and Derivation of flexural equation.

Unit – III

Deflection of beams: for a simply supported and Cantilever beam with problems using Double Integration method and Macaulay's method.

Unit – IV

Elastic stability of Columns: Euler's theory, Critical load determination of columns with different end constraints.

Unit – V

Theories of failures: Von-mises theory, octahedral shears distortion energy theory, Maximum principle elastic strain theory, Maximum principle shear strain theory, Maximum shear stress theory.

TEXT BOOKS:

1. Strength of Materials by R S Khurmi, S Chand and company Ltd
2. Strength of Materials by S Ramamrutam, Dhanpat Rai Publications

REFERENCES:

1. Aircraft Structures for Engineering Students by THG Megson, Elsevier Aerospace Engineering Series.

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MALLA REDDY COLLEGE OF ENGINEERING & TECHNOLOGY

	L	T/P/D	C
II Year B. Tech, ANE-II Sem			
	3	**-/-/-**	**3**

(R18A2109)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: Aircraft Engine components- performance requirements, thermodynamic processes- change of state- representation by T-s and 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, 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, thrust reversal, vectoring mechanisms. Afterburner functions and its components, design requirements and parameters. Gross thrust coefficient, discharge, coefficient, velocity coefficient, angularity coefficient, 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, 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, Typical turbine blade profiles, turbine performance maps, Thermal limits of blades, cooling, materials, multistage, multi-spooled turbines.

UNIT IV

ANATOMY OF JET ENGINE-III BURNER: Burners- types, components- function, schematic diagram, airflow distribution, cooling- types, cooling effectiveness, performance parameters - effect of combustor design, Fuel injection, atomization, vaporization, recirculation- flame stabilization, flame holders. Afterburners, fuels - composition.

UNIT V:

DESIGN OF GAS TURBINE ENGINE: Aircraft Mission Analysis, Engine Selection- Performance and Parametric Analysis, Sizing the Engine, Major Considerations in Engine Components Design.

SYSTEM MATCHING AND ANALYSIS: Matching of Gas Turbine Components, Cycle Analysis of one and two spool engines, Gas Generator, Component Modeling, Matching of Engine and Aircraft.

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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MALLA REDDY COLLEGE OF ENGINEERING & TECHNOLOGY

	L	T/P/D	C
II Year B. Tech, ANE-II Sem			
	3	**-/-/-**	**3**

(R18A2110) AIRCRAFT PERFORMANCE

OBJECTIVES OF THE COURSE:

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

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. 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 Mach number; constant altitude, methods- comparison 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 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 performance.

UNIT – IV: MANEUVER PERFORMANCE:
Accelerated motion of aircraft - equations of motion- the maneuver envelope. Longitudinal maneuvers- the pull-up, push over maneuvers. Lateral maneuvers- turn performance- turn rates, turn radius- limiting factors. Maneuver boundaries, Maneuver performance of military aircraft, transport aircraft.

UNIT-V: TAKE-OFF AND LANDING- SAFETY REQUIREMENTS - FLIGHT PLANNING:
Estimation of take-off distances. The effect on the take-off distance with respect to 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.

TEXT BOOKS:

Eshelby, M.E., Aircraft Performance; Theory and Practice, AIAA Education Series, AIAA, 2000, ISBN: 1-56347-398-4.

REFERENCE BOOKS:

1. Raymer, D.P., Aircraft Design: A Conceptual Approach, third edition, AIAA Education Series, AIAA, 1999, ISBN: 1-56347-281-0.
2. Yechout, T.R. et al., Introduction to Aircraft Flight Mechanics, AIAA Education Series, AIAA, 2003, ISBN: 1-56347-577-4.

Outcomes:

1. The student will have a clear understanding of the fundamental concept leading to aircraft performance including military and passenger aircraft.

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MALLA REDDY COLLEGE OF ENGINEERING & TECHNOLOGY

	L	T/P/D	C
II Year B. Tech, ANE-II Sem	**3**	**-/-/-**	**3**

(R18A0024)PROBABILITY AND STATISTICS

Objectives:

1. To understand a random variable that describes randomness or an uncertainty in certain realistic situations which can be either discrete or continuous type.
2. To learn functions of multiple random variables through joint distributions since the random situations are described as functions of multiple random variables.
3. To learn some of the important probability distributions like Binomial, Poisson Distributions (discrete case) and the Normal Distribution (continuous case).
4. To understand linear relationship between two variables and also to predict how a dependent variable changes based on adjustments to an independent variable.
5. To make inferences about a population from sample data(large and small samples) using probability theory.

UNIT – I: Random Variables

Single and multiple random variables -discrete and continuous. Probability distribution function, mass function and density function of probability distributions.Mathematical expectation and variance.

UNIT-II: Probability distributions

Binomial distribution – properties, mean and variance, Poisson distribution – properties, mean and variance and normal distribution – properties, mean and variance.

UNIT -III: Correlation and Regression

Correlation -coefficient of correlation, rank correlation. Regression-regression coefficients, lines of regression.

UNIT –IV: Sampling

Sampling: Definitions of population, sampling, statistic, parameter - types of sampling - expected values of sample mean and variance, standard error - sampling distribution of means and variance. Estimation - point estimation and interval estimation.

Testing of hypothesis: Null and Alternative hypothesis - Type I and Type II errors, critical region - confidence interval - Level of significance, one tailed and two tailed test.

Unit-V: Statistical Inferences

Large sample Tests: Test of significance - Large sample test for single mean, difference of means, single proportion, and difference of proportions.
Small samples: Test for single mean, difference of means, test for ratio of variances (F-test) - Chi-square test for goodness of fit and independence of attributes.

TEXT BOOKS:

i. Fundamental of Statistics by S.C. Gupta, Himalaya Publishing House.
ii. Fundamentals of Mathematical Statistics by SC Gupta and V.K. Kapoor, Sultan Chand Publishers.
iii. Higher Engineering Mathematics by B.S. Grewal, Khanna Publishers.

REFERENCES:

i. Probability and Statistics for Engineers and Scientists by Sheldon M.Ross, Academic Press.
ii. Probability and Statistics by Dr.T.K.V Iyengar , B.KrishnaGandhi ,S. Ranganatham & M V S S A N Prasad. S Chand Publishers.

Course Outcomes: After learning the contents of this paper the student will be able to

- Describe randomness in certain realistic situation which can be either discrete or continuous type.
- Provide very good insight which is essential for industrial applications by learning probability distributions.
- Make data-driven decisions by using correlation and regression.
- Understand the importance of sampling distribution of a given statistic of a random sample.
- *Draw statistical inference* using samples of a given size which is taken from a population and to apply statistical methods for analyzing experimental data.

MALLA REDDY COLLEGE OF ENGINEERING & TECHNOLOGY

	L	T/P/D	C
II Year B. Tech, ANE-I Sem			
	-	**-/3/-**	**1.5**

(R18A0391) 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. Verification of Bernoulli's apparatus.
11. Pipe friction.
12. 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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-	-/3/-	1.5

(R18A0392) CADLAB

LIST OF EXPERIMENT:

1. INTRODUCTION to CAD and AutoCAD – BASICS
2. 2D – FIGURES for practice USING AutoCAD
3. ISOMETRIC DRAWING for practice USING AutoCAD
4. INTRODUCTION TO CREO 3.0
5. 3-D FIGURES USING CREO
6. Modeling of Knuckle Joint
7. Modeling of Piston Cylinder Assembly
8. Modeling of stuffing box
9. Modeling of wing
10. Modeling of Fuselage
11. Modeling of Empennage
12. Assembling of Landing Gear

Software: AUTOCAD 2013 and CREO – 3.0

REFERENCES:

1. Engineering graphics with Auto CAD- R.B. Choudary/Anuradha Publishes

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(R18A0004)FOREIGN LANGUAGE: FRENCH
(Mandatory Course)

INTRODUCTION

In view of the growing importance of foreign languages as a communication tool in some countries of the world, French has been identified as one of the most popular languages after English. As a result, French program is introduced to develop the linguistic and communicative skills of engineering students and to familiarize them to the French communication skills. This course focuses on basic oral skills.

OBJECTIVES

1. To inculcate the basic knowledge of the French language.
2. To hone the basic sentence constructions in day to day expressions for communication in their vocation.
3. To culminate their major with evidence of a purposeful education.

UNIT - I:

Speaking: Introduction to the French language and culture – Salutations - French alphabet - Introducing people

Writing: Understand and fill out a form

Grammar: The verbs “to be ' and “to have '' in the present tense of the indicative

Vocabulary: The numbers from 1 to 20 - Professions – Nationalities

UNIT - II:

Speaking: Talk about one’s family – description of a person - express his admirations and preferences - express possession - express negation

Writing: Write and understand a short message

Grammar: Nouns (gender and number) - Articles - The –er verbs in the present - Possessive adjectives Qualifying adjectives

Vocabulary: The family – Clothes - Colors - The numbers from 1 to 100 - The classroom

UNIT - III

Speaking: Talk about your daily activities - be in time - ask and indicate the date and time - talk about sports and recreation - express the frequency

Writing: A letter to a friend
Grammar: The expression of time – The –ir verbs in the present - The verbs do, go, take, come, - Adverbs - Reflexive verbs
Vocabulary: The days and months of the year - The sports – Hobbies

UNIT - IV
Speaking: Express the quantity - ask and give the price - express the need, the will and the capacity - compare (adjective) - speak at the restaurant / in the shops
Writing: A dialogue between a vendor and a customer at the market
Grammar: Verbs "to want", "to can" - Express capacity / possibility - Express will / desire – the future tense
Vocabulary: The food – Meals - Fruits and vegetables – The parts of the body

UNIT - V
Speaking: Express the prohibition and the obligation - describe an apartment - talk about the weather / ask the weather - ask the opinion - give your opinion - express your agreement or disagreement
Writing: Descriptions
Grammar: Demonstrative adjectives -Prepositions - The verb 'must' to indicate obligation and necessity in the present
Vocabulary: Seasons – Holidays - The city – Furniture

NOTE: The students are exposed to simple listening and reading activities.

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 Evelyne Charvier-Berman, Anne C. Cummings.

OUTCOMES

1. The students will be able to communicate in French at A1 level.
2. The student will have an advantage in the competitive job market.
3. This course benefits the graduates when pursuing study *opportunities* in the countries where French is the official language.

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2	-/-/-	-

(R18A0005)FOREIGN LANGUAGES: GERMAN
(Mandatory Course)

INTRODUCTION

This is the age of globalization. Faster communication, extensive travel, greater interaction, outsourcing of jobs, demand of skilled person had made the engineering graduates to learn GERMAN language. Nowadays Aircraft and mechanical domain require more and more graduates with minimum knowledge to speak in German language

German language has been one of the fastest learning language in the world. This course is customized according to the demand of the requirement in job industries.

OBJECTIVES:

1. To equip with the vocabulary to create new sentences, sentence pattern, correct pronunciation.
2. To make the students an efficient German language speaker.
3. To focus on basic linguistic and communicative structures of the German language.

SYLLABUS

UNIT 1 : Basics of Deutsch

Introduction – (About German Country, Language & Culture)
Formal And Informal Greetings
Alphabet
Numbers (0-50)
Days Of The Week And Months Of The Year
Vocabulary, Exercises and Assignments

UNIT 2 : Getting closer with Deutsch

Family
Seasons & Weather
Time & Directions, Days Of Weak, Months
Colours & Shapes, Numbers (51 – 100)
Subject Pronouns
Vocabulary, Exercises and Assignments

Unit 3 : **Construction of Simple Sentences**

Formal Introduction
Asking Questions
Responding to the Questions
Simple Sentences
Articles, Numbers (101 And Above)
Vocabulary, Exercises and Assignments

Unit 4 : **Dialogue Writing**

Introduce Oneself
Introduce Others
At the Restaurant
At the Railway Station
At the University
Vocabulary, Exercises and Assignments

REFERENCE BOOKS

6. Collins easy learning GERMAN dictionary
7. Hallo deutsch – Parul sharma
8. Studio D A1 – Hermann
9. So geht das – New Saraswati book house
10. Practice German language for beginners – Dominic
11. German Made easy – Diego Agundez

OUTCOMES

Student will be able to:

1. stand ahead of getting the opportunity in the Job market by learning German language.
2. learn German language with engineering degree that will give them a sense of identity among the competitive global engineering industry.
3. learn German language on a regular basis that will help them in improving multi-lingual ability.

OPEN ELECTIVE - I

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3	-/-/-	3

OPEN ELECTIVE - I
(R18A0451) 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

(R18A0551) 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

(R18A0553) DATA STRUCTURES USING PYTHON

COURSE OBJECTIVES:

- To read and write simple Python programs.
- To develop Python programs with conditionals and loops.
- To define Python functions and call them.
- To use Python data structures –- lists, tuples, dictionaries.
- To do input/output with files in Python.

Unit I

Introduction to Python, Installation and Working with Python, Understanding Python variables, Python basic Operators, Understanding python blocks, Python Data Types: Declaring and using Numeric data types: int, float, complex, Using string data type and string operations.

UNIT II

Control Flow- if, if-elif-else, loops ,For loop using ranges, string ,Use of while loops in python, Loop manipulation using pass, continue, break and else, Programming using Python conditional and loops block, Python arrays.

UNIT III

Functions -Calling Functions, Passing Arguments, Keyword Arguments, Default Arguments, Variable-length arguments, Anonymous Functions, Fruitful Functions(Function Returning Values), Scope of the Variables in a Function - Global and Local Variables. Powerful Lamda function in python.

UNIT IV

Data Structures-List Operations, Slicing, Methods; Tuples, Sets, Dictionaries, Sequences. Comprehensions, Dictionary manipulation, list and dictionary in build functions

UNIT V

Sorting:BubbleSort,SelectionSort,InsertionSort,Mergesort,Quicksort.LinkedLists,Stacks,Queues

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

- Read, write, execute by hand simple Python programs.
- Structure simple Python programs for solving problems.
- Decompose a Python program into functions.
- Represent compound data using Python lists, tuples, dictionaries.
- Read and write data from/to files in Python Programs

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.

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II Year B.Tech II Sem	L	T/P/D	C
	3	-/-/-	3

OPEN ELECTIVE - I

(R18A0351) INTELLECTUAL PROPERTY RIGHTS

COURSE 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

COURSE 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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OPEN ELECTIVE - I

(R18A0352) GREEN ENERGY SYSTEMS

COURSE 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

COURSE 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.

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3	-/-/-	3

OPEN ELECTIVE – I

(R18A0555) DATA VISUALIZATION

Course Objectives:

- To learn different statistical methods for Data visualization.
- To understand the basics of R and Python.
- To learn usage of Watson studio.
- To understand the usage of the packages like Numpy, pandas and matplotlib.
- To know the functionalities and usages of Seaborn.

UNIT I

Introduction to Statistics : Introduction to Statistics, Difference between inferential statistics and descriptive statistics, Inferential Statistics- Drawing Inferences fromData, Random Variables, Normal Probability Distribution, Sampling, Sample Statistics and Sampling Distributions.

R overview and Installation- Overview and About R, R and R studio Installation, Descriptive Data analysis using R, Description of basic functions used to describe data in R.

UNIT II

Data manipulation with R: Data manipulation packages-dplyr, data.table, reshape2, tidyr, Lubridate, Data visualization with R.

Data visualization in Watson Studio: Adding data to datarefinery, Visualization of Data on WatsonStudio.

UNIT III

Python: Introduction toPython, How toInstall, Introduction to JupyterNotebook, Python scripting basics, Numpy and Pandas-Creating and Accessing Numpy Arrays, Introduction to pandas, read and write csv, Descriptive statistics using pandas, Working with text data and date time columns, Indexing and selecting data, groupby, Merge / Join datasets

UNIT IV

Data Visualization Tools in Python- Introduction to Matplotlib, Basic plots using matplotlib, Specialized Visualization Tools usingMatplotlib, Advanced Visualization Tools using Matplotlib-Waffle Charts, Word Clouds.

UNIT V

Introduction to Seaborn: Seaborn functionalities and usage, Spatial Visualizations and Analysis in Python with Folium, Case Study.

TEXT BOOKS:

1. Core Python Programming - Second Edition,R. Nageswara Rao, Dreamtech Press.
2. Hands on programming with R by Garrett Grolemund,Shroff/O'Reilly; First edition
3. Fundamentals of Mathematical Statistics by S.C. Gupta, Sultan Chand & Sons

REFERENCE BOOKS:

1. Learn R for Applied Statistics: With Data Visualizations, Regressions, and Statistics by Eric Goh Ming Hui, Apress
2. Python for Data Analysis by William McKinney, Second Edition, O'Reilly Media Inc. \
3. The Comprehensive R Archive Network- https://cran.r-project.org
4. https://seaborn.pydata.org/
5. https://dataplatform.cloud.ibm.com/

Course Outcomes:

At Completion of this course, students would be able to -

- Apply statistical methods for Data visualization.
- Gain knowledge on R and Python
- Understand usage of various packages in R and Python.
- Demonstrate knowledge of Watson studio.
- Apply data visualization tools on various data sets

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III Year B.Tech ANE-I Sem	L	T/P/D	C
	2	-/1/-	3

(R18A2111) AIRCRAFT VEHICLE STRUCTURES

Objectives:

- To impart basic understanding of aircraft structures
- To provide the students an understanding on the linear static analysis of determinate and Indeterminate aircraft structural components.
- To provide an understanding on idealization

UNIT –I

THEORY OF THIN PLATES AND THIN WALLED BEAMS

Analysis of thin rectangular plates subject to bending, distributed transverse load, combined bending and twisting, Wagner beam analysis.

UNIT –II

UNSYMMETRICAL BENDING

Unsymmetrical bending-resolution of bending moments - direct stress distribution, shear flow in open section beams, shear centre, Torsion of thin walled closed section- Bredth - Batho shear flow.

UNIT –III

ENERGY METHODS

Strain Energy due to axial, bending and torsional loadings. Deflection in beams- Castigliano's theorem

UNIT-IV

STRUCTURAL IDEALIZATION AND LOADING DISCONTINUITIES IN THIN WALLED BEAMS

Structural idealization of different aircraft components, shear stress distribution at a built in end of a closed section beam.

UNIT- V

Stress Analysis of Aircraft Components

Wing and Fuselage - Direct stress and shear flow distribution -Wing spars, tapered wing and fuselage frames.

Text Books:

1. Strength of materials by R.S.Khurmi.
2. Strength of materials by Hibler.

3. Aircraft structures for engineering students by T H G Megson

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.

Outcomes:

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

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III Year B.Tech ANE-I Sem	L	T/P/D	C
	3	-/-/-	3

(R18A2112) AIRCRAFT STABILITY AND CONTROL

Objectives:

1. To understand the concepts of stability and control of aircraft.
2. To familiarize with various Aircraft motions and related stability
3. Analyze the different type of modes in longitudinal, lateral and directional motion of aircraft, and recovery from those modes.
4. Understand Method of mathematical modeling of physical systems
5. Review Performance analysis and design of aircraft control system

UNIT –I: Stability, Control Requirements &Static Longitudinal Stability and Control: Degree of freedom of a system -Static and dynamic stability -Purpose of controls -Inherently and marginally stable airplanes. **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-**stick free stability**-Hinge moment coefficient-stick free neutral points- maneuvers-stick force gradients-stick force per'g'-Aerodynamic balancing.

UNIT –II: **Aircraft Equations of motion- Perturbed Motion- Linearized, Decoupled Equations**:

Aircraft Equations of Motion (EOM), Aircraft Position and Orientation, Stability-Frame and Body- Frame, Euler's Equations, Small Disturbance Theory and Linearization of EOM, Decoupling into longitudinal and lateral-directional motions- conditions for validity- role of symmetry.

UNIT –III: **Lateral ,Directional & Dynamic Stability-Response To Control**: 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.
Solutions to the stability quartic of the linearized 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.

UNIT –IV: **Control System Modeling and Feedback Control**

Basic components of control system, open loop system, closed loop system, Types. Reduction of block diagrams - rules and conventions. Stability analysis- Routh Hurwitz, Polar plot, - determination of gain margin and phase margin.

UNIT-V: Design of Aircraft Controller, Stability and Control Augmentation & Auto Pilots

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.

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.

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III Year B.Tech ANE-I Sem	L	T/P/D	C
	3	-/-/-	3

(R18A0061) 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.

OUTCOMES:

Students should be able

- To understand the basic economic principles, forecast demand and supply
- To estimate cost and understand market structure, pricing practices
- To interpret the financial results of the organisation.

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 (Survey Methods, Expert Opinion, Test Marketing, Controlled Experience, Judgemental Approach, and Time Series Analysis).

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)

Unit-III

Markets: Types of Competition and Markets, Features of Perfect Competition, Monopoly and Monopolistic Competition;

Pricing: Objectives, Methods of Pricing; Business: Features of different forms of Business Organisation (Sole Trader, Partnership, Joint Stock Company, Cooperative Society, and Public Enterprises).

Unit-IV

Introduction to Capital and Financial Accounting: Need for Capital, Types of Capital, Working Capital Analysis, Methods and Sources of raising Finance.

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

Unit-V

Investment Decision: Capital Budgeting - Features, Objectives, and Methods (Payback Method, Accounting Rate of Return and Net Present Value) - advantages & disadvantages. (Simple Problems)

Financial Analysis: Analysis and Interpretation of Liquidity Ratios, Activity Ratios, Capital Structure Ratios and Profitability Ratios. (Simple Problems)

References:

- Managerial Economics & Financial Analysis, Special Edition-MRCET. McGraw Hill Publications, 2017 D.N. Dwivedi, Managerial Economics, Vikas Publications.
- Justin Paul, Leena, Sebastian, Managerial Economics, Cengage
- P. L. Mehta, Managerial Economics: Analysis, Problems and Cases, Sultan Chand & Sons.
- S. N. Maheswari & S. K. Maheswari, Financial Accounting, Vikas Publications.
- M. Y. Khan and P. K. Jain, Financial Management, McGraw Hill

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III Year B.Tech ANE-I Sem

L	T/P/D	C
2	-/1/-	3

(R18A2113) 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, 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, regular reflection from a solid boundary. Expansion waves, Prandtl – Meyer Expansion. Shock Expansion theory.

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

LINEARIZED SUPERSONIC FLOWS AND HYPERSONIC FLOWS

Linearized supersonic pressure coefficient, application to airfoils, lift and drag for flat plate, comparision with shock expansion theory.

Qualitative aspects of hypersonic flows, Newtonian theory, modified Newtonian theory, lift and drag.

UNIT- V

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.

Text Books:

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

Reference Books:

1. Radhakrishnan, E, E., Gas Dynamics, Prentice Hall of India, 1995.

2. Anderson, J .D., Modern Compressible Flow with Historical Perspective, Mc Graw-Hill International third edition Singapore-2004.

Outcomes:

- Understand the compressible flow parameters shock and expansion wave effecting flow behavior.
- Able to design nozzle, diffuser and variable area ducts to obtain required aerodynamic outputs.
- Able to understand hypersonic flows.

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III Year B. Tech, ANE-I Sem

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3	-/-/-	3

(R18A2131)INTRODUCTION TO SPACE TECHNOLOGY

(PROFESSIONAL ELECTIVE – I)

Objectives:

- Students acquire knowledge about the present space technology.
- Students can focus on various orbits, re-entry paths, and also understand the future scenario.
- To provide an exposure with attitude requirements and design limitations.

UNIT - I

Fundamentals of Rocket Propulsion: Space Mission-Types based on Space Environment, vehicle selection. Rocket propulsion-Types, Rocket equation, chemical rocket propulsion, solid propellant rocket motor, liquid propellant rocket engine,

Two-dimensional trajectories of rockets and missiles-Multi-stage rockets-Vehicle sizing-Two stage Multi-stage Rockets-Trade-off Ratios-Single Stage to Orbit-Sounding Rocket-Aerospace Plane-Gravity Turn Trajectories-Impact point calculation-injection conditions-Flight dispersions.

UNIT - II

Atmospheric Reentry: Introduction-Steep Ballistic Reentry-Ballistic Orbital Reentry-Skip Reentry-"Double-Dip" Reentry - Aero-braking - Lifting Body Reentry.

UNIT - III

Fundamentals of Orbit Mechanics, Orbit Maneuvers: Two-body motion-Circular, elliptic, hyperbolic, and parabolic orbits-Basic Orbital Elements-Ground trace In-Plane Orbit changes-Hohmann Transfer-Bielliptical Transfer-Plane Changes - Combined Maneuvers - Propulsion for Maneuvers.

UNIT - IV

Satellite Attitude Dynamics: Torque free axi-symmetric rigid body-Attitude Control for Spinning Spacecraft - Attitude Control for Non-spinning Spacecraft - The Yo-Yo Mechanism - Gravity - Gradient Satellite-Dual Spin Spacecraft- Attitude Determination.

UNIT - V

Space Mission Operations: Supporting Ground Systems Architecture and Team interfaces - Mission phases and Core operations - Team Responsibilities - Mission Diversity - Standard Operations Practices.

Text Books:

1. "Spaceflight Dynamics", W.E. Wiesel, McGraw Hill, 1997.

2. "Rocket Propulsion and Space flight dynamics", Cornelisse, Schoyer HFR and Wakker KF, Pitman, 1984.

Reference Books:

1. Vincet L. Pisacane, "Fundamentals of Space Systems", Oxford University Press, 2005.
2. "Understanding Space: An Introduction to Astronautics", J.Sellers, McGraw Hill, 2000.
3. "Introduction to Space Flight", Francis J Hale, Prentice-Hall, 1994.
4. "Spacecraft Mission Design", Charies D.Brown, AIAA education Series, 1998.
5. "Elements of Space Technology for aerospace Engineers", Meyer Rudolph X, Academic Press, 1999.

Outcomes:

- Students can correlate with the different orbits and mechanics available.
- Students can obtain knowledge of space mission operations.
- Students can able to design the conceptual requirements.

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III Year B.Tech ANE-I Sem

L	T/P/D	C
3	-/-/-	3

(R18A2132) MECHANISMS AND MACHINE DESIGN
PROFESSIONAL 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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III Year B.Tech ANE-I Sem

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(R18A2133) WIND TUNNEL TECHNIQUES

PROFESSIONAL ELECTIVE – I

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.

OPEN ELECTIVES II

MALLA REDDY COLLEGE OF ENGINEERING AND TECHNOLOGY

III Year B.Tech. I Sem

L	T/P/D	C
3	-/-/-	3

OPEN ELECTIVE II

(R18A1251)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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III Year B.Tech. I Sem	L	T/P/D	C
	3	-/-/-	3

OPEN ELECTIVE II

(R18A0552) 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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III Year B.Tech. I Sem	L	T/P/D	C
	3	-/-/-	3

OPEN ELECTIVE II

(R18A01252) 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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---/-/-3

OPEN ELECTIVE II
(R18A0353) 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), Data Warehousing, Data Mining, Reasons for the growth of ERP market.

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, Financial Management, Quality Management, Materials Management, Supply chain Management (SCM), 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 Plan
2)To understand basic concepts of erp systems for manufacturing or service companies.

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III Year B. Tech I Sem	L	T/P/D	C
	3	-/-/-	3

OPEN ELECTIVE II

(R18A0354) 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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III Year B. Tech, ANE-I Sem

	L	T/P/D	C
(R18A2183)AERODYNAMICS AND PROPULSION LAB	**-**	**-/3/-**	**1.5**

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

MALLA REDDY COLLEGE OF ENGINEERING & TECHNOLOGY

III Year B. Tech, ANE-I Sem

	L	T/P/D	C
(R18A2184) Aircraft Structures Lab	-	-/3/-	1.5

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. Compression tests on long columns - Critical buckling loads
4. Compression tests on short columns - Critical buckling loads
5. Failure strength of riveted joints.
6. Failure strength of bolted joints.
7. NDT inspection methods.
8. Shear Center of open and closed sections.
9. To calculate instability of a Wagner beam
10. Deflection of a simply supported beam with varying load conditions.
11. Unsymmetrical bending of cantilever beam
12. Verification of principle of superposition

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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III Year B. Tech, ANE-I Sem

	L	T/P/D	C
(R18A0521) CYBER SECURITY	**2**	**-/-/-**	**-**

-Course objectives:

- To familiarize various types of cyber-attacks and cyber-crimes
- To give an overview of the cyber laws
- To study the defensive techniques against these attacks

Course Outcomes: The students will be able to understand cyber-attacks, types of cybercrimes, cyber laws and also how to protect them self and ultimately the entire Internet community from such attacks.

UNIT - I

Introduction to Cyber Security: Basic Cyber Security Concepts, layers of security, Vulnerability, threat, Harmful acts, Internet Governance – Challenges and Constraints, Computer Criminals, CIA Triad, Assets and Threat, motive of attackers, active attacks, passive attacks, Software attacks, hardware attacks, Spectrum of attacks, Taxonomy of various attacks, IP spoofing, Methods of defense, Security Models, risk management, Cyber Threats-Cyber Warfare, Cyber Crime, Cyber terrorism, Cyber Espionage, etc., Comprehensive Cyber Security Policy.

UNIT - II

Cyberspace and the Law & Cyber Forensics: Introduction, Cyber Security Regulations, Roles of International Law. The INDIAN Cyberspace, National Cyber Security Policy.

Introduction, Historical background of Cyber forensics, Digital Forensics Science, The Need for Computer Forensics, Cyber Forensics and Digital evidence, Forensics Analysis of Email, Digital Forensics Lifecycle, Forensics Investigation, Challenges in Computer Forensics, Special Techniques for Forensics Auditing.

UNIT - III

Cybercrime: Mobile and Wireless Devices: Introduction, Proliferation of Mobile and Wireless Devices, Trends in Mobility, Credit card Frauds in Mobile and Wireless Computing Era, Security Challenges Posed by Mobile Devices, Registry Settings for Mobile Devices, Authentication service Security, Attacks on Mobile/Cell Phones, Mobile Devices: Security Implications for Organizations, Organizational Measures for Handling Mobile, Organizational Security Policies and Measures in Mobile Computing Era, Laptops.

UNIT- IV

Cyber Security: Organizational Implications: Introduction, cost of cybercrimes and IPR issues, web threats for organizations, security and privacy implications, social media marketing: security risks and perils for

organizations, social computing and the associated challenges for organizations. **Cybercrime and Cyber terrorism:** Introduction, intellectual property in the cyberspace, the ethical dimension of cybercrimes the psychology, mindset and skills of hackers and other cyber criminals.

UNIT - V

Privacy Issues: Basic Data Privacy Concepts: Fundamental Concepts, Data Privacy Attacks, Datalinking and profiling, privacy policies and their specifications, privacy policy languages, privacy in different domains- medical, financial, etc.

Cybercrime: Examples and Mini-Cases

Examples: Official Website of Maharashtra Government Hacked, Indian Banks Lose Millions of Rupees, Parliament Attack, Pune City Police Bust Nigerian Racket, e-mail spoofing instances. **Mini-Cases:** The Indian Case of online Gambling, An Indian Case of Intellectual Property Crime, Financial Frauds in Cyber Domain.

TEXT BOOKS:

1. Nina Godbole and Sunit Belpure, Cyber Security Understanding Cyber Crimes, Computer Forensics and Legal Perspectives, Wiley

2. B. B. Gupta, D. P. Agrawal, Haoxiang Wang, Computer and Cyber Security: Principles, Algorithm, Applications, and Perspectives, CRC Press, ISBN 9780815371335, 2018.

REFERENCES:

1. Cyber Security Essentials, James Graham, Richard Howard and Ryan Otson, CRC Press.

2. Introduction to Cyber Security, Chwan-Hwa(john) Wu,J. David Irwin, CRC Press T&FGroup.

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III Year B. Tech, ANE-II Sem

	L	T/P/D	C
(R18A2114) FINITE ELEMENT ANALYSIS	**2**	**1/-/-**	**4**

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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III Year B. Tech, ANE-II Sem

	L	T/P/D	C
(R18A2115) Aerospace Propulsion Systems	**2**	**1/-/-**	**3**

Objective:

- Students acquire knowledge about the present space equipment.
- Students can focus on various launch systems available in aerospace industry and also understand the future scenario.
- 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:

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

MALLA REDDY COLLEGE OF ENGINEERING & TECHNOLOGY

III Year B. Tech, ANE-II Sem	L	T/P/D	C
	2	1/-/-	3

(R18A1205) ARTIFICIALINTELLIGENCE

Course Objectives: To train the students to understand different types of AI agents, various AI search algorithms, fundamentals of knowledge representation, building of simple knowledge-based systems and to apply knowledge representation, reasoning. Study of Markov Models enable the student ready to step into applied AI.

UNIT - I

Introduction: AI problems, Agents and Environments, Structure of Agents, Problem Solving Agents **Basic Search Strategies**: Problem Spaces, Uninformed Search (Breadth- First, Depth-First Search, Depth-first with Iterative Deepening), Heuristic Search (Hill Climbing, Generic Best-First, A*), Constraint Satisfaction (Backtracking, Local Search)

UNIT - II

Advanced Search: Constructing Search Trees, Stochastic Search, A* Search Implementation, Minimax Search, Alpha-Beta Pruning

Basic Knowledge Representation and Reasoning: Propositional Logic, First-Order Logic, Forward Chaining and Backward Chaining, Introduction to Probabilistic Reasoning, Bayes Theorem

UNIT - III

Advanced Knowledge Representation and Reasoning: Knowledge Representation Issues, Non- monotonic Reasoning, Other Knowledge Representation Schemes

Reasoning Under Uncertainty: Basic probability, Acting Under Uncertainty, Bayes' Rule, Representing Knowledge in an Uncertain Domain, Bayesian Networks

UNIT - IV

Learning: What Is Learning? Rote Learning, Learning by Taking Advice, Learning in Problem Solving, Learning from Examples, Winston's Learning Program, Decision Trees.

UNIT - V

Expert Systems: Representing and Using Domain Knowledge, Shell, Explanation, Knowledge Acquisition.

TEXT BOOK:

1. Russell, S. and Norvig, P, Artificial Intelligence: A Modern Approach, Third Edition, Prentice- Hall, 2010.

REFERENCE BOOKS:

1. Artificial Intelligence, Elaine Rich, Kevin Knight, Shivasankar B. Nair, The McGraw Hill publications, Third Edition, 2009.
2. George F. Luger, Artificial Intelligence: Structures and Strategies for Complex Problem Solving, Pearson Education, 6th ed., 2009.

MALLA REDDY COLLEGE OF ENGINEERING & TECHNOLOGY

III Year B. Tech, ANE-II Sem

	L	T/P/D	C
(R18A2134)FLIGHT SCHEDULING AND OPERATIONS PROFESSIONAL ELECTIVE – II	**3**	**-/-/-**	**3**

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

MALLA REDDY COLLEGE OF ENGINEERING & TECHNOLOGY

III Year B. Tech, ANE-II Sem

	L	T/P/D	C
(R18A2135) AIR TRANSPORTATION SYSTEMS (PROFESSIONAL ELECTIVE – II)	**3**	**-/-/-**	**3**

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

MALLA REDDY COLLEGE OF ENGINEERING & TECHNOLOGY

III Year B. Tech, ANE-II Sem

L	T/P/D	C
3	-/-/-	3

(R18A2136) AIRFRAME STRUCTURAL DESIGN (PROFESSIONAL ELECTIVE – II)

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, Air loads, external loading, weight, operating conditions, conformity to government regulations.

Unit II

FASTENERS AND STRUCTURAL JOINTS

Fasteners and fittings- role, significance, general design considerations, Fastener systems, types, fastener information, dimensions, materials, allowable strength- tensile, shear, bending. Rivets, bolts and screws, nuts-detail design consideration. Fittings- lugs, bushings and bearings-loading design and analysis. Joints – splices, eccentric, gusset, welded, brazed, bonded- types, methods of joining, failure modes.

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. Leading and trailing edge assembly- control surfaces, flaps- structure. Tail unit- horizontal, vertical tail, elevator, rudder- configuration.

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.

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. Significance Fail-safe design- the concept, requirements, damage tolerance.

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

OPEN ELECTIVES III

MALLA REDDY COLLEGE OF ENGINEERING AND TECHNOLOGY

III Year B.Tech. II Sem

L	T/P/D	C
3	-/-/-	3

OPEN ELECTIVE III

(R18A0452) 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.

MALLA REDDY COLLEGE OF ENGINEERING AND TECHNOLOGY

III Year B.Tech. II Sem	L	T/P/D	C
	3	-/-/-	3

OPEN ELECTIVE III

(R18A0453) INTERNET OF THINGS & ITS APPLICATIONS

OBJECTIVES:

i) To study the fundamentals about IoT
ii) To study about IoT Access technologies
iii) To study the design methodology and different IoT hardware platforms.
iv) To study the basics of IoT Data Analytics and supporting services.
v) To study about various IoT case studies and industrial applications.

UNITI: FUNDAMENTALS OF IoT- Evolution of Internet of Things, Enabling Technologies, M2M Communication, IoT World Forum (IoTWF) standardized architecture, Simplified IoT Architecture, Core IoT Functional Stack, Fog, Edge and Cloud in IoT, Functional blocks of an IoT ecosystem, Sensors, Actuators, Smart Objects and Connecting Smart Objects.

UNIT II: IoT PROTOCOLS- IoT Access Technologies: Physical and MAC layers, topology and Security of IEEE 802.15.4, 802.11ah and Lora WAN, Network Layer: IP versions, Constrained Nodes and Constrained Networks,6LoWPAN, Application Transport Methods: SCADA, Application Layer Protocols: CoAP and MQTT.

UNIT III: DESIGN AND DEVELOPMENT- Design Methodology, Embedded computing logic, Microcontroller, System on Chips, IoT system building blocks

IoT Platform overview: Overview of IoT supported Hardware platforms such as: Raspberry pi, Arduino Board details

UNIT IV: DATA ANALYTICS AND SUPPORTING SERVICES:

Data Analytics: Introduction, Structured Versus Unstructured Data, Data in Motion versus Data at Rest, IoT Data Analytics Challenges, Data Acquiring, Organizing in IoT/M2M,

Supporting Services: Computing Using a Cloud Platform for IoT/M2M Applications/Services, Everything as a service and Cloud Service Models.

UNIT V: CASE STUDIES/INDUSTRIAL APPLICATIONS: IoT applications in home, infrastructures, buildings, security, Industries, Home appliances, other IoT electronic equipments, Industry 4.0 concepts.

Text Books:

1. IoT Fundamentals: Networking Technologies, Protocols and Use Cases for Internet of Things, David Hanes, Gonzalo Salgueiro, Patrick Grossetete, Rob Barton and Jerome Henry, Cisco Press, 2017
2. Internet of Things – A hands-on approach, Arshdeep Bahga, Vijay Madisetti, Universities Press,

2015
3. Internet of Things: Architecture, Design Principles And Applications, Rajkamal, McGraw Hill HigherEducation

Reference Books:

1. The Internet of Things – Key applications and Protocols, Olivier Hersent, David Boswarthick, Omar Elloumi and Wiley, 2012 (for Unit2).
2. "From Machine-to-Machine to the Internet of Things – Introduction to a New Age of Intelligence",Jan Ho¨ ller, VlasiosTsiatsis, Catherine Mulligan, Stamatis, Karnouskos, Stefan Avesand. David Boyle and Elsevier, 2014.
3. Architecting the Internet of Things,Dieter Uckelmann, Mark Harrison, Michahelles and Florian (Eds), Springer,2011.
4. Recipes to Begin, Expand, and Enhance Your Projects, 2nd Edition,Michael Margolis,Arduino Cookbook and O"Reilly Media,2011.

Course Outcomes:

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

- Understand the basics of IoT.
- Implement the state of the Architecture of anIoT.
- Understand design methodology and hardware platforms involved in IoT.
- Understand how to analyze and organize the data.
- Compare IOT Applications in Industrial & realworld.

MALLA REDDY COLLEGE OF ENGINEERING AND TECHNOLOGY

III Year B.Tech - II Sem

L	T/P/D	C
3	-/-/-	3

(OPEN ELECTIVE - III)

(R18A1253) SOFTWARE TESTING TECHNIQUES

COURSE OBJECTIVES:

1) Knowing the concepts of Software Engineering and software development life cycle.
2) Understanding the foundations, techniques, and tools in the area of software testing and its practice in the industry.
3) Learning the functional aspect of the various testing techniques.
4) Knowledge of the creation of test cases and usage of testing tools.

UNIT - I INTRODUCTION

Software, Software Engineering, Process Models: Waterfall Model, Spiral Model, Prototyping, V Model. Software Testing – Definition of Software Testing – Objective and limits of testing – Testing Strategy – Roles and Responsibilities of a Software Tester – Independent Verification and Validation.

UNIT - II SOFTWARE TESTING REQUIREMENTS

Software Testing Requirements - Analyzing the requirements -Classifying the Functional and Non Functional Requirements. Software Testing Review Process - Objective of Software Testing Review - Types of Reviews: Peer Review – Walkthrough - Inspection - Checklists of Review Process - Review Log.

UNIT - III TESTING TECHNIQUES

White box testing techniques – Static and Dynamic Testing – Statement Coverage – Decision/Branch Coverage – Basic Path Testing – Control Flow Graph Coverage – Conditional Coverage – McCabe's Cyclomatic Complexity – Mutation Testing. Black Box Test Techniques: Boundary Value Analysis – Equivalent Class Partition – Cause-Effect Analysis – Decision Table – State Transition Table – Pair Wise Testing – Use Case Testing.

UNIT - IV TESTING TYPES

Unit Testing, Functional Testing: Smoke Testing – Integration, System Testing, User Acceptance Testing - Non Functional Testing:– Performance Testing – Recovery Testing – Security Testing – Compatibility Testing – Usability Testing – Ad Hoc Testing – Internationalization Testing – Configuration Testing - Data ware House Testing and Business Intelligence Testing – SOA Testing - Mobile Testing.

UNIT - V TEST CASE DESIGN

Definition of Test Case - Standards, Guidelines and Naming Conventions – Characteristics of Good Test Cases – Test Case templates – Creation of Test Case – Requirement Coverage – Traceability Matrix – Test Case Review Process – Test Execution – Test Log - Reporting of Test Execution – Definition of Risk - Risk Based Testing Approach.

Overview of Testing Tools like Winrunner, Loadrunner, Selenium, JMeter.

TEXT BOOKS :

1. Software Testing Techniques – BorisBeizer, Dreamtech, second edition.
2. Software Testing Tools – Dr.K.V.K.K.Prasad, Dreamtech.
3. S.Subashni, N.Satheesh Kumar, Dr.B.G.Geetha, Dr.G.Singaravel, ”Software Testing”, Umayam Publications , First edition, 2013.

REFERENCE BOOKS:

1. Srinivasan Desikan, Gopalaswamy Ramesh,”Software Testing: Principles and Practice”, Pearson Education India, First Impression 2006.
2. Software Testing Techniques – SPD(Oreille)
3. Software Testing Concepts and Tools:P.NageshwarRao, dreamtechPress.
4. Art of Software Testing – Meyers, John Wiley.
5. Software Testing in the Real World – Edward Kit, Pearson.

COURSE OUTCOMES:

1) Analyze the strategies for software testing.
2) Identify the issues in test management and testing activity.
3) Apply the suitable testing strategy for a given application.
4) Development of test cases and selection of appropriate testing tool.

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L	T/P/D	C
3	-/-/-	3

OPEN ELECTIVE III

(R18A0355) 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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3	-/-/-	3

(OPEN ELECTIVE - III)

(R18A0251) ELECTRICAL SYSTEMS & APPLICATIONS

COURSE OBJECTIVES:

- To introduce the fundamental concepts of electro mechanical energy conversion
- 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

ELECTRICAL SYSTEM COMPONENTS: LT system wiring components, Selection of Cables, Wires, Switches, Distribution Box, Metering System, Tariff structure, Protection Components- Fuse, MCB, MCCB, ELCB, Inverse current characteristics, Symbols, Single Line Diagram (SLD) of a wiring system, Contactor, Isolator,Relays, MPCB, Electric shock and Electrical safety practices.

UNIT- II

RESIDENTIAL AND COMMERCIAL ELECTRICAL SYSTEMS: Types of residential and commercial wiring systems, general rules and guidelines for installation. Load calculation and sizing of wire, rating of main switch, distribution board and protection devices. Earthing system calculations.Requirements of commercial installation- deciding lighting scheme and number of lamps, earthing of commercial installation, selectionand sizing of components.

UNIT- III

ILLUMINATION SYSTEMS: Understanding various terms related to light intensity, Lumens, candle power, lamp efficiency,specific consumption.Various illumination schemes- Incandescent lamps, modern luminaries like CFL, LED andtheir operation, energy saving in illumination systems, design of a lighting scheme for residential and commercial premises, flood lighting.

UNIT-IV:

INDUSTRIAL ELECTRICAL SYSTEMS: UPS System-Types, Principle of operation.Battery banks, sizing theUPS and Battery Banks, Selection of UPS and Battery Banks.

UNIT-V:

SINGLE PHASE AC MOTOR AND SPECIAL MOTORS: Constructional features, Principle of operation, Characteristics, Speed control and Applications of Single phase AC motor, Stepper motor, Brushless DC motor and Universal motor(Qualitative Treatment only).

TEXT BOOKS:

1. S. L. Uppal and G. C. Garg, “Electrical Wiring, Estimating & Costing”, Khannapublishers, 2008.
2. K. B. Raina, “Electrical Design, Estimating & Costing”, New age International, 2007.
3. H. Joshi, “Residential Commercial and Industrial Systems”, McGraw Hill Education, 2008.

REFERENCE BOOKS:

1. N.V. Suryanarayana, “Utilization of Electrical Power including Electric drives and Electric traction”, New Age International (P) Limited Publishers, 1st Edition, 1994.
2. E. Open Shaw Taylor, “Utilization of Electric Energy”, Orient Longman,1st Edition,1937

COURSE OUTCOMES:

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

- Maintain/Troubleshoot various lamps and fittings in use.
- Design Illumination systems for various applications.
- Utilize effectively the electrical systems in industries.

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III Year B. Tech, ANE-II Sem	L	T/P/D	C
OPEN ELECTIVE III			
(R18A0554) OPERATING SYSTEM CONCEPTS	**3**	**-/-/-**	**3**

OBJECTIVES:

- To learn the fundamentals of Operating Systems.
- To learn the mechanisms of OS to handle processes and threads and their communication
- To learn the mechanisms involved in memory management in contemporary OS
- Mutual exclusion algorithms, deadlock detection algorithms and agreement protocols To know the components and management aspects of concurrency management

Unit I:

Introduction, objectives and functions of OS, Evolution of Operating Systems - Simple Batch, Multi programmed, time shared, Personal Computer, Parallel, Distributed Systems, Real-Time Systems, OS services, system calls, system programs, virtual machines.

Unit-II:

Process Management:

Process concept, Process states, threads, **CPU Scheduling** - Scheduling algorithms, multiple processors and real time scheduling. **Process synchronization** – Critical section problems, Peterson's Solution, semaphores, monitors.

Unit-III:

Memory Management:

Basic concept, Logical and Physical addresses, contiguous memory allocation, swapping, paging, segmentation. **Virtual memory** – Basics of Virtual Memory, Demand Paging, Page Replacement algorithms, allocation of frames, thrashing.

Unit-IV: **File Management**: Concept of File, Access methods, File types, File operation, Directory structure, File System structure, Allocation methods (contiguous, linked, indexed), Free-space management (bit vector, linked list, grouping), directory implementation (linear list, hash table), Case study: UNIX, Windows.

Unit-V:

Disk Management: Disk structure, Disk scheduling - FCFS, SSTF, SCAN, C-SCAN, Disk attachment, disk management.

Dead locks: Characterization, Dead lock Prevention, Dead lock Avoidance, Dead lock Detection and Recovery.

Text Book:

1. Operating Systems Concepts –Avil Silberschatz j, Peter Galvin, GreyGagne

Reference:

1. Modern Operating Systems –Andrew S. Tanenbaum, PHI

2. Operating Systems: Internals and Design Principles, 5th Edition, William Stallings,Prentice Hall of India

OUTCOMES:

At the end of the course the students are able to:

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

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III Year B. Tech, ANE-II Sem

L	T/P/D	C
0	-/3/-	1.5

(R18A2185)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.
11. Modal Analysis of Cantilever Beam
12. Introduction to UDEF and USERMAT

Note: Total 10 experiments are to be conducted.

Equipment Needed:

1. **Computers**: Core 2 duo processor with 1 GB RAM
1. **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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III Year B. Tech, ANE-II Sem

	L	T/P/D	C
(R18A2186) PROGRAMMING LANGUAGE FOR MATHEMATICAL MODELS LAB	**0**	**-/3/-**	**1.5**

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, 2D and 3D plots.
2. Program to solve differential equations.
3. Program to solve system of equations using numerical methods.
4. Program to generate airfoil coordinates.
5. Program to find critical Mach number of an airfoil and to generate drag polar graph.
6. Program to find flow characteristics across shock waves.
7. Program to calculate the performance of turbofan.
8. Program to find the flow characteristics of a CD nozzle.
9. Program to calculate the deflection, bending moment, shear force of a beam.
10. Determine the buckling load of a column with different end conditions.
11. Find out displacements of a uniform bar/stepped bar subjected to mechanical/thermal loads.
12. 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 SCILAB or 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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	L	T/P/D	C
III Year B. Tech, ANE-II Sem			
(R18A0006)TECHNICAL WRITING	**2**	**-/-/-**	**0**
(Mandatory Course)			

INTRODUCTION:

Technical Communication and Soft skills focuses on enhancing students' communication. A thorough drill in grammar exercises is given. Various technical writing styles and skills are developed. The future placement needs of the students are met by giving them an exposure to group discussions and mock interviews.

The students hone these skills under the guidance of instructor whose constant evaluation helps in the professional development. This course fulfills the need of the aspirants in acquiring and improving the skills required for placements and professional success.

OBJECTIVES:

- To make the students recognize the role of Technical English in their academic and professional fields.
- To improve language proficiency and develop the required professional skills.
- To equip students with tools to organize, comprehend, draft short and long forms of technical work.

SYLLABUS

The textbook prescribed for study is a manual that has been compiled by the department of English to meet the academic and professional needs of the students.

UNIT I – Personal Evaluation

Self-Assessment and Self- Awareness - Self-Esteem - Perception and Attitudes - Values and Beliefs - Time Management- Concord

UNIT 2 - Professional Communication

Extempore - Oral Presentations – Presentation Aids- Email Writing, Business Letter Writing - Memo Writing - Transformation of Sentences

UNIT 3 – Career Planning

Group Discussion, Interviews - Leadership Skills & Team Building - Personal Goal Setting and Career Planning - Complex Problem Solving - Creativity - Role and Responsibilities of an Engineer - Tenses

UNIT 4 - Technical Writing

Principles of Effective Writing - Editing Strategies to Achieve Appropriate Technical Style – Technical Report Writing - Voice

UNIT 5 - Ethics and Responsibilities

Personality Development in Social and Office Settings – Netiquettes - Work Culture and Cubicle Etiquettes - Correction of Sentences

REFERENCES:

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)
3. Shiv Khera, You Can Win, Macmillan Books, New York, 2003.
4. Raman Sharma, Technical Communications, Oxford Publication, London, 2004.
5. Meenakshi Raman, Prakash Singh, Business communication, Oxford Publication, New Delhi 2012.
6. Dale Jung k, Applied Writing for Technicians, McGraw Hill, New York, 2004. (ISBN: 07828357-4)
7. Sharma, R. and Mohan, K. Business Correspondence and Report Writing, TMH New Delhi 2002.
8. Xebec, Presentation Book, TMH New Delhi, 2000. (ISBN 0402213)

OUTCOMES:

- The students will be able to understand information which assists in completion of the assigned job tasks more successfully.
- Students will be able to communicate their ideas by writing projects, reports, instructions, diagrams and many other forms of professional writing.
- Students will also be able to adhere to ethical norms of scientific communication.
- Students will be able to strengthen their individual and collaborative work strategies.

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IV YEAR B. Tech. AE – I SEM	L	T/P/D	C
	2	1/-/-	3

(R18A2116)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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IV Year B. Tech, ANE-I Sem

L	T/P/D	C
2	1/-/-	3

(R18A2117) MECHANICAL VIBRATIONS

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.

FREE VIBRATION OF SINGLE DEGREE OF FREEDOM SYSTEMS: Introduction, Free vibration of an undamped translational system, free vibration of an undamped torsional system. Concepts on different damping conditions.

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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	L	T/P/D	C
(R18A2118) FLIGHT VEHICLE DESIGN	**3**	**-/-/-**	**3**

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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3	-/-/-	3

(R18A2119) 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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L	T/P/D	C
3	-/-/-	3

(R18A2137) CAD/CAM
PROFESSIONAL ELECTIVE –III

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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IV Year B. Tech, ANE-I Sem

L	T/P/D	C
3	-/-/-	3

(R18A2138) AIRCRAFT SYSTEMS
PROFESSIONAL ELECTIVE –III

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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L	T/P/D	C
3	-/-/-	3

(R18A0318) HEAT TRANSFER
PROFESSIONAL ELECTIVE –III

***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.
- Learn different modes of Heat Transfer.
- Understand and apply the dimensional analysis.
- Develop the empirical relations for fluid flow heat transfer.

UNIT-I

Introduction: Basic modes of heat transfer- Rate equations – Differential heat conduction equation in Cartesian, Cylindrical and Spherical coordinate systems. Steady state one dimensional heat conduction solutions for plain and composite slabs, cylinders and spheres, electrical resistance concept - Critical thickness of insulation- Heat conduction through fins of uniform and variable cross section- Fin effectiveness and efficiency.

UNIT-II

Unsteady state Heat Transfer conduction: I-D Transient heat conduction- Lumped system analysis, and solutions by use of Heisler charts.

UNIT-III

Convection: Dimensional analysis- Continuity, momentum and energy equations - Boundary layer theory concept- 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- Dimensionless numbers and Empirical correlations.

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 factor - Heat exchangers with phase change.

Boiling and Condensation: Different regimes of boiling- Nucleate, Transition and Film boiling. Condensation: Laminar film condensation-Empirical relations, Nusselt's theory- Condensation on vertical flat plate and horizontal tubes- Drop wise condensation.

UNIT- V

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.**

TEXT BOOKS:

1. Heat Transfer, by J.P.Holman, Int.Student edition, McGraw Hill Book Company.
2. Fundamentals of Heat and Mass Transfer- Sachdeva, New Age Publications

REFERENCE BOOKS:

1. Heat Transfer by S.P.Sukhatme.
2. Heat transfer by Yunus A Cengel.

3. Heat transfer by Arora and Domakundwar, Dhanpat Rai & sons, New Delhi

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

- Understand 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 to different modes of Heat Transfer.
- Design the extended surfaces like fins for better heat transfer

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IV Year B. Tech, ANE-I Sem

L	T/P/D	C
-	-/3/-	1.5

(R18A2187)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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IV Year B. Tech, ANE-I Sem

	L	T/P/D	C
(R18A2188) FLIGHT VEHICLE DESIGN LAB	-	-/3/-	1.5

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 flightsimulation.

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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IV Year B. Tech, ANE-II Sem

L	T/P/D	C
3	-/-/-	3

(R18A2120) AIRCRAFT MAINTENANCE ENGINEERING

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

MALLA REDDY COLLEGE OF ENGINEERING & TECHNOLOGY

IV Year B. Tech, ANE-II Sem

L	T/P/D	C
3	-/-/-	3

(R18A2139) HELICOPTER AERODYNAMICS
(PROFESSIONAL ELECTIVE - IV)

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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IV Year B. Tech, ANE-II Sem	L	T/P/D	C
(R18A2140) ADVANCED COMPUTATIONAL AERODYNAMICS (PROFESSIONAL ELECTIVE - IV)	3	-/-/-	3

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.

MALLA REDDY COLLEGE OF ENGINEERING & TECHNOLOGY

IV Year B. Tech, ANE-II Sem

	L	T/P/D	C
(R187A2141) ANALYSIS OF COMPOSITE STRUCTURE (PROFESSIONAL ELECTIVE - IV)	**3**	**-/-/-**	**3**

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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IV Year B. Tech, ANE-II Sem

	L	T/P/D	C
(R187A2142) AIRLINE AND AIRPORT MANAGEMENT (PROFESSIONAL ELECTIVE – V)	**3**	**-/-/-**	**3**

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-Organization and administration Airport ownership and organization , responsibilities of Airport manager .Components of an airport-The airfield-Navigation aids(NAVAIDS)located on airfields-Air traffic Control and surveillance facilities located on the airfield.

UNIT II

AIRPORT OPERATIONS MANAGEMENT: Airspace and air traffic management, Airport operations management under FAR Part 139, Airport terminals and ground access, Airport security and Administration -Security at commercial service airports-Security at general aviation airports.

UNIT III

AIRPORT ADMINISTRATION AND FINANCIAL MANAGEMENT ,CAPACITY AND DELAY

concept of Airport planning and financial accounting-Revenue strategies at commercial airports-Pricing of airport facilities and services, , The future of airport management.

Defining capacity-Factors affecting capacity and delay-estimating capacity-Simulation Models-Defining delay-Estimating delay-Analytical estimates of delay.

UNIT IV

INTRODUCTION TO AIRLINE PLANNING: Structure of Airline Industry (Domestic & International)-Growth and Regulation-Deregulation-Major and National Carriers-Regional Carriers-Economic characteristics of the Airlines Airline Planning Process-Airline Terminology and Measures: airline demand, airline supply, average load factor, unit revenue, Airline Planning Decisions

UNIT-V

FLEET PLANNING AND ROUTE EVALUATION: Factors in Fleet Planning-Hub-and-Spoke System-Technical Aspects-Fleet Rationalization-Fleet Commonality-Long Range Aircraft-Noise Restrictions-Factors in Design and Development-Fleet Planning Process; Route Evaluation in Hub Networks-Route profitability estimation issues-Demand Driven Dispatch.

Text Books

1. Airport Planning and Management 6/E 0006 Edition by Young Seth, Mc GRAW Hills.
2. Airport Management by Ravindran P.C.K, Asian Law House.
3. Air Transportation: A Management Perspective (Fifth Edition) by Alexander T.Wells and John G.Wensveen, Brooks Cole,2003

REFERENCE BOOKS

1. Airport Systems: Planning, Design and Management by Rechard De Neufville Tata Mc Graw Hills.
2. Airline Marketing and Management by Stephen Shaw, Ashgate Publishing, 2004
3. Airline Management, by Peter P BelobabaMIT Open Courseware Lecture Notes, 2006

Outcomes:

- The student can get an broad overview and functioning of the airline industry. It focuses on the underlying marketing, financial, operational and competitive factors that influence airline viability.
- The student can investigate how the sensitivity of airline profitability impacts airline management decisions and analyze the principles of airline economics, costs and pricing.
- The student and assess the individual characteristics of low-cost carriers and business only airlines.

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L	T/P/D	C
3	-/-/-	3

(R187A2143) AEROELASTICITY
(PROFESSIONAL ELECTIVE - V)

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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L	T/P/D	C
3	-/-/-	3

(R187A2144) HYPERSONIC AERODYNAMICS (PROFESSIONAL ELECTIVE - V)

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.