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 9001:2008 Certified)
Maisammaguda, Dhulapally (Post Via Hakimpet), Secunderabad – 500100, Telangana State, India.
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BACHELOR OF TECHNOLOGY
AERONAUTICAL ENGINEERING

COURSE STRUCTURE AND SYLLABUS
(Batches admitted from the academic year 2015 - 2016)

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

PRELIMINARY DEFINITIONS AND NOMENCLATURES

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

FOREWORD

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

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

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

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

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

PRINCIPAL

MALLA REDDY COLLEGE OF ENGINEERING & TECHNOLOGY

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VISION

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

MISSION

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

QUALITY POLICY

- To implement best practices in Teaching and Learning process for both UG and PG courses meticulously.
- To provide state of art infrastructure and expertise to impart the 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.

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.

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.

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 (PSO's)

1. To mould students to become a professional with all necessary skills, personality and sound knowledge in basic and advance technological areas.
2. 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.
3. 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.
4. Todevelop leadership skills in our students necessary to shape the social, intellectual, business and technical worlds.

DEPARTMENT OF AERONAUTICAL ENGINEERING

COURSE STRUCTURE

I Year B. Tech (ANE) – I Semester

S.NO	SUBJECT CODE	SUBJECT	L	T/P/D	C	MAX.MARKS	
						Int	Ext
1	R15A0001	English	3	-	2	25	75
2	R15A0021	Mathematics-I	5	1	4	25	75
3	R15A0011	Engineering Physics-I	3	-	2	25	75
4	R15A0014	Environmental Studies	4	-	3	25	75
5	R15A0501	Computer Programming With C	4	-	3	25	75
6	R15A0301	Engineering Mechanics	5	1	4	25	75
7	R15A0581	Computer Programming Lab	-	3	2	25	50
8	R15A0084	IT Workshop/Engineering Workshop Lab	-	3	2	25	50
9	R15A0081	English Language Communication Skills Lab-I	-	3	2	25	50
*10	R15A0003	Human Values And Societal Perspectives	2	-	-	50	-
		TOTAL	26	11	24	275	600

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

I Year B. Tech (ANE) – II Semester

S.NO	SUBJECT CODE	SUBJECT	L	T/P/D	C	MAX.MARKS	
						Int	Ext
1	R15A0002	Professional English	3	-	2	25	75
2	R15A0022	Mathematics-II	5	1	4	25	75
3	R15A0012	Engineering Physics-II	3	-	2	25	75
4	R15A0013	Engineering Chemistry	4	1	3	25	75
5	R15A0502	Object Oriented Programming	4	-	3	25	75
6	R15A0302	Engineering Drawing	2	3	4	25	75
7	R15A0582	Object Oriented Programming Lab	-	3	2	25	50
8	R15A0083	Engineering Physics / Chemistry Lab	-	3	2	25	50
9	R15A0082	English Language Communication Skills Lab-II	-	3	2	25	50

		TOTAL	21	14	24	225	600

II Year B. Tech (AE) – I Semester (5 Core Subjects + 1 Open Elective + 2 Labs+1 Mandatory Subject)

S.NO.	SUBJECT CODE	SUBJECT	L	T/P/D	C	MAX MARKS	
						INT	EXT
1	R15A0362	Mechanics Of Fluids	4	1	3	25	75
2	R15A0363	Mechanics Of Solids	4	1	3	25	75
3	R15A0364	Thermodynamics	5	1	4	25	75
4	R15A2101	Aircraft Production Technology	4	-	3	25	75
5	R15A2102	Aircraft Engineering Drawing	2	3	4	25	75
6	 R15A0061 R15A0507 R15A0067	Open Elective – I Managerial Economics And Financial Accountancy Java Programming Technology Management	4	-	3	25	75
7	R15A0389	CADLab	-	3	2	25	50
8	R15A0384	MoSand MoF Lab	-	3	2	25	50
*9	R15A0004 R15A0005	Foreign Language : French Foreign Language :German	2	-	-	50	-
Total			**25**	**12**	**24**	**250**	**550**

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

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

S.NO.	SUBJECT CODE	SUBJECT	L	T/P/D	C	MAX MARKS	
						INT	EXT
1	R15A2103	Aerospace Propulsion	4	1	3	25	75
2	R15A2104	Aerodynamics	4	-	3	25	75
3	R15A2105	Aerospace Vehicle Structures -I	4	1	3	25	75
4	R15A0206	Electrical And Electronics Engineering	4	-	3	25	75
5	R15A2106	Aircraft Performance	4	1	3	25	75
6	 R15A0069 R15A0065 R15A0024	Open Elective – II Intellectual Property Rights Management Sciences Probability and Statistics	4	-	3	25	75
7	R15A0006	Gender Sensitization	-	3	2	75	-
8	R15A2181	Aircraft Production Technology Lab	-	3	2	25	50
9	R15A0282	Electrical And Electronics Engineering Lab	-	3	2	25	50
Total			24	12	24	275	550

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

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

S.NO.	SUBJECT CODE	SUBJECT	L	T/P/D	C	MAX MARKS	
						INT	EXT
1	R15A2107	Introduction To Space Technology	4	-	3	25	75
2	R15A2108	High Speed Aerodynamics	5	1	4	25	75
3	R15A2109	Aerospace Vehicle Structures -II	5	1	4	25	75
4	R15A2110	Aircraft Stability And Control	4	1	3	25	75
5	R15A2111 R15A0367 R15A0366	Core Elective – I Aerospace Materials And Composites Experimental Stress Analysis Engineering Optimization	4	-	3	25	75
6	R15A0068 R15A0365 R15A0521	Open Elective – III Total Quality Management Mechanisms & Mechanical Design Web Technologies	4	-	3	25	75
7	R15A2182	Aerodynamics and Propulsion Lab	-	3	2	25	50
8	R15A2183	Aerospace Structures Lab	-	3	2	25	50
Total			**26**	**9**	**24**	**200**	**550**

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

S.NO.	SUBJECT CODE	SUBJECT	L	T/P/D	C	MAX MARKS	
						INT	EXT
1	R15A2112	Finite Element Analysis	5	1	4	25	75
2	R15A2113	Control Theory for Aircraft	5	1	4	25	75
3	R15A2114	Flight Vehicle Design	4	-	3	25	75
4	R15A2115	Aircraft Systems	4	-	3	25	75
5	R15A2116 R15A2117 R15A2118	Core Elective – II Launch Vehicle And Missile Technology Air Transportation Systems Space Mechanics	4	-	3	25	75
6	R15A0371 R15A0568 R15A0062	Open Elective – IV Green Energy Systems App Design and Development Supply Chain Management	4	-	3	25	75
*7	R15A0005	Technical Communication And Soft Skills	2	-	-	50	-
8	R15A2184	Flight Vehicle Design and Instrumentation Lab	-	3	2	25	50
9	R15A2185	Programming Language For Mathematical Models	-	3	2	25	50
Total			28	8	24	250	550

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

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

S.No.	Subject Code	SUBJECT	L	T/P/D	C	Max. Marks	
						Int	Ext
1	R15A2119	Computational Aerodynamics	5	1	4	25	75
2	R15A2120	Airframe Structural Design	4	-	3	25	75
3	R15A0368	Mechanical Vibrations & Structural Dynamics	5	1	4	25	75
4	R15A2121	Avionics	4	-	3	25	75
5	R15A2122 R15A2123 R15A0331	Core Elective - III Aircraft Noise and Aeroacoustics Flight Scheduling Operations CAD/CAM	4	-	3	25	75
6	R15A2124 R15A2125 R15A2126	Core Elective - IV Civil Aviation Rules and Regulations Aircraft Maintenance Engineering Hypersonic Aerodynamics	4	-	3	25	75
7	R15A2186	Computational Aerodynamics Lab	-	3	2	25	50
8	R15A2187	Computational Structures Lab	-	3	2	25	50
TOTAL			**26**	**8**	**24**	**200**	**550**

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

S.No.	Subject Code	SUBJECT	L	T/P/D	C	Max. Marks	
						Int	Ext
1	R15A2127 R15A2128 R15A0323	Core Elective - V Helicopter Engineering Advanced Computational Aerodynamics Heat Transfer	5	1	4	25	75
2	R15A2129 R15A0370 R15A2130	Core Elective – VI Aeroelasticity Fatigue and Fracture Mechanics Airline and AirportManagement	5	1	4	25	75
3	R15A2188	Mini Project	-	-	4	-	100
4	R15A2189	Technical Seminar	-	6	2	50	-
5	R15A2190	Major Project	15	-	10	100	200
Total			**25**	**8**	**24**	**200**	**450**

MALLA REDDY COLLEGE OF ENGINEERING & TECHNOLOGY

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

3 - / - / - 2

(R15A0001) ENGLISH

Introduction:

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

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

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

Objectives:

- To improve the language proficiency of the students in English with emphasis on LSRW skills.
- To equip the students to study academic subjects more effectively using the theoretical and practical components of the English syllabus.
- To develop the study skills and communication skills in formal and informal situations.

SYLLABUS:

Listening Skills:

Objectives

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

- Intensive listening
- Listening for specific information

Speaking Skills:

Objectives

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

Reading Skills:

Objectives

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

NOTE : The students will be trained in reading skills using the prescribed text for detailed study.

They will be examined in reading and answering questions using 'unseen' passages which may be taken from authentic texts, such as magazines/newspaper articles.

Writing Skills:

Objectives

1. To develop an awareness in the students about writing as an exact and formal skill
2. To equip them with the components of different forms of writing, beginning with the lower order ones.
   - Writing sentences
   - Use of appropriate vocabulary
   - Paragraph writing
   - Coherence and cohesiveness

- Narration / description
- Note Making
- Formal and informal letter writing
- Describing graphs using expressions of comparison

TEXTBOOKS PRESCRIBED:

In order to improve the proficiency of the student in the acquisition of the four skills mentioned above, the following texts and course content, divided into Five Units are prescribed in each semester:

For Detailed study

First text book entitled "Skills Annexe: Functional English for Success", published by Orient BlackSwan, Hyderabad.

For Non-detailed study

Second textbook titled "Epitome of Wisdom", published by Maruthi Publications, Guntur.

Unit –I:

1. Chapter entitled 'Mokshagundam Visvesvaraya' from *Epitome of Wisdom*, published by Maruthi Publications, Hyderabad.

L- Listening – Project Based Assignment
S- Speaking – Jam session
R- Reading – The Palm Islands
W- Writing – Writing Paragraphs
G- Grammar – Conjunctions and Adverbs

V- Vocabulary – Prefixes and Suffixes

Unit – II

1. Chapter entitled "Never Never Nest" by Cedric Mount, published in *Ten One Act Plays, 1937*, Willett, Clark and Company, 1937.

L- Listening – Project Based Assignment
S- Speaking – Role plays—Introduction, Greetings, Requests, Permission
R- Reading – Reading for the plot
W- Writing – Note writing
G- Grammar – Articles, Finite and Non-finite Verbs, Auxiliary Verbs and Nouns
V- Vocabulary – Homophones, Homographs and Homonyms

Unit – III

1. Chapter entitled "Risk Management" from *Skills Annexe -Functional English for Success*, published by Orient Black Swan, Hyderabad.

L- Listening – Project Based Assignment
S- Speaking – Role plays – Refusal, Apology, and Complimenting
R- Reading – Shivakasi Accident
W- Writing – Note Making and Note Taking
G- Grammar – Tenses and Punctuation
V- Vocabulary – Synonyms and Antonyms

Unit – IV

1. Chapter entitled 'Leela's Friend' from *Epitome of Wisdom*, published by Maruthi Publications, Hyderabad.

L- Listening – Project Based Assignment
S- Speaking – Role plays—Congratulating, Consolation, and Social Etiquettes
R- Reading – Forensic Science
W- Writing – Letter Writing
G- Grammar – Contractions, Questions, Prepositions
V- Vocabulary – Phrasal Verbs

Unit –V

1. Chapter entitled "Three Days to See" from *Epitome of Wisdom*, published by Maruthi Publications, Hyderabad.

L- Listening – Project Based Assignment
S- Speaking – Professional and Telephone Etiquettes
R- Reading – Reading for Facts
W- Writing – Business Letters, Complaints, Apologies, Requests
G- Grammar – Correction of Sentences and Modal Auxiliaries
V- Vocabulary – Confused Words

* Exercises from the texts not prescribed shall also be used for classroom tasks.

REFERENCES :

1. Contemporary English Grammar Structures and Composition by David Green, MacMillan Publishers, New Delhi. 2010.
2. Innovate with English: A Course in English for Engineering Students, edited by T Samson, Foundation Books.
3. English Grammar Practice, Raj N Bakshi, Orient Longman.
4. Technical Communication by Daniel Riordan. 2011. Cengage Publications. New Delhi.
5. Effective English, edited by E Suresh Kumar, A RamaKrishna Rao, P Sreehari, Published by Pearson.
6. Handbook of English Grammar& Usage, Mark Lester and Larry Beason, Tata Mc Graw – Hill.
7. Spoken English, R.K. Bansal & JB Harrison, Orient Longman.
8. Technical Communication, Meenakshi Raman, Oxford University Press
9. Objective English Edgar Thorpe & Showick Thorpe, Pearson Education
10. Grammar Games, Renuvolcuri Mario, Cambridge University Press.
11. Murphy's English Grammar with CD, Murphy, Cambridge University Press.
12. Everyday Dialogues in English, Robert J. Dixson, Prentice Hall India Pvt Ltd.,
13. ABC of Common Errors Nigel D Turton, Mac Millan Publishers.
14. Basic Vocabulary Edgar Thorpe & Showick Thorpe, Pearson Education
15. Effective Technical Communication, M Ashraf Rizvi, Tata Mc Graw – Hill.
16. An Interactive Grammar of Modern English, Shivendra K. Verma and Hemlatha Nagarajan , Frank Bros & CO
17. A Communicative Grammar of English, Geoffrey Leech, Jan Svartvik, Pearson Education
18. Enrich your English, Thakur K B P Sinha, Vijay Nicole Imprints Pvt Ltd.,
19. A Grammar Book for You And I, C. Edward Good, MacMillan Publish.

Outcomes:

- Write formal or informal letters and applications for different purposes.
- Select and extract relevant information through skimming and scanning.
- Utilize the strategy of brainstorming in preparing analytical, argumentative and expository essays.
- Draft concise emails following professional email etiquette.
- Enhance their grammatical competency by spotting errors

MALLA REDDY COLLEGE OF ENGINEERING AND TECHNOLOGY

I Year B. Tech ANE-I Sem	L	T/P/D	C
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(R15A0021) MATHEMATICS – I

Objectives:

To learn

- Concept of rank of a matrix and applying the concept of rank to know the consistency of linear equations and to find all possible solutions if exist and concept of eigen values and eigen vectors of a matrix
- The mean value theorems and to understand the concepts geometrically , functions of several variables and optimization of these functions.
- Methods of solving the differential equations of 1^{st} and higher order cooling, Natural growth and decay, bending of beams etc.
- Properties of Laplace Transform, Inverse Laplace Transform and Convolution theorem

UNIT - I:Matrix Theory

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

UNIT – II: Differential Calculus

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

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

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

Formation of differential equation- Solution of D.E - Variable Separable form-Homogeneous-Non homogeneous- Exact-Non Exact-Linear and Bernoulli's equations-Applications of first order differential equations – Newton's Law of cooling- Law of natural growth and decay- Orthogonal trajectories

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

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

UNIT – V Laplace Transforms and Applications

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

TEXT BOOKS:

1.Engineering Mathematics – I by T.K. V. Iyengar, B. Krishna Gandhi & Others, S. Chand.

2. Higher Engineering Mathematics by B.S. Grewal, Khanna Publishers.

REFERENCES:

1. Advanced Engineering Mathematics by R.K. Jain & S.R.K. Iyengar, 3rd edition, Narosa Publishing House, Delhi.
2. Advanced engineering Mathematics by Kreyszig, John Wiley & Sons Publishers.
3. Engineering Mathematics – I by D. S. Chandrasekhar, Prison Books Pvt. Ltd.

Outcomes:

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

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(R15A0014) ENVIRONMENTAL STUDIES

Objectives:

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

UNIT-I:

Introduction: Definition of Environment and Environmental Sciences.

Ecosystems: Definition, Scope and Importance of ecosystem. Brief Classification, structure and function of an ecosystem, Food chains, food webs and ecological pyramids. Flow of energy, Biogeochemical cycles (Carbon, Oxygen, Nitrogen, Water, phosphorus, sulphur cycle) Bioaccumulation, Biomagnification, and carrying capacity.

UNIT-II:

Natural Resources: Classification of Resources: water resources: use and over utilization of surface and ground water, water conservation Dams: benefits and problems. Forest resources, 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, Automobile and Industrial pollution, reduction of pollutants. **Water pollution**: Sources and types of pollution, water treatment methods. **Soil Pollution**: Sources and types, Impacts of modern agriculture, degradation of soil. Solid waste and its management, composition and characteristics of e-Waste and its management.

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

Natural Hazards (Droughts, Floods, Cyclone, Landslides, Earthquake, Tsunami) and Disaster Management, Carbon Footprint.

UNIT-V:

Environmental Policy, Legislation & EIA: Environmental Protection act1986, Air Act- 1981, Water Act 1974, Forest conservation act 1980, Wild life Protection Act-1972, Municipal solid waste management and handling rules, biomedical waste management and handling rules, hazardous 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 of Sustainable Development, Population and its explosion, Environmental Education, Concept of Green Building.

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:

- 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
- Achieve basic concepts of atomic, molecular and electronic changes related to conductivity and magnetism
- Familiarize the student with the fundamentals of the treatment technologies and the considerations for its design and implementation in water treatment plants
- Gain knowledge on synthesis of organic compounds by using different reaction mechanisms
- Comprehend the types of fuels, characteristics and combustion systems with emphasis on engineering applications

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(R15A0501) COMPUTER PROGRAMMING WITH C

Objectives

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

UNIT - I

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

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

UNIT-II

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

UNIT – III

Arrays – Declaration and Initialization, Inter Function Communication, Array Applications, Two dimensional arrays, Multi dimensional arrays.

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

String manipulation functions.

UNIT-IV

Pointers-Introduction, Definition and uses of pointers, address operator, Pointer variables, Pointer constants ,dereferencing pointers, void pointers, Pointer arithmetic, Pointers to Pointers, Pointers and Arrays, Pointers and Functions, Pointers to functions, Array of pointers, Pointers and Strings.

UNIT-V

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

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

TEXT BOOKS:

1. Computer Science: A Structured Programming Approach Using C, B.A.Forouzan and R.F. Gilberg, Third Edition, Cengage Learning.
2. Mastering C, K.R.Venugopal, S R Prasad, Tata McGraw-Hill Education.

REFERENCE BOOKS:

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

Outcomes:

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

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(R15A0301) ENGINEERING MECHANICS

Unit – I

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

Unit – II

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

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

Unit – III

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

Unit – IV

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

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

Unit – V

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

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

TEXT BOOKS:

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

REFERENCES:

1. Engg. 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. Engg. Mechanics / KL Kumar / Tata McGraw Hill.
6. Engineering Mechanics / Irving Shames / Prentice Hall

Outcomes

- Sketching free body diagrams and determine the resultant of forces and/or moments.
- Apply laws of mechanics to determine efficiency of simple machines with consideration of friction.
- Determine centroid and centre of gravity for various objects and bodies
- Analyze moment of inertia and mass moment of inertia
- Analyze kinetics and kinematics of a particle

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(R15A0581) COMPUTER PROGRAMMING LAB

Objectives:

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

Week 1:

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

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

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

Week 2:

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

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

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

Week 3:

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

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

Week 4:

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

b)Write a C programperformarithmeticoperations using switch statement.

Week 5:

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

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

Week 6:

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

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

Week 7:

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

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

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

Week 8:

Revision of programs

Week 9:

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

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

Week 10:

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

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

Week 11:

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

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

Week 12:

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

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

Week 13:

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

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

Week 14:

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

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

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

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

Week 15:

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

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

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

Week 16:

Revision Of Programs

TEXT BOOKS

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

Outcomes

- Acquire basic knowledge of different types in programming.
- To understand the syntax and building blocks of the C- program.
- Correlate problem using the C-Program.
- To compile and debug a C- Program.
- To generate an executable file from program

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(R15A0084) IT WORKSHOP LAB / ENGINEERING WORKSHOP

Objective:

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

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 , Linux and the required device drivers. In addition hardware and software level troubleshooting process, tips and tricks would be covered.

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.

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 and LaTeX.

PC Hardware

Week 1:

Task 1: Generations of computers, Types of Computers, applications of computers Von Neumann architecture. Identify the different hardware componentsof a PC & their functions.

Task 2: practice to disassemble and assemble the components of a PC to working condition.

Week 2:

Task 3 : Installation of windows operating system in PC.

Task 4: Exposure to Basic commands in MS-DOS commands like ver, vol, date, time, cls, dir, md, cd, path, rd, copy con, type, copy, move, del, ren, prompt, ipconfig etc.

Week 3:

Task 5: Installation of operating systems LINUX and different packages on a PC.

Task 6: Exposure to Basic commands in Linux General Purpose utilities like man, who, tty,

clear, date, cal, passwd; FileHandling utilities like pwd, mkdir, rmdir, cp, rm, mv, cat, cd, ls, ln; Filters like wc, cmp, diff, head, tail, sort.

Week 4:

Task 7: Practice hardware troubleshooting exercises related to various components of computer like monitor,drives, memory devices, printers etc. and software troubleshooting related to BIOS etc.

NETWORKING

Week 5:

Task 8: Students should get to know about some of the Communication and Transmission devices,Network cabling, Features of Networking, Communication Protocols, Types of Network Topologies and Types of Networks.

Internet & World Wide Web

Week 6:

Task 9: Orientation & Connectivity Boot Camp and surfing the Web using Web Browsers: Students should getconnected to their Local Area Network and access the Internet. In the process they should configure the TCP/IP setting and demonstrate how to access the websites and email. Students customize their web browsers using bookmarks, search toolbars and pop up blockers.

Week 7:

Task 10: Search Engines and Netiquette (Demonstration): Students should know about different search enginesand their usage. A few topics would be given to the students for which they need to search on Google etc.

Week 8:

Task 11: Cyber Hygiene (Demonstration): Awareness of various threats on the internet. To install antivirus softwareand to configure their personal firewall and windows update on their computers.

Productivity Tools

Documentation

Week 9:

Task 12: Word Orientation: The mentor needs to give an overview of LaTeX and Microsoft (MS) office 2007.Importance of LaTeX and MS office 2007. Give the details about LaTeX/MS word accessing, overview of toolbars, saving files and Using help and resources.

Week 10:

Task 13: Using LaTeX/Word to create project certificate. Features to be covered:- Formatting Fonts in word, DropCap in word, Applying Text effects, Using Character Spacing, Borders and Colors, Inserting Header and Footer, Using Date and Time option and Mail merge in LaTeX/Word.

Week 11:

Task 14: Creating project abstract Features to be covered:-Formatting Styles, Inserting

table, Bullets andNumbering, Changing Text Direction, Cell alignment, Footnote, Hyperlink, Symbols, Spell Check, Track Changes.

Presentation

LaTeX /MS Power Point

Week 12:

Task15: Students will be working on basic power point utilities and tools which help them create basic power pointpresentation. Topic covered during this week 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. Students will be given model power point presentation which needs to be replicated (exactly how it's asked).

Week 13:

Task 16: Second week helps students in making their presentations interactive. Topic covered during this weekincludes: Hyperlinks, Inserting –Images, Clip Art, Audio, Video, Objects, Tables and Charts.

Excel

Week 14:

Task 17: Excel Orientation: The mentor needs to tell the importance of MS office 2007/ equivalent (FOSS) toolExcel as a Spreadsheet tool, give the details of the two tasks and features that would be covered in each. Using Excel – Accessing, overview of toolbars, saving excel files, Using help and resources.

Week 15:

Task 18: Creating a Scheduler - Features to be covered:- Gridlines, Format Cells, Summation, auto fill, FormattingText.

Week 16:

Task 19 : Calculating GPA - .Features to be covered:- Cell Referencing, Formulae in excel– average, standarddeviation, Charts, Renaming and Inserting worksheets, Hyper linking, Count function, LOOKUP/VLOOKUP, Sorting, Conditional formatting.

REFERENCE BOOKS:

1. Introduction to Information Technology, ITL Education Solutions limited, Pearson Education.
2. IT Essentials PC Hardware and Software Companion Guide Third Edition by David Anfinson and Ken.
3. Quamme. – CISCO Press, Pearson Education.
4. PC Hardware and A+Handbook – Kate J. Chase PHI (Microsoft).

Outcomes:

- Apply knowledge for computer assembling and software installation
- Ability how to solve the trouble shooting problems.

- Apply the tools for preparation of PPT, Documentation and budget sheet etc.
- Exposure to handling data using Excel
- Acquaint with formatting tools

ENGINEERING WORKSHOP

1. TRADES FOR EXERCISES:

At least two exercises from each trade:

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

1. TRADES FOR DEMONSTRATION & EXPOSURE:

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

TEXT BOOK:

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

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(R15A0081) ENGLISH LANGUAGE COMMUNICATION SKILLS LAB– I

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

Objectives

- To facilitate computer aided multi-media instruction enabling individualized and independent language learning
- To sensitise the students to the nuances of English speech sounds, word accent, intonation and rhythm
- To bring about a consistent accent and intelligibility in their pronunciation of English by providing an opportunity for practice in speaking
- To improve the fluency in spoken English and neutralize mother tongue influence
- To train students to use language appropriately for interviews, group discussion and public speaking

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

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

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

Exercise –I

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

ICS Lab: Ice-Breaking activity - JAM session

Exercise –II

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

ICS Lab: Situational Dialogues –Role Plays - Expressions in Various Situations –Self-introduction and Introducing Others –Greetings –Apologies –Requests- Refusal- Permissions – Complementing – Congratulating - Consoling

Exercise -III

CALL Lab: Syllable and Syllabification

ICS Lab: Etiquette – Social and Professional Telephone Etiquette

Outcomes:

- Better Understanding of nuances of language through audio-visual experience and group activities.
- Neutralization of accent for intelligibility
- Speaking with clarity and confidence thereby enhancing employability skills of the students.

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(R15A0003) HUMAN VALUES AND SOCIETAL PERSPECTIVES

(MANDATORY COURSE)

Objective: This introductory course input is intended

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

Unit-I:

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

Unit-II:

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

Unit-III:

Understanding Harmony in the Family and Society-Harmony in Hum an-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 (socity being an extension of family): Samadhan, Samridhi, Abhay, Sah-astitva as comprehensive Human Goals. Visualizing a universal harmonious order in society – Undivided society(Akhand Samaj), Universal Order (Sarvabhaum Vyawastha) –from family to world family!

Unit-IV:

Understanding Harmony in the Nature and Existence – Whole existence as Co-existence: Understanding the harmony in the Nature. Interconnectedness and mutual fulfillment among the four orders of nature recyclability and self-regulation in nature. Understanding Existence as Co-existence (SAh-astiva) of mutually interacting units in all –pervasive space. Holistic perception of harmony at all level of existence.

Unit-V:

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

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 system.

Case studies of typical holistic technologies, management models and production systems. Strategy for transition from the present state to Universal Human Order:

a) At the level of individual: as socially and ecologically responsible engineers, technologists and managers.
b) At the level of society: as mutually enriching institutions and organizations.

TEST BOOKS

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

REFERENCE BOOKS

1. Ivan llich,1974, Energy & Equity, The Trinity press, Worcester and Harpercollins, USA.
2. E.F.Schumacher, 1973, small is Beautiful: a study of economics as if people mattered, Blond & Briggs,Britain.
3. A Nagraj, 1998, Jeevan Vidya ek Parichay, Divya path Sansathan Amarkantak.
4. Sussan George, 1976, How the other Half Dies, Penguin press Reprinted 1986,1991.
5. PL Dhar, RR Gaur,1990 Science and Humanism Commonwealth Publishers.
6. A.N.Tripathy,2003, Human Values, New Age International Publishers
7. Subhas Palekar, 2000, How to practice Natural Farming, Pracheen(Vaidik) Krishi Tantra Shodh, Amravati.

8. Donella H.Meadows,Dennis L. Meadows, Jorgen Randers, Willian A. Behrens lll, 1972, Limits to Growth –Club of Rome's report Universe Books.
9. E.G Seebauer & Robert L. Beery, 2000, Fundamentals of Ethics for Scientists & Engineers, Oxford University Press.
10. M Govindrajran , S Natrajan & V.S Senthil kuma, Engineering Ethichs (including Human Values), Eastern Economy Edition, prentice Hall of India Ltd.

Relevant CD,s Movies, Documentaries & other Literature:

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

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(R15A0002) PROFESSIONAL ENGLISH

Introduction:

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

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

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

Objectives:

- To improve the language proficiency of the students in English with emphasis on LSRW skills.
- To equip the students to study academic subjects more effectively using the theoretical and practical components of the English syllabus.
- To develop the study skills and communication skills in formal and informal situations.

SYLLABUS:

Listening Skills:

Objectives

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

- Listening for general content
- Listening to fill up information
- Intensive listening
- Listening for specific information

Speaking Skills:

Objectives

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

Reading Skills:

Objectives

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

NOTE : The students will be trained in reading skills using the prescribed text for detailed study.

They will be examined in reading and answering questions using 'unseen' passages which may be taken from authentic texts, such as magazines/newspaper articles.

Writing Skills:

Objectives

3. To develop an awareness in the students about writing as an exact and formal skill
4. To equip them with the components of different forms of writing, beginning with the lower order ones.
   - Writing sentences
   - Use of appropriate vocabulary

- Paragraph writing
- Coherence and cohesiveness
- Narration / description
- Note Making
- Formal and informal letter writing
- Describing graphs using expressions of comparison

TEXTBOOKS PRESCRIBED:

In order to improve the proficiency of the student in the acquisition of the four skills mentioned above, the following texts and course content, divided into Five Units are prescribed in each semester:

For Detailed study

First text book entitled "Skills Annexe: Functional English for Success", published by Orient BlackSwan, Hyderabad.

For Non-detailed study

Second textbook titled "Epitome of Wisdom", published by Maruthi Publications, Guntur.

Unit –I:

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

L- Listening – Project Based Assignment on poem 'If' by Rudyard Kipling
S- Speaking – Describing Persons and Places
R- Reading – Comprehending Poem
W- Writing – Business Circulars and Notices
G- Grammar – Adjectives, Comparison of Adjectives
V- Vocabulary – Similes and Metaphors

Unit – II

1. Chapter entitled "Human Values and Professional Ethics" from *Skills Annexe -Functional English for Success*, published by Orient Black Swan, Hyderabad.

L- Listening – Project Based Assignment
S- Speaking – Description of Objects, Events and Experiences
R- Reading – What I Cherish the Most
W- Writing – CV and Cover Letter (Self-Appraisal Letter)
G- Grammar – Transitive and Intransitive Verbs
V- Vocabulary – Collocations

Unit – III

1. Chapter entitled "The Convocation Speech" from *Epitome of Wisdom*, published by Maruthi Publications, Hyderabad.

L- Listening – Project Based Assignment
S- Speaking – Giving Directions and Instructions

R- Reading – What is meant by Entrepreneurship?
W- Writing – Essay Writing (On-the-Spot Organization of Thoughts)
G- Grammar – Active and Passive Voices
V- Vocabulary – One-word Substitutes

Unit – IV

1. Chapter entitled "The Last Leaf" from *Epitome of Wisdom*, published by Maruthi Publications, Hyderabad.

L- Listening – Project Based Assignment
S- Speaking – Oral Presentations
R- Reading – Reading Comprehension
W- Writing – Report Writing
G- Grammar – Concord
V- Vocabulary – Idiomatic Expressions

Unit –V

1. Chapter entitled "Sachin Tendulkar" from *Skills Annexe -Functional English for Success*, published by Orient Black Swan, Hyderabad.

L- Listening – Project Based Assignment
S- Speaking – Project Oral Presentations
R- Reading – Reading Articles
W- Writing – E-mail Writing
G- Grammar – Common Errors
V- Vocabulary – Misspelt Words

* Exercises from the texts not prescribed shall also be used for classroom tasks.

REFERENCES:

1. Contemporary English Grammar Structures and Composition by David Green, MacMillan Publishers, New Delhi. 2010.
2. Innovate with English: A Course in English for Engineering Students, edited by T Samson, Foundation Books.
3. English Grammar Practice, Raj N Bakshi, Orient Longman.
4. Technical Communication by Daniel Riordan. 2011. Cengage Publications. New Delhi.
5. Effective English, edited by E Suresh Kumar, A RamaKrishna Rao, P Sreehari, Published by Pearson.
6. Handbook of English Grammar& Usage, Mark Lester and Larry Beason, Tata Mc Graw – Hill.
7. Spoken English, R.K. Bansal & JB Harrison, Orient Longman.
8. Technical Communication, Meenakshi Raman, Oxford University Press
9. Objective English Edgar Thorpe & Showick Thorpe, Pearson Education
10. Grammar Games, Renuvolcuri Mario, Cambridge University Press.
11. Murphy's English Grammar with CD, Murphy, Cambridge University Press.
12. Everyday Dialogues in English, Robert J. Dixson, Prentice Hall India Pvt Ltd.,
13. ABC of Common Errors Nigel D Turton, Mac Millan Publishers.

14. Basic Vocabulary Edgar Thorpe & Showick Thorpe, Pearson Education
15. Effective Technical Communication, M Ashraf Rizvi, Tata Mc Graw – Hill.
16. An Interactive Grammar of Modern English, Shivendra K. Verma and Hemlatha Nagarajan , Frank Bros & CO
17. A Communicative Grammar of English, Geoffrey Leech, Jan Svartvik, Pearson Education
18. Enrich your English, Thakur K B P Sinha, Vijay Nicole Imprints Pvt Ltd.,
19. A Grammar Book for You And I, C. Edward Good, MacMillan Publish.

Outcomes:

- Usage of English Language, written and spoken.
- Enrichment of comprehension and fluency.
- Gaining confidence in using language in verbal situations.

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(R15A0022) MATHEMATICS – II

Objectives

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

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

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

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

UNIT – II : Numerical techniques and Curve Fitting

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

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

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

UNIT – III: Fourier series

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

UNIT-IV: Partial differential equations

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

UNIT – V : Vector Calculus

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

PRESCRIBED TEXT BOOKS:

1. Mathematical Methods by T.K.V. Iyengar, B.Krishna Gandhi & Others, S. Chand.
2. Higher Engineering Mathematics by Dr. B.S. Grewal, Khanna Publishers.

REFERENCES:

1. Advanced Engineering Mathematics by Kreyszig, John Wiley & Sons.
2. Introductory Methods by Numerical Analysis by S.S. Sastry, PHI Learning Pvt. Ltd.
3. Higher Engineering Mathematics by B.S. Grewal, Khanna Publications.

Outcomes:

- From a given discrete data, one will be able to predict the value of the data at an intermediate point and The student will be able to find a approximate root of a given equation.
- By curve fitting, one can find the most appropriate formula for a guesses relation of the data variables. This method of analysis data helps engineers to understand the system for better interpretation and decision making. and will be able to find a numerical solution for a given differential equation.
- One will be able to find the expansion of a given function by Fourier series.

- After studying this unit, one will be able to find a corresponding Partial Differential Equation for an unknown function with many independent variables and to find their solution.
- The student will be able to evaluate multiple integrals(line, surface volume integrals) and convert line integrals to area integrals and surface integrals to volume integrals.

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(R15A0012) ENGINEERING PHYSICS-II

OBJECTIVES:

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

UNIT-I

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

CRYSTALLOGRAPHY: Introduction, Lattice points, Space lattice, Basis, Unit cell, lattice parameters, Crystal systems, Bravais lattices, Atomic number, coordination number, packing factor of SC,BCC,FCC crystals, Lattice planes, miller indices. Expression for inter planar distance in cubic crystal.

UNIT- II

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

DEFECTS IN CRYSTALS: Types of crystal defects**,** Point defects-Vacancies, Interstitials, Estimation of defect concentrations of Schottky and Frenkel defects, Line defects- edge dislocation and screw dislocation**.** Burger's vector.

UNIT-III

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

ULTRASONICS: Introduction-generation of Ultrasonic waves-piezoelectric and magneto-striction method. Properties and Detection of Ultrasonic waves, NDT.

Unit-IV

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

SUPER CONDUCTIVITY: Super conductivity, General properties of super conductivityMeissner effect**,** Types of super conductors**,** Applications of super conductors.

UNIT-V

NANO SCIENCE & NANO TECHNOLOGY: Nano scale. Types of Nano materials-Surface to volume ratio and Quantum confinement. Synthesis of Nano materials-Bottom up Fabrication and Top down Fabrication- Sol gel, Bcs Theory, Physical Vapour Deposition. Characterisation of Nano particles –XRD and SEM . Applications of Nano materials.

TEXT BOOKS:

1 .Engineering Physics, Dr M Arumugam, Anuradha Publishers
2. A Text Book of Engineering Physics –P. G. Kshirsagar– S. Chand

REFERENCES:

1. Introduction to Solid State Physics – C. Kittel (Wiley Eastern).
2. Nanotechnology – M. Ratner & D. Ratner (Pearson Ed.).

OUTCOMES:

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

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(R15A0013)ENGINEERING CHEMISTRY

Objectives

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

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

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

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

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

UNIT- III: Engineering Materials

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

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

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

Nanomaterials: Introduction and applications of nanomaterials.

UNIT IV: Water and its Treatment:

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

UNIT V: Fuels

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

TEXT BOOKS:

1. Engineering Chemistry by P.C Jain & Monica Jain, Dhanpatrai Publishing Company 14th Edition (2013)

REFERENCE BOOKS

1. Engineering Chemistry by BharathiKumari and JyotsnaCherukuri, VGS Techno Series (2013)
2. Engineering Chemistry by R.P. Mani, K.N. Mishra, B. Rama Devi /CENGAGE learning

(2013)

Course Outcomes:

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

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(R15A0502)OBJECT ORIENTED PROGRAMMING

Objectives

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

Unit I

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

Unit-II

Functions, Classes and Objects:

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

Unit-III

Constructors, Destructors, Inheritance:

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

Inheritance : Introduction to inheritance, Defining Derived Classes, Single Inheritance, Multiple Inheritance, Multi-Level Inheritance, Hierarchical Inheritance, Hybrid Inheritance, Abstract Classes, Constructors in Derived Classes,Operator overloading, Rules for Operator overloading, overloading of binary and unary operators .

Unit-IV

Pointers, Virtual Functions and Polymorphism:

Introduction, Memory Management, new Operator and delete Operator, Pointers to Objects, this Pointer, Pointers to Derived Classes, Polymorphism, compile time polymorphism, Run time polymorphism, Virtual Functions, Pure Virtual Functions, Virtual Base Classes, Virtual Destructors.

Unit-V.

Templates and Exception handling:

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

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

Streams I/O: Stream classes hierarchy, Stream I/O, File streams and String streams, Error handling during file operations

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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(R15A0302) ENGINEERING DRAWING

Course Objectives:

- To impart and inculcate proper understanding of the theory ofprojection.
- To improve the visualizationskills.
- To enable the students with various concepts like dimensioning, conventions and standards related to working drawings in order to become professionallyefficient.

UNIT – I

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

a) Polygons-Construction of Regular Polygons (General methods only no special methods).
b) Conic Sections Including Rectangular Hyperbola
c) Cycloid, Epicycloid and Hypocycloid
d) Scales-Plain, Diagonal and Vernier Scales

UNIT – II

Projection: Principles of Orthographic Projections – Conventions – First and Third Angle projections.

Projections of Points. Points in all four quadrants.

Projections of Lines- Parallel, perpendicular inclined to one plan and inclined to both planes. True length and trueangle of a line.

UNIT – III

Projections of Planes: Plane parallel, perpendicular and inclined to one reference plane. Plane inclined to both reference planes.

Projections of Solids: Projections of regular solids, cube, prisms, pyramids, cylinder and cone,axis inclined to both planes.

UNIT – IV

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

UNIT – V

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

TEXT BOOKS

1.Engineering Drawing – Basant Agarwal, TMH

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.
3. Engineering Drawing – M.B. Shah and B.C. Rana, Pearson.

Course Outcomes:

- Student's ability to convert sketches to engineered drawings will increase.
- Students will be able to draw orthographic projections and sections.
- Student's ability to perform basic sketching techniques will improve
- Analyze different angle of projections and will be able to gain on planes, solids like pyramid, frustum etc
- Understand the logic behind design and development of projections to apply appropriate technique resources and modern engineering and IT tools

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(R15A0582)OBJECT ORIENTED PROGRAMMING LAB

Objectives:

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

Week 1:

Study of C++ Standard library functions.

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 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.
c) Write aProgram to illustrate New and Delete Keywords for dynamic memory allocation

Week 5

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

Member	Description
Data members	
sname	Name of the student
Marks array	Marks of the student
total	Total marks obtained
tmax	Total maximum marks

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

Week 6:

a) Write a Program to Demonstrate the i)Operator Overloading.ii) Function Overloading.
b) Write a Program to Demonstrate Friend Function and Friend Class.

Week 7:

a) Write a Program to Access Members of a STUDENT Class Using Pointer to Object Members.
b) Write a Program to Generate Fibonacci Series use Constructor to Initialize the Data Members.

Week 8:

Revision laboratory

Week 9

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

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

d) Subtraction of matrices. e) Multiplication of matrices

Week 10

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

a)Single inheritance b)Multiple inheritance

c)Multi level inheritance d)Hierarchical inheritance

Week 11

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

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

Week 12

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

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

Write a C++ program that uses functions to perform the following operations to:

i. Insert a sub-string in to the given main string from a given position.
ii. Delete n characters from a given position in a given string.

Week 15

a) Write a C++ program to display the contents of a text file.
b) Write a C++ program which copies one file to another.

Week 16

Revision laboratory

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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(R15A0083) ENGINEERING PHYSICS / ENGINEERING CHEMISTRY LAB

Engineering Physics Lab

(Any EIGHT experiments compulsory)

Objectives:

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.

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

The experiments are selected from various area of Physics like Physical Optics, Lasers, Fiber Optics, Sound, Mechanics, Electricity & Magnetism and Basic Electronics.

Also the student is exposed to various tools like Screw gauge, VernierCallipers, Physics Balance, Spectrometer and Microscope.

1. The Rigidity modulus (η) of the material of the wire using a Torsional pendulum.
2. Frequency of a vibrating bar, or a tuning fork using Melde's Experimental Arrangement
3. CR Circuit
4. Dispersive power of the material of the given prism-Spectrometer
5. Solar cell characteristics
6. Single slit diffraction Using laser
7. L.C.R. Circuit
8. Determination of the wavelength of sodium light and or (b) the radius of curvature of the surface of the Plano convex lens by forming Newton's rings.
9. Numerical Aperture In Optical Fibers
10. LED Characteristics

LABORATORY MANUAL:

1. Laboratory Manual of Engineering Physics by Dr.Y.Aparna&Dr.K.VenkateswaraRao

   (V.G.S Publishers)

2. Engineering Physics Lab Manual by Dr. C .V. MadhusudhanaRao&V.Vasanth Kumar

   (SciTech Publishers)

Outcomes:

The student is expected to learn from this laboratory course the concept of error and its analysis. It also allows the student to develop experimental skills to design new experiments in Engineering.

With the exposure to these experiments the student can compare the theory and correlate with experiment.

ENGINEERING CHEMISTRY LAB

List of Experiments

(Any Eight experiments compulsory)

Titrimetry:

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

Mineral analysis:

3. Estimation of manganese dioxide in pyrolusite.

Instrumental Methods:

Colorimetry:

4. Determination of ferrous iron in cement by colorimetric method
5. Estimation of copper by colorimetric method

Conductometry:

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

Potentiometry:

8. Titration of strong acid vs strong base by potentiometry.

Preparation:

9. Preparation of Phenol Formaldehyde Resin
10. Preparation of Aspirin

Physical properties:

11. Determination of viscosity of sample oil by Redwood Viscometer.
12. Determination of Surface tension of liquid by Stalagmometer

TEXT BOOKS:

1. Inorganic quantitative analysis, Vogel.
2. Practical Engineering Chemistry by K. Mukkanti, etal, B.S. Publications, Hyderabad.
3. Laboratory manual of Engineering Chemistry by Y. BharathiKumari and JyotsnaCherukuri (VGS Techno series)

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(R15A0082) ENGLISH LANGUAGE COMMUNICATION SKILLS LAB- II

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

Objective

- To facilitate computer aided multi-media instruction enabling individualized and independent language learning
- To sensitise the students to the nuances of English speech sounds, word accent, intonation and rhythm
- To bring about a consistent accent and intelligibility in their pronunciation of English by providing an opportunity for practice in speaking
- To improve the fluency in spoken English and neutralize mother tongue influence
- To train students to use language appropriately for interviews, group discussion and public speaking

EXERCISE –IV

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

EXERCISE –V
CALL Lab: Intonation Types
ICS Lab: Giving Instructions and Directions

EXERCISE –VI
CALL Lab: Neutralisation of Mother Tongue Influence
ICS Lab: Oral Presentations Team and Individual
GRAMMAR EXERCISES: Articles, Prepositions, Concord, Correction of Sentences
VOCABULARY EXERCISES: Antonyms, Synonyms, One word substitutes, Prefix and Suffixes.

PROJECTS

Students have to choose one of the following projects for their internals, and submit before the end of the semester. This project carries 25 marks.

1. Conduct interview using interrogative sentences.

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

2. Project on differences between group discussion and debate.

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

3. Book Review

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

- Characterization, plot, theme, message

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

4. Idioms and Phrasal Verbs

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

5. Project on Kinesics

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

6. UK and US vocabulary

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

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

7. Magazine Article Review

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

8. Career Guidance Project

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

9. Mother Tongue Influence

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

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

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

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

ELCS Lab:

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

The Computer aided Language Labfor 40 students with 40 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 :

The Interactive CommunicationSkills 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.

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

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

DISTRIBUTION AND WEIGHTAGE OF MARKS

English Language Laboratory Practical Examination:

1. The practical examinations for the English Language Laboratory shall be conducted as per the University norms prescribed for the core engineering practical sessions.
2. For the Language lab sessions, there shall be a continuous evaluation during the year for 25 sessional 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 same institution

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(R15A0362)MECHANICS OF FLUIDS

Objectives:

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

UNIT I

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

UNIT II

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

UNIT III

Fluid Dynamics: Surface & body forces, substantive derivative, local derivative and convective derivative, momentum equation, Euler equation, Bernoulli's equation. Phenomenological basis of Navier-Stokes equation. Flow measurements: pressure, velocity and mass flow rate, viscosity, Pitot-static tube, venturi meter and orifice meter, viscometers. Flow of through pipes, major and minor losses, Flow through nozzle.

UNIT IV

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

UNIT V

Dimensional and Model Analysis and Forces on submerged bodies:

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

Text Books:

1. Engineering Fluid mechanics – K.L . Kumar, S.Chand & Co.
2. Introduction to Fluid Mechanics and Fluid machines – S.K. Som and G. Biswas

Reference Books:

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

Outcomes:

- "To introduce and explain about fundamentals of Fluid Mechanics, which makes the student ready to understand about the applications of Aerodynamics, Hydraulics, Gas dynamics etc."
- To give fundamental knowledge of fluid, its properties and behavior under various conditions of internal and external flows.
- To develop understanding about hydrostatic law, and application of mass, momentum and energy equation in fluid flow
- Assess the fluid flow and flow parameters using measuring devices.

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(R15A0363) MECHANICS OF SOLIDS

Objectives:

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

UNIT – I

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

UNIT – II

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

UNIT – III

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

UNIT-IV

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

UNIT – V

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

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

Text Books:

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

Reference Books:

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

Outcomes:

- Understand the fundamental concepts of stress and strain in materials
- Knowledge of beams and analysis of Shear Force and Bending moments
- Apply the basic concepts to find the shear stress distribution and deflection in simply supported and Cantilever beam
- Analysis of Elastic stability in columns under loading conditions
- Knowledge on failure theories and factor of safety

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(R15A0364)THERMODYNAMICS

Objectives:

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

UNIT - I

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

UNIT - II

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

UNIT - III

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

UNIT - IV

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

UNIT - V

Thermodynamic Cycles: Power cycles: Otto, Diesel, Dual Combustion cycles, Sterling Cycle, Atkinson Cycle, Lenoir Cycle - Description and representation on P-V and T-S diagram, Thermal Efficiency,

Mean Effective Pressures on Air standard basis - comparison of Cycles. Application of Brayton cycles in aviation.

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

Text Books:

1. Engineering Thermodynamics / PK Nag / TMH, 5th Edition
2. 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
- To apply the knowledge of mathematics, science and engineering fundamentals to model the energy conversion phenomenon
- Students can correlate cycles applicable for engines.
- To investigate the effectiveness of energy conversion process in mechanical power generation for the benefit of mankind
- Students should be able to analyze the relationship between various processes and working mechanisms of the engines.

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(R15A2101)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:

- Acquire a knowledge of various manufacturing methodsand the techniques involved in joining and forming process performed in aircraft industry.
- Able to understand the various advancements in the machining process and the working principle of the equipment
- understand the importance and process involved in unconventional machining process
- Acquire a knowledge on material processing of various metal and alloys and also the techniques for improve of their mechanical and physical properties.
- Understand the various Assembly stages, Tools and equipment and inspection techniques used aircraft Assembly

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(R15A2102) AIRCRAFT ENGINEERING DRAWING

Objectives:

- To 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 I

Sections and Sectional views: Right regular solids – prism, cylinder, pyramid, cone – use of auxiliary views.

Development of surfaces: Developments of surfaces of right regular solids – prisms, cylinders, pyramids, cone and their parts.

Unit II

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, webs, ribs.

Limits and tolerances: Limit System – Tolerances – Fits - Tolerances of Form and Position.

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

Unit III

Introduction to simple Air Craft components.

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

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

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

Unit IV

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

a) Keys, cotter joints and knuckle joint.
c) Riveted joints for plates
d) Shaft coupling, spigot and socket pipe joint.
e) Journal, pivot and collar and foot step bearings.

Unit V

Assembly Drawings:
Drawings of assembled views for the part drawings of the following using conventions and easy drawing proportions.
a) Engine parts – Eccentrics, Petrol Engine connecting rod, piston assembly.
b) Other machine parts - Screws jacks, Plummer block
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

Text Books:

1. Machine Drawing by K. L. Narayana, P. Kannaiah, K. Venkata Reddy New Age International
2. Raymer, D.P., Aircraft Design: A Conceptual Approach, third edition, AIAA Education Series, AIAA, 1999, ISBN: 1-56347-281-0.

Outcomes:

- Ability to understand and apply the knowledge of machine drawing as a system of communication
- Develop detailed drawings of machines parts from assembly drawing
- Ability to get exposed to existing national standards related to technical drawings
- Ability to evaluate external and internal details of the machine component from which it can be manufactured
- Ability to model assembly drawings of aircraft components

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(R15A0061) MANAGERIAL ECONOMICS AND FINANCIAL ANALYSIS (OPEN ELECTIVE - I)

Objectives:

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

Unit-I

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

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

Unit-II

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

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

Unit-III

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

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

Unit-IV

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

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

Unit-V

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

Text Books:

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

Reference Books:

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

Outcomes:

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

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(R15A0507)JAVA PROGRAMMING
(OPEN ELECTIVE - I)

Objectives:

- This subject aims to introduce students to the Java programming language.
- Upon successful completion of this subject, students should be able to create Java programs that leverage the object-oriented features of the Java language, such as encapsulation, inheritance and polymorphism; use data types, arrays and other data collections;
- Implement error-handling techniques using exception handling, create and event-driven GUI using Swing components.

UNIT-I

OOP Concepts:- Data abstraction, encapsulation, inheritance, Benefits of Inheritance, Polymorphism, classes and objects, Procedural and object oriented programming paradigms.

Java Programming- History of Java, comments, Data types, Variables, Constants, Scope and Lifetime of variables, Operators, Operator Hierarchy, Expressions, Type conversion and casting, Enumerated types, Control flow- block scope, conditional statements, loops, break and continue statements, simple java stand alone programs, arrays, console input and output, formatting output, constructors, methods, parameter passing, static fields and methods, access control, this reference, overloading methods and constructors, recursion, garbage collection, building strings, exploring string class.

UNIT – II

Inheritance – Inheritance hierarchies super and sub classes, Member access rules, super keyword, preventing inheritance: final classes and methods, the Object class and its methods.

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

Interfaces- Interfaces Vs Abstract classes, defining an interface, implement interfaces, accessing implementations through interface references, extending interface.

Inner classes- Uses of inner classes, local inner classes, anonymous inner classes, static inner classes, examples.

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

UNIT-III

Exception handling- Dealing with errors, benefits of exception handling, the classification of exceptions- exception hierarchy, checked exceptions and unchecked exceptions, usage of try, catch, throw, throws and finally, rethrowing exceptions, exception specification, built in exceptions, creating own exception sub classes.

Multithreading – Differences between multiple processes and multiple threads, thread states, creating threads, interrupting threads, thread priorities, synchronizing threads, inter-thread communication, producer consumer pattern,Exploring java.net and java.text.

UNIT-IV

Collection Framework in Java – Introduction to java collections, Overview of java collection framework, Generics, Commonly used collection classes- Array List, Vector, Hash table, Stack, Enumeration, Iterator, String Tokenizer, Random, Scanner, Calendar and Properties.

Files- Streams- Byte streams, Character streams, Text input/output, Binary input/output, random access file operations, File management using File class.

Connecting to Database – JDBC Type 1 to 4 drivers, Connecting to a a database, querying a a database and processing the results, updating data with JDBC.

UNIT-V

GUI Programming with Java- The AWT class hierarchy, Introduction to Swing, Swing Vs AWT, Hierarchy for Swing components, Containers – Jframe, JApplet, JDialog, JPanel, Overview of some Swing components – Jbutton, JLabel, JTextField, JTextArea, simple Swing applications, Layout management – Layout manager types – border, grid and flow

Event Handling- Events, Event sources, Event classes, Event Listeners, Relationship between Event sources and Listeners, Delegation event model, Examples: Handling a button click, Handling Mouse events, Adapter classes.

Applets – Inheritance hierarchy for applets, differences between applets and applications, Life cycle of an applet, Passing parameters to applets, applet security issues.

Text Books:

1. Java Fundamentals – A Comprehensive Introduction, Herbert Schildt and Dale Skrien, TMH.

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.

Outcomes:

- An understanding of the principles and practice of object oriented analysis and design in the construction of robust, maintainable programs which satisfy their requirements;
- A competence to design, write, compile, test and execute straightforward programs using a high level language;
- An appreciation of the principles of object oriented programming;
- An awareness of the need for a professional approach to design and the importance of good documentation to the finished programs.
- Be able to implement, compile, test and run Java programs comprising more than one class, to address a particular software problem.
- Demonstrate the ability to use simple data structures like arrays in a Java program.
- Be able to make use of members of classes found in the Java API (such as the Math class).
- 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.
- Able to develop applications using Applet,AWT,JDBC and Swings

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(R15A0067) TECHNOLOGY MANAGEMENT
(OPEN ELECTIVE - I)

Objectives:

- The Objective of the course is to expose students to the importance of technology in conduct of business and its skillful management for optimum results.

Unit-I

The Process of Technological Innovation: The Need for a Conceptual Approach, Technological Innovation as a Conversion Process, Factors Contributing to Successful Technological Innovation. Strategies For Research and Development: R&D as A Business, Resource Allocation to R&D, R&D Strategy In the Decision Making Process, Selection and Implementation of R&D Strategy, R and D and Competitive Advantage, New Product Development- Techniques For Creative Problem Solving.

Unit-II

Financial Evaluation of Research and Development Projects: The Need For Cost Effectiveness, R&D Financial Forecasts, Risk as a Factor In Financial Analysis, Project Selection Formulae, Allocation of Resources, DCF and Other Techniques of evaluating R&D ventures.

Unit-III

Research and Development: Programme Planning and Control, Portfolio Planning, Project Planning and Control, Project Termination, Resource Allocation and Management- New Product Development: New Product Development as a Competitive Strategy, Market Research For Developing New Products, Commercialisation of Research Outcomes, Industrial Design, Product Architecture and Design For Manufacture, Developing Indigenous Substitute For Raw Materials.

Unit-IV

Technological Forecasting For Decision Making: The Definition of Technological Forecasting, Forecasting System Inputs and Outputs, Classification of Forecasting Techniques, Organisation For Technological Forecasting, Current Status.

Unit-V

Transfer of Technology: Modes of technology transfer, Price of technology transfer, Negotiation for price of MOT.

Text Books:

- Tarek Khalil: Management of Technology-The Key to Competitiveness and Wealth Creation, McGraw Hill, Boston, 2009.
- Krishnamacharyulu: Management of Technology, HPH, 2009
- V.K.Narayanan: Managing Technology and Innovation for Competitive Advantage, Pearson Education, 2009.
- Krishnamacharyulu & Lalitha: Management of Innovation, Himalaya, 2009.
- Norma Harison and Samson: Technology management – Text and cases, TMH, 2009
- Shane: Technology Strategy for Managers and Entrepreneurs, Pearson, 2009

Outcomes:

- Understand the role of R&D in technological innovation leading to business development
- Carry out financial analysis of R&D projects to establish their sustainability
- Develop strategies for designing and marketing of new products as part of business development
- Develop forecasting models for predicting technological changes and to identify market needs
- Identify different modes of technology transfer and pricing of the technology transfer

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(R15A0389) CAD LAB

Objectives:

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

LIST OF EXPERIMENT:

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

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

Reference Books:

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

Outcomes:

- Knowledge of various softwares available for engineering purpose.
- Learning the basics of AutoCAD software
- Application of various commands in AutoCAD to draw orthographic and isometric figures
- Learning procedure to draw 3D figures by using AutoCAD

- Learning different operations like threading, sweep and swept blend and implementation in modeling various components by using CREO software

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(R15A0384) MECHANICS OF SOLIDS AND MECHANICS OF FLUIDS LAB

Objectives:

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

(A) MECHANICS OF SOLIDS LAB:

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

a) Brinells hardness test

b) Rockwell hardness test

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

(B) MECHANICS OF FLUIDS LAB

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

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

Equipment needed

MOS – lab

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

MOF – lab

1 Venturimeter test rig

2.Test rig for Flow over notch

3.Pipe friction apparatus

4.Bernoulli's apparatus

5.test rig for Orifice meter

6. Mouthpiece apparatus.

Outcomes:

- Analyze various strength of materials through characterization
- Understand various characterization methods depending on the type of loading
- Prove good understanding of concepts and their applications in the laboratory
- Demonstrate practical understanding of friction losses in internal flows.
- Demonstrate the ability to work in groups on small design projects that are appropriate to the course

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(R15A0004) FOREIGN LANGUAGE:FRENCH
(Mandatory Course)

INTRODUCTION:

In view of the growing importance of foreign languages as a tool for local communication in few countries French has been identified as one of the most required language after English. So the consequent emphasis on training students to acquire communicative competence in foreign language, the syllabus has been designed to develop linguistic and communicative competencies of engineering students. In the French classes, the focus is on the basic speaking skills.

Objectives:

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

UNIT-I:

Pronunciation guidelines; Single vowels, Vowels and consonants combinations,; Numbers and Genders; , articles verbs and their groups; present tense; adjectives from singular to plural

UNIT-II

Sentences Structures; Prepositions, affirmatives, Negative and, Interrogative Sentences, The Family, Conversation, Notes on Vocabulary, Grammar, Liaisons and mechanisms.

UNIT-III

D'où viens-tu (Where do you come from); Vocabulary, Conversation, Notes on Vocabulary, Liaisons Guidelines. Comparer (Comparing); Vocabulary, Conversation, Liaisons, Ordinal Number up to 100. Grammar.

UNIT-IV

Le temps (Time); Vocabulary, Grammar; Vocabulary related to - The Family, Vocabulary - Some more grammar.

UNIT-IV

French Expressions and Idioms; Day-to-day Life, At Work, about Sports, Specia Events Other French Flavours; country of wine, pefumes and landscapes; - Québec and Accadie, , pass time in Suisse, people of france.

Outcomes:

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

Reference Books:

1. Le Nouveau Sans Frontiere-1, Cle International | 2003 |
2. Cahier d' activit'es ov Le Nouveau Sans Frontiere-1 Cle International | 2003 |
3. Easy French Step-by-step by Myrna Bell Rochester
2. Ultimate French Beginner-Intermediate (Coursebook) By Livid Language
3.Ã L'Aventure: An Introduction to French Language and Francophone Cultures By by Evelyne Charvier-Berman, Anne C. Cummings.

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(R15A0005) FOREIGN LANGUAGES: GERMAN

(Mandatory Course)

OBJECTIVES :

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

SYLLABUS

UNIT I

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

UNIT- II

Communication patterns, prose passages, etc.

UNIT- III

Communication skills in everyday situations

UNIT-IV

Training in creative writing in German.

UNIT- V

Training in creative speaking in German.

TEXT BOOKS

Lernziel Deutsch

Reference books:

Themen

Tangram

Sprachkurs Deutsch

Schulz-Griesbach

Outcomes

- Students familiarize with a modern foreign language – German
- The students with German get acquainted for basic communication in everyday situations.
- Students will know with the basics of writing simple direct sentences and short compositions.

- Students get to know the basics of German language to communicate in the work place when they find the necessity.
- Students will attain creative speaking skills

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(R15A2103)AEROSPACE PROPULSION

Objectives:

- 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: Evolution of flight propulsion, types of aerospace propulsion, working principles, advantages, disadvantages, applications – reciprocating engines, propellers, jet engine, turboprop, turbofan, turbo-shaft, ramjet, scramjet, pulsejet. Engine components-performance requirements, thermodynamic processes- change of state- representation by T-sand p-v diagrams - pressure ratios, temperature ratios. Energy transfer, losses- entropy generation-mechanisms. Performance- polytropic, stage and component efficiencies, burning efficiency
Station numbering in engine, thrust generation, momentum equations, equation of thrust for installed and uninstalled cases, factors affecting thrust, Role of propulsion in aircraft performance.

UNIT II

ANATOMY OF JET ENGINE-I

INLETS: Locations, Types of inlets, operating principle, functions, geometry, operating conditions, flow field, capture area, sizing, flow distortion, drag, and diffuser loses, methods of mitigation, performance.

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

UNIT III

ANATOMY OF JET ENGINE-II

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

NOZZLE: Exhaust nozzles- primary nozzle, fan nozzle- governing equations of flow- choking, engine back pressure control, nozzle-area ratio, thrust reversal, vectoring mechanisms. Afterburner functions and its components, design requirements and parameters. Performance gross thrust coefficient, discharge, coefficient, velocity coefficient, angularity coefficient, performance maps.

UNIT IV

RAMJET & SCRAMJET ENGINE: components, Performance of turbojets, ramjets at high speeds- limitations. Need for supersonic combustion, Implications criticality of efficient diffusion and acceleration, problems of combustion in high speed flow, The scramjet engine- construction, flow process- description, control volume analysis spill-over drag, plume drag, Component performance analysis- isolator, combustor- flow detachment and reattachment, thermal throat, scheduled, distributed fuel injection, Nozzle flow, losses- failure to recombination, viscous losses, plume losses. Scramjet performance applications, Combined cycle engines- turbo-ramjet, Air turbo-rocket (ATR), ejector ramjet, Liquid-air collection engine (LACE)- need, principle, construction, operation, performance

UNIT V

ROCKET ENGINE:

CHEMICAL ROCKET: Classification of rocket engine, chemical rocket engine types, working principle, schematic diagram, applications, types, advantages and disadvantages- solid, liquid and hybrid propellant rocket engine, propellants types used, injectors, nozzles, igniters, storage, TVC, combustion instabilities, combustion chamber, pulse detonation engine, rotary rocket engine

NUCLEAR: Power, thrust, energy. Nuclear fission- basics, sustainable chain reaction, calculating criticality, reactor dimensions, neutron leakage, control, reflection, prompt and delayed neutrons, thermal stability. Nuclear propulsion, history, principles, fuel elements, exhausts velocity, operating temperature, The nuclear thermal rocket engine, radiation and management, propellant flow and cooling, control, start-up and shutdown, nozzle, thrust generation. Potential applications of nuclear engines- operational issues, interplanetary transfer manoeuvres, faster interplanetary journey. Development status of nuclear engines, alternative reactor types, safety issues, nuclear propelled missions.

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: Micro-propulsion, micro-propulsion options, application of MEMS, chemical, electric micro-thrusters, principle, description, Propellantless propulsion, tethers, momentum exchange, electro-dynamic Photon rocket, beamed energy propulsion, solar, magnetic sails.

Text Books:

1. V Ganeshan Gas Turbines, Mc Graw-Hill Third Edition 2014.

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

Reference Books:

1. Ahmed F.EL. Sayeed., Aircraft Propulsion and Gas Turbine Engines, CRC Press, ISBN 978-0-8493-9196-5
2. Sutton, Rocket propulsion elements, Wiley Interscience publications, 7edition, ISBN- 0-471-32642-9

Outcomes:

- Understand operation of different airbreathing propulsion systems and their applications
- Learn construction and design features of inlets, compressors and turbines
- Develop knowledge on function of combustors and exhaust nozzles and their performance measurement techniques
- Identify problems of high speed propulsion systems and study combined cycle engines suitable for hypersonic applications
- Classify different non-airbreathing propulsion systems and their applications

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(R15A2104)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 andwing sections.
- To introduce the basics of viscous flow.

UNIT - I

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

UNIT - II

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

UNIT - III

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

UNIT - IV

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

UNIT - V

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

Text books:

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

Reference Books:

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

Outcomes:

- Defines basic understanding of Aircraft Structural members.
- Illustrate the methodologies to analyze beams and approximate aircraft structural members.
- Solve complex problems such as indeterminate structures.
- Analyze Columns with various boundary conditions.
- Compare classical methods with Energy methods to justify solutions.

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(R15A2105)AEROSPACE VEHICLE STRUCTURES - I

Objectives:

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

UNIT – I

Introduction to Aircraft Structure and Theory of Elasticity: Structural components of Aircraft – Stringers, longerons, ribs, bulkheads etc. General types of constructions, Monocoque, semi-monocoque and geodesic construction, typical wing and fuselage structure.Equilibrium and Compatibility conditions for elastic solids, 2D elasticity equations for plane stress, plane strain and generalized plane strain cases Airy's stress function. Simple problems in plane stress / plane strain stresses and Strains on arbitrary planes and transfomations.

UNIT - II

Deflection of determinate beams: Assumptions of elementary theory of bending – slope, deflection and radius of curvature – Differential equation for the elastic axis of a beam – Double integration and McCauley's methods. Determination of slope and deflection for cantilever and simply supported beams subjected to point loads, - U.D.L, Uniformly varying load. Singularity method of deflection analysis.

UNIT - III

Redundant Structures: Indeterminate structures and order of redundancy, Introduction to redundant analysis, Statically determinate models - Area movement method, Clayprons method - Use of freee body diagrams to explain compatitbility and redundant analysis principles. Singularity method for uniform beams with various boundary and support conditions (props, hinges and fixities) subjected to distributed / discrete loads (including moments).

UNIT - IV

Stability of Structural systems, Modes of instability of columns. Euler's formula for critical loads of column. Slenderness ratio, Effect of boundary conditions on mode shapes and critical loads. Column with initial curvature, effect of eccentricity. Long, medium and short column ranges. Rankine and

Jhonson's formulae. Eigen values and Eigen modes. Effect of intermediate supports. Concept of beam column.

UNIT - V

Energy principles and shear flow in closed sections: Introduction to energy principles and methods. Principles of Virtual Displacement and Principle of Virtual Force Castigliano's theorems, Maxwell's reciprocal theorem and Unit load method. The displacement method (Rayleigh Ritz method). Direct application of energy principles to beams and trusses.

Text Books:

1. Megson THG, "Aircraft Structure for Engineering students", Edward Arnold Publication.

Reference Books:

1. Shames I.H. and Dym C.L, Energy and finite element methods structural analysis McGraw Hill.
2. B.C.Punmia, "Theory of Structures", Laxmi Publication.
3. Timoshenko S.P. and J.N Goodier, "Theory of Elasticity" McGraw Hill Book Co.
4. David J. Peery "Aircraft Structures" McGraw Hill Book Company.
5. S.Ramamrutham, R.Narayana, "Theory of Structures" - Dhanpat Rai Publishing Co, 2003.
6. Argyris J.H. and Kelsey S.Energy theorems and structural analysis, Butterworths Scientific Publications 1960.
7. Donaldson, B.K. "Analysis of Aircraft Structures - AnIntroduction" McGraw Hill.
8. David H. Allen, and Walter E. Haiseler "Introduction to Aeronautical Structure Analysis", Jhon Wiley & Son, 1985.

Outcomes:

- Defines basic understanding of Aircraft Structural members.
- Illustrate the methodologies to analyze beams and approximate aircraft structural members.
- Solve complex problems such as indeterminate structures.
- Analyze Columns with various boundary conditions.
- Compare classical methods with Energy methods to justify solutions.

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(R15A0206)ELECTRICAL AND ELECTRONICS ENGINEERING

Objectives:

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

UNIT-I:

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

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

UNIT-II:

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

UNIT-III:

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

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

UNIT–IV:

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

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

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

EEE: Text Books

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

EEE: Reference Books:

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

ECE: Text Books

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

ECE: Reference Books:

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

Outcomes:

- Knowledge on the concepts of electrical DC and AC circuits, basic law's of electricity, instruments to measure the electrical quantities.
- Gain the knowledge on different methods to solve the electrical networks and construction operational features of energy conversion devices.
- Apply the basic theory in conceptual things to real-world electrical, electronic problems and applications.
- Acquaint knowledge on constructional features and operation of measuring instruments like voltmeter, ammeter, wattmeter etc.
- Emphasis on basics of electronics, semiconductor devices and their characteristics and operational features.

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(R15A2106)AIRCRAFT PERFORMANCE

Objectives:

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

UNIT – I

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

UNIT - II

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

UNIT - III

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

UNIT - IV

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

UNIT - V

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

Text Books:

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

Reference Books:

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

Outcomes:

- To introduce basic concepts of aerodynamics and propulsions directly related to performance of aircraft
- To describe the cruise performance of an airplane in relation with range and endurance with different types of engines and also to understand effects of weight, altitude and temperature on performance"
- To make student determine and apply the concept of climb and descent performance
- To make students understand to calculate power for best climb and descent performance.
- Calculate bank angle, turn speed and radius in steady horizontal turning flight at a given load factor"students can use methods to calculate take-off and landing runway distances and to understand fuel planning, safety and environment effects of aircraft performance."

MALLA REDDY COLLEGE OF ENGINEERING & TECHNOLOGY

II Year B. Tech, ANE-II Sem

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

(R15A0069) INTELLECTUAL PROPERTY RIGHTS (OPEN ELECTIVE – II)

Objectives:

- 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.

Text Books

1. A short course in International Intellectual Property Rights – Karla C. Shippey, World Trade Press – 2nd Edition.
2. Intellectual Property Rights – Heritage, Science, & Society under international treaties – A. Subbian, - Deep & Deep Publications – New Delhi.

Reference Books:

1. Intellectual Property Rights: N K Acharya: ISBN: 9381849309
2. Intellectual Property Rights: C B Raju : ISBN-8183870341
3. Intellectual Property : Examples and Explanation – Stephen M McJohn, 2/e, ISBN-13: 978-0735556652
4. Intellectual Property Rights in the Global Economy – Keith E Maskus, PIIE, ISBN paper 0-88132-282-2

Outcomes:

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

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4	-/-/-	3

(R15A0065) MANAGEMENT SCIENCE
(OPEN ELECTIVE – II)

Objectives:

- This course is intended to familiarize the students with the basic knowledge of Management related concepts, Organization structures, Control charts, Marketing management, Human resource management, Project management, Strategic management in order to achieve the positions of future leaders and managers.

Unit-I

Introduction to Management: Nature of Management, importance functions of Management, Systems approach to Management, Taylor's scientific Management theory, Fayal's principles of Management, Maslow's need hierarchy theory, McGregor's Theory X and Theory Y, Hertzberg Two Factor Theory of Motivation, Leadership Styles, Social responsibilities of Management.

Unit-II

Organization Structures, Control charts and Marketing Management: Line Organization structure, Line and Staff organization structure, Matrix organization structure, Team Organization structure, Control charts ($\bar{X}$chart, R chart, C chart, P chart), EOQ, ABC analysis, Functions of Marketing, Marketing Mix, Marketing strategies based on PLC.

Unit-III

Human Resource Management: Importance of HRM, HRM Vs PMIR (Personnel Management and Industrial Relations), Functions of HR Manager: Man power planning, Recruitment, Selection, Training and Development, Wage and Salary administration, Performance Appraisal, Grievance handling and welfare administration, Job evaluation, and merit rating.

Unit-IV

Project Management(PERT and CPM): Network analysis, Program Evaluation and Review Technique(PERT), Critical Path Method (CPM), Identifying Critical path, Probability of completing the project within given time, Project cost analysis, Project crashing(simple problems).

Unit-V

Strategic Management: Vision, Mission, Goals, Objectives, Policy, Strategy, Programs, Corporate planning process, Environmental scanning, SWOT analysis, Steps in strategy formulation and implementation.

Text Books:

1. Harold Koontz, Heinz Weihrich, A.R.Aryasri, Principles of Management, TMH, 2010.
2. K. Aswathappa, "Human Resource Management, Text and Cases", TMH, 2011.
3. Philip Kotler, Kevin Lane Keller, Abraham Koshy and Mithleshwar Jha: Marketing Management, 13/e, Pearson Education, 2012.
4. Dipak Kumar Bhattacharyya, Production and Operations Management, Universities Press, 2012.

Reference Books:

1. Dilip Kumar Battacharya, Principles of Management, Pearson, 2012.
2. Gary Dessler, "Human Resource Management", 12 Edition, Pearson- 2012.
3. Rajan Saxena: Marketing Management, 4/e, TMH, 2013
4. Aryasri: Management Science, McGraw Hill, 2012

Outcomes:

- To know the basic management practices, functional areas of the organisation which helps the students to build up their career in the corporate world.

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II Year B. Tech, ANE-II Sem

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

(R15A0024) PROBABILTY AND STATISTICS
(OPEN ELECTIVE – II)

Objectives:

- Understand a random variable that describes randomness or an uncertainty in certain realistic situation. It can be either discrete or continuous type.
- In the discrete case,study of the binomial and the Poisson random variables and the normal random variable for the continuous case predominantly describe important probability distributions. Important statistical properties for these random variables provide very good insight and are essential for industrial applications.
- Most of the random situations are described as functions of many single random variables. In this unit, the objective is to learn functions of many random variables, through joint distributions.
- The types of sampling, Sampling distribution of means, Sampling distribution of variance, Estimations of statistical parameters, Testing of hypothesis of few unknown statistical parameters.
- The mechanism of queuing system, The characteristics of queue, The mean arrival and service rates.
- The expected queue length, The waiting line
- The random processes, The classification of random processes, Markov chain, Classification of states
- Stochastic matrix (transition probability matrix),Limiting probabilities, Applications of Markov chains.

UNIT -1 : Introduction to Statistics & Probability

Introduction to Statistics

Measures of central tendency-Mean ,Median and Mode ,dispersion-Variance and Standard Deviation. Correlation -Coefficient of correlation , Rank correlation, Regression- Regression Coefficients , Lines of Regression.

probability - axioms of probability – some elementary theorems and Examples – conditional probability – Baye's theorem.

UNIT -2: Random Variables and Probability Distributions

Random Variables: Single and multiple Random variables -Discrete and Continuous. Probability distribution function, mass function and density function of probability distribution. mathematical expectation.

Probability distributions: Binomial distribution – properties, mean and variance, Poisson distribution – properties, mean and variance and Normal distribution – properties, mean and variance

UNIT -3 : Sampling Distributions and Statistical Inferences

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

Parameter Estimations : likelihood estimate , interval estimate.
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
Large sample Tests: i) Test of significance of single mean and equality of means of two samples(cases of known and unknown variance whether equal or unequal) ii) Tests of significance difference between sample proportion and population proportion and difference between two sample proportions

UNIT -4 : Exact Sampling Distributions(Small samples)
Exact Sampling Distributions(Small samples) Student t- distribution - properties
i)Test of significant difference between sample and population mean
ii)Test of difference between means of two small samples(independent and dependent samples)
F- distribution - properties –test of equality of two population variances
Chi-square distribution -properties –i)Test of goodness of fit ii)Test of independence of attributes

UNIT-5
Queuing Theory and Stochastic process
Structure of a queuing system its characteristics-Arrival and service process-Pure Birth and Death process Terminology of queuing system -Queuing model and its types-M/M/1 model of infinite queue (without proofs)and M/M/1 model of finite queue (without proofs).
Stochastic Process Introduction to stochastic process-classification and methods of description of Random process i.e,stationary and non-stationary Average values of single and two or more random process Markov process, Markov chain, Examples of Markov chains, Stochastic matrix.

Text Books:

1. Probability and Statistics by T.K..V Iyengar& B.Krishna Gandhi S.Ranganatham,MVSSAN Prasad. SCHAND Publishers
2. Fundamentals of Mathematical Statistics by SC Gupta and V.K. Kapoor.

Reference Books :

1. Higher Engineering Mathematics By Dr.B.S.Grewal,Khanna Publishers
2. Probability and Statistics for Engineers and Scientists by Sheldon M.Ross,Academic Press.

Outcomes:

- Students would be able to identify distribution in certain realistic situation. It is mainly useful for circuit as well as non circuit branches of engineering. Also able to differentiate among many random variables involved in the probability models. It is quite useful for all branches of engineering.
- The student would be able to calculate mean and proportions (small and large samples)and to make important decisions from few samples which are taken out of unmanageably huge populations.It is mainly useful for non-branches of engineering.
- The student would be able to find the expected queue length, the ideal time the traffic intensity and the waiting time. these are very useful tools in many engineering and data management problems in the industry. it is useful for all branches of engineering.
- The student would able to understand about the random process, markov process and markov chains which are essentially models of many time dependent processes such as signals in communications, time series analysis, queuing systems. The student would be able

to find the limiting probabilities and the probabilities in n^{th} state. It is quite useful for all branches of engineering.

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(R15A0006)GENDER SENSITIZATION

(An Activity – based Course)

Objectives of the Course:

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

Learning Outcomes:

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

Unit – I

UNDERSTANDING GENDER:

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

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

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

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

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

Unit – II

GENDER AND BIOLOGY:

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

Declining Sex Ratio. Demographic Consequences.

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

Two or Many? Struggles with Discrimination.
Additional Reading: Our Bodies, Our Health (Towards a World of Equals: Unit – 13)

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

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

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

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

Reference Books:

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

5. Shatrughna, Veena et al. Women`s Work and its Impact on Child Health and Nutrition, Hyderabad, National Institute of Nutrition, India Council of Medcial Research 1993.
6. Stress Shakti Sanghatana. "We Were Making History….'Life Stories of Women in the Telangana People`s Struggle. New Delhi:Kali of Women, 1989.
7. Menon, Nivedita. Seeing Like a Feminist. New Delhi. Zubaan-Penguin Books, 2012.
8. Jayaprabha, A. "Chupulu (Stares)". Women Writing in India: 600BC to the Present. Volume II: The 20th Century Ed. Susie Tharu and K. Lalita. Delhi: Oxford University Press, 1995. 596-597.
9. Javeed, Shayam and Anupam Manuhaar. "Women and Wage Discrimination in India: A Critical Analysis". International Journal of Humanilities and Social Science Invention 2, 4(2013).
10. Gautam, Liela and Gita Ramaswamy. "A 'Conversation' between a Daughter and Mother". Broadsheel on Contemporany Politics. Special Issue on Sexuality and Harassment: Gender Politics on Campus Today. Ed.Madhumeeta Sinha and Asma Rasheed. Hydrabad: Anveshi research Center for Women`s Studies, 2014.
11. Abdulali Sohaila. " I Fought For My Life…and Won." Abailable online at: http://www.thealternative. In/lifestyle/i-fought-for-my lifeand-won-sohaila-abdulal/
12. Jeganathan Pradeep, Partha Chatterjee (Ed). "Community, Gender and Violence Subaltern Studies XI". Permanent Block and Ravi Dayal Publishers, New Delhi, 2000
13. K. Kapadia. The Violence of Development: The Politics of Identity, Gender and Social Inequalities in India. London: Zed Books, 2002.
14. S. Benhabib. Situating the self: Gender, Community, and Postmodernism in Contemporary Ethics, London:Routledge, 1992.
15. Virginia Woolf A Room of One`s Oxford: Black Swan. 1992.
16. T. Banuri and M. Mahmood, Just Development: Beyond Adjustment with a Human Face, Karachi: Oxford University Press, 1997.

Outcomes

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

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(R15A2181)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:

- Students able apply some of the manufactures process for preparation of complicated jobs.
- Hands on experience on operating machinery
- Students can corelate various welding technologies
- Knowledge on sandwich structures and wood gluing concepts
- Acquire knowledge on CNC operation and part programming

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(R15A0282)ELECTRICAL AND ELECTRONICS ENGINEERING LAB

SECTION-A: ELECTRICAL ENGINEERING

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

SECTION-B: ELECTRONICS ENGINEERING

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

Note: Any 10 experiments can be conducted.

Outcomes

- Study different meters and instruments for measurement of electronic quantities
- Study the characteristics of different devices like generators, motors etc experimentally
- Design and experiment with various application circuits using diodes
- Design and experiment with various signal and power amplifier circuits using BJTs and FETs
- Design and experiment with various voltage regulation circuits

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

(R15A2107)INTRODUCTION TO SPACE TECHNOLOGY

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:

- Basic Understanding of rocket propulsion, types equation, their stages as well as trajectories
- Ability to understand about Atmospheric Re-entry
- Analysis of orbit Mechanics and their maneuvers
- Knowledge of Attitude determination of spacecraft/satellites
- Analysis the space mission operations

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III Year B. Tech, ANE-I Sem	**5**	**1/-/-**	**4**

(R15A2108) 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, 1D Flow With Heat Addition and Friction, Normal Shock, Oblique Shock.

UNIT-I ONE DIMENSIONAL COMPRESSIBLE FLOWS

Review of Thermodynamics. Definition of Compressibility, Review of Governing equations. Stagnation conditions, Speed of sound, Mach number, flow regimes, shock waves. Alternative forms of Energy equations, Normal shock relations, Hugonoit equation, One dimensional flow with heat addition and one dimensional flow with friction.

UNIT-II OBLIQUE SHOCK AND EXPANSION WAVES

Oblique shock relations. Super sonic flow over a wedge Θ - β - M relations strong and weak shock solutions , Shock polar. Regular reflection from a solid boundary. Pressure deflection diagrams, Intersections of shock wave. Expansion waves. Prandtl – Meyer Expansion.Shock Expansion theory. Detached shock in front of blunt body.

UNIT-III

SUBSONICCOMPRESSIBLE AND SUPERSONIC LINEARISED FLOW OVER AIRFOIL

Introduction - Velocity potential equation –small perturbation equation - Prandtl-Glauert compressibility corrections - Critical Mach number - Drag divergence Mach number - Area rule - Supercritical airfoil. Linearized supersonic pressure coefficient- Improved compressibility correction factors, Application to airfoil. conical flows-physical aspects, Delta Wing Aerodynamics.

UNIT- IV

FLOW THROUGH NOZZLES AND VARIABLE AREA DUCTS

Area-velocity relation, Isentropic flow through Convergent – Divergent nozzles. Choked flow conditions. Normal shock. Under and Over expansion conditions. Flow through diffusers – wave reflections from a free boundary. Method of Characteristics Application to supersonic wind tunnels and rocket engine.

UNIT-V EXPERIMENTAL AERODYNAMICS

Model testing in wind tunnels and types of wind tunnels. Pressure, Temperature, Velocity measurements – Hotwire and Laser – Doppler anemometer. Force measurements – Wind tunnel

balances. Scale effects and corrections, wall interferences, Flow visualization techniques-schileren and shadowgraph methods.

Text Books:

1. Anderson, J .D., Fundamental of Aerodynamics, Mc Graw-Hill International third edition Singapore-2001.
2. Anderson, J .D., Modern Compressible Flow with Historical Perspective, Mc Graw-Hill International third edition Singapore-2004.
3. W.E. Rae & Allen Pope, Low speed wind tunnel testing, John Willey &sons

Reference Books:

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

Outcomes:

- Explain brief review of thermodynamics and fluid mechanics in relation to compressible flows
- Demonstrate different types of shock waves and expansion waves and its properties across different situations.
- Understand the importance of quasi one-dimensional flow for obtaining supersonic speeds.
- Illustrate the concepts of method of characteristics and its applications in nozzle designs.
- Demonstrate the experimental methods and characteristics of various wind tunnels.

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5	1/-/-	4

(R15A2109) AEROSPACE VEHICLE STRUCTURES - II

Objectives:

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

UNIT-I

Thin Plate Theory, Structural Instability: Analysis of thin rectangular plates subject to bending, twisting, distributed transverse load, combined bending and in-plane loading-thin plates having small initial curvature, energy methods of analysis. Buckling of thin plates-elastic, inelastic, experimental determination of critical load for a flat plate, local instability, Tension field beams-complete diagonal tension, incomplete diagonal tension.

UNIT-II

Bending, Shear and Torsion of Thin Walled Beams: Unsymmetrical bending-resolution of bending moments, direct stress distribution, position of neutral axis. Deflection due to bending and approximation for thin walled sections, temperature effects. Shear loaded thin Walled beams-general stress, strain and displacement relationships,shear centre, twist and warping. Torsion of beams of closed section-displacements associated with Bredt-Batho shear flow. Torsion of open section beams. **St. Venant Torsion Theory of Warping**

UNIT-III

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

UNIT-IV

Structural and Loading Discontinuities in Thin Walled Beams: Closed section beams-shear stress distribution of a closed section beam built in at one end under bending, shear and torsion loads. Open section beams-I Section beam Subjected to torsion, torsion of beam of arbitrary section, torsion bending constant, distributed torque loading-extension of theory for general systems of loading. Shear lag-effect of shearing strains in beams-redistributed of bending stresses due to restraining of Warping, limitation of elementary bending theory, effect of accounting for shear lag on the estimated strength.

UNIT-V

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

Bending, shear, torsion, cut-outs in fuselages, fuselage frames and wing ribs-principles of stiffener/ web construction, fuselage frames,wing ribs.

Text Books:

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

Reference Books:

1. Allen,D.H. and Haisler,W.E.,introduction to Aerospace structural Analysis,john Wiley,2010.
2. Bruhn.E.H, Analysis and Design of Flight Vechicles structures,Tir-state off-set company,USA,1965.
3. Lakshmi Narasaiah.G, Aircraft Stractures, BS Publications, 2010.
4. Sechler.E.E. and Dunn, L.G., Aiplane Structural Analysis and Design, John Wiley & Sons.

Outcomes:

- Understand theoretical foundations, complexities, and design of modern aircraft structures.
- Analyze shear flow and bending stress in various structural members
- Idealize a real aircraft structure and apply theoretical foundations to convert into an analytical form.
- Analyze various structural components like wing and fuselage subject to different loading conditions
- Design and create simple aerospace structures to support mechanical loads.

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(R15A2110) AIRCRAFT STABILITY AND CONTROL

Objectives:

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

UNIT - I:

Aircraft in Equilibrium Flight - Elevator Angle to Trim - Longitudinal Static and Maneuver Stability: Need for controlled flight, Equilibrium, stability, trim, and control- definitions- examples. Longitudinal forces and moments on aircraft in un accelerated flight- contribution of principal components. Equations of equilibrium. Elevator angle required to trim. Longitudinal static stability- definition, Stick fixed neutral point- static margin**. Effect of flaps and flight speed on force and moment coefficients**, aerodynamic derivatives. Steady, symmetric pull-up maneuvers-equations of motion- pitch rate, pitch damping.

UNIT - II:

Estimation of Aerodynamic Force and Moment Derivatives of Aircraft: Derivatives of axial, normal force components and pitching moment with respect to the flight speed, angle of attack, pitch rate, elevator angle, and flight configuration- effects of flaps, power, compressibility and aero elasticity.
Lateral directional motion- coupling- derivatives of side force, rolling and yawing moments with respect to the sideslip, rate of sideslip, roll rate, yaw rate, aileron, and rudder deflections.

UNIT - III:

Stick Free Longitudinal Stability- Control Forces to Trim, Lateral- Directional Static Stability and Trim: Elevator hinge moments- relation to control stick forces. Hinge moment derivatives, Stick force to trim in symmetric un accelerated flight, maneuvering flight. Stick force gradients- effect of trim speed- role of trim tab. Effect of freeing elevator on tail effectiveness, static and maneuver stability, Elevator- free factor. Stick- free neutral and maneuver points, stability margins- relation with stick force gradients. Aerodynamic and mass balancing of control surfaces. Control tabs- types, function construction.
Lateral- directional static stability, definition, requirements. Equilibrium of forces and moments. Aileron, rudder, elevator and thrust required to trim aircraft in steady sideslip, roll, coordinated turn, engine out condition. Cross wind landings.

UNIT - IV:

Aircraft Equations of motion- Perturbed Motion- Linearized, Decoupled Equations: Description of motion of flight vehicles- systems of reference frames- Euler angles, angles of attack and sideslip- definitions- earth to body axis transformation, Rotation axis system- expressions for linear and angular momenta of rigid body, time derivatives- inertia tensor, components of linear and angular velocities, accelerations. Description of motion as perturbation over prescribed reference flight condition. Equation of motion in perturbation variables. Assumption of small perturbations, first

order approximations- linearized equations of motion. Decoupling into longitudinal and lateral-directional motions- conditions for validity- role of symmetry.

UNIT - V:

Longitudinal and Lateral- Directional Dynamic Stability: Linearized longitudinal equations of motion of aircraft- three degree of freedom analysis- characteristic equations- solutions- principal modes of motion- characteristics- time constant, un damped natural frequency and damping ratio- mode shapes- significance.One degree of freedom, two degree of freedom approximations- constant speed (short period), constant angle of attack (long period) approximations- solutions- comparison with three degree of freedom solutions- justification of approximations. Lateral directional equations- three degree of freedom analysis

Text Books:

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

Reference Books:

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

Outcomes:

- student will be able to understand the need of static stability, marginal stability and the need for stability of the aircraft
- Derive an expression for static longitudinal stability of the aircraft
- Explain the condition for static longitudinal stability, lateral and directional stability
- Differentiate the aircraft components contribution for the longitudinal static stability of the aircraft
- Formulate the importance of the aerodynamic derivatives i.e., stability derivatives and control derivatives

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(R15A2111) AEROSPACE MATERIALS AND COMPOSITES (CORE ELECTIVE – I)

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-IIHEAT TREATMENT OF METALS AND ALLOYS

LightMetalAlloys: Aluminumanditsalloys,highstrengthandhigh corrosionalloys.Titaniumanditsalloys:applications,Classificationofsteelsalloys,effectofalloying elements,magnesiumalloysandtheirproperties, maragingsteels:propertiesandapplications.

HighStrengthandHeatResistantAlloys: Classificationofheatresistant materials,iron, nickel and cobalt based alloys, refractorymaterials, silica basedceramics, properties ofinconel,monel,nimonicandsuperalloys; applicationofheatresistantalloyinaerospacevehicles.Heattreatment ofsteelanditsalloys.Casehardening,initialresidual stressesandstressalleviation procedures,corrosionpreventionandprotectivetreatments.

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

Introduction, polymer matrix composites,metalmatrixcomposites,ceramicmatrixcomposites,carbon-carboncomposites,fiber, reinforcedcompositesandnature-madecompositesandapplications.
Reinforcements:FibersGlass,Silica,Kevlar,carbon,boron,siliconcarbide,andborncarbide, fibres.Particulatecomposites,Polymercomposites,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: Propertiesofflightvehiclematerials,importanceofstrength/ weightratioofmaterialsforaerospacevehiclesstructures,importance oftemperature variations,factorsaffectingtheselectionofmaterialfor differentpartsofairplanes.

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,AircraftMaterialsandProcesses,5/e,SterlingBookHouse,1998.
2. D.Agarwal, L.J. Broutman and K. Chandrasekhara,AnalysisandPerformanceof FibreComposites,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,MechanicalMetallurgy,1/e,McGrawHill,1976.
3. Nonlinear Approaches in Engineering Applications

Outcomes:

- Study the types of mechanical behavior of materials for aircraft applications.
- Understand the mechanical properties of materials by heat treatment processes.
- Understand the analysis of composite laminates under different loading conditions and different environmental conditions.
- Knowledge in usage of composite materials in aircraft component design.
- Learning NDT methodologies

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(R15A0367)EXPERIMENTAL STRESS ANALYSIS
(CORE ELECTIVE – I)

Objectives:

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

UNIT I

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

UNIT II

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

UNIT III

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

UNIT IV

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

UNIT V

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

Text Books:

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

Reference Books:

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

Outcomes:

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

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(R15A0366)ENGINEERING OPTIMIZATION
(CORE ELECTIVE – I)

Objectives:

- Introduce methods of optimization to engineering students, including linear programming, integer programming, quadratic programming, nonlinear programming, and heuristic methods.
- The goal is to maintain a balance between theory, numerical computation, problem setup for solution by optimization software, and applications to engineering systems.

UNIT – I

Introduction: Optimal Problem formulation: Design variables-Constraints- Objective function-Variable bounds. Engineering Optimization problems: Classification& Some examples (just theory & discussion): Truss structure.

Single variable non-linear optimization problems: Local minimum Global minimum & Inflection point. Necessary & Sufficient conditions theorems, some problems based on this. Numerical methods: Exhaustive Search methods- Fibonacci method, Golden section method & comparison. Interpolation methods: Quadratic.

UNIT – II

Multivariable unconstrained non-linear optimization problems: **Numerical methods** Direct Search methods: Univariate method, Pattern Search methods: Powell, Hook-Jeeve's, Rosen Brock's search and Simplex methods. Gradient methods: Gradient of a function-Importance- Gradient direction search based methods: Steepest descent/ascent method, Conjugate gradient method and variable metric method.

UNIT – III

Multivariable constrained non-linear optimization problems Classical optimization techniques: Constraints – equations-Lagrangian method- inequalities-Kuhn-Tucker necessary and sufficient conditions-Quadratic problem-Statement- Wolfe's and Beale's methods.

UNIT – IV

a) Geometric Programming: Posynomials – arithmetic – geometric inequality – unconstrained G.P-constrained G.P(type only)

b) Sensitivity Analysis: Linear programming – Formulation – Simplex method and Artificial variable techniques-Big-M & two-phase methods- Change in the cost coefficients, coefficients & constants of the constraints, addition of variables.

UNIT – V

a) Simulation-Definition-Steps involved- Types of simulation Models-Advantages and disadvantages-Simple problems on queuing & inventory.

b) Non-traditional optimization algorithms: Genetic algorithms: working principles differences and similarities between Gas and traditional methods. Simulated annealing.

Text Books:

1. Engineering Optimization: Theory & Practice-S.S.Rao-New Age International Publications- Thir Edition-2003
2. Optimization for Engineering Design- Kalyanmoy Deb-Prentice-Hall of India Pvt.Ltd, NewDelhi-2005.
3. Operations Research- S.D.Sharma- Kedar Nath & Ran Nath Co., New Delhi

Reference Books:

1. Optimization Theory & Practice: Beveridge & Schechter.McGraw-Hill International Student edition.
2. Optimization in Operations Research Ronald L.Rardin. Pearson Education, Low Price Edition.
3. Optimization Theory & Practice: Mohan C.Joshi & KM Moudgalya. Narosa Publishing House, Chennai
4. Operations Research: A.P.Verma. S.K.Kataria & Sons, New Delhi-110006

Outcomes:

- formulation of optimization models and solution methods in optimization
- methods of sensitivity analysis and post processing of results
- applications to a wide range of engineering problems

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(R15A0068) TOTAL QUALITY MANAGEMENT (OPEN ELECTIVE – III)

Objectives:

- Total Quality Management is a method by which management and employees can become involved in the continuous improvement of the production of goods and services.
- It is a combination of Quality and management tools aimed at increasing business and reducing losses due to wasteful practices.
- The simple objective of TQM is "Do the right things, right the first time, every time."

Unit-I

Principles and Practices-I: Introduction,- Gurus of TQM,- Historic Review, Benefits of TQM-Leadership, characteristics of Quality leaders.-The Deming Philosophy-Quality councils-Strategic Planning- Customer Satisfaction-Customer perception of Quality-service Quality,-Customer Retention- Employee Involvement- Employee survey-Empowerment-Gain sharing-Performance Appraisal.

Unit-II

Principles and Practices-II: Continuous process Improvement,- the Juran trilogy,- The PDCA Cycle-Kaizen- Reengineering. Supplier Partnership- Partnering-Sourcing-Supplier Selection-Supplier rating-Performance Measures-Basic concept-Strategy-Quality cost- Bench marking- reasons for bench marking-Process-Understanding current performance-Pitfalls and criticism of benchmarking.

Unit-III

Tools and Techniques-I: Information Technology-Computers and the quality functions-Information quality Issues-Quality management System-Benefits of ISO registration-ISO 9000 series Standards-Internal Audits. Environmental Management System-ISO 14000 series-Benefits of EMS- Relation to Healthy and safety-Quality Function Deployment-The voice of the Customer- Building a House of Quality-QFD Process.

Unit-IV

Tools and Techniques-II: Quality by Design- Benefits-Communication Model-Failure Mode and Effective Analysis-Failure Rate, FMEA Documentation-The process of FMEA Documentation-Product liability-Proof and Expert Witness. Total Productive Maintenance- promoting the Philosophy and Training-Improvements and needs-Autonomous Work groups.

Unit-V

Management Tools: Management Tools,-Introduction-Forced field Analysis-Tree diagram- Process decision Program Chart-Statistical Process Control-Cause and Effect diagram-Histogram-state of control – Process Capability- Experimental Design-Hypothesis-Orthogonal Design-Two factors and Full factors-Quality Strategy for Indian Industries-Quality Management in India.

Text Books:

- Dale H. Besterfield, Total Quality Management, 4/e, Pearson Education India, 2015.
- P M Charantimath, Total Quality Management, 2/e, Pearson Education India, 2011.

Reference Books:

- John Bank, The essence of Total Quality Management, 2/e, Prentice Hall of India 2001.
- Suganthi, L, Samuel, A Anand, Total Quality Management, PHI
- Dr. K.C. Arora, Total Quality Management, S.K. Kataria & Sons, 2010.
- Singhal, K. R.Singhal, Divya, Implementing ISO 9001:2008 Quality Management System: A Reference Guide, 2/e, PHI
- Sridhara Bhat: Total Quality Management, 1/e, Himalaya, 2011
- **S.D.Bagade,** Total Quality Management, 1/e, Himalaya, 2011

Outcomes:

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

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(R15A0365) MECHANISMS AND MECHANICAL DESIGN (OPEN ELECTIVE-III)

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, centroids and axodes – 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.

Kinematic Design: Four bar mechanism, Freudenstein equation. Precession point synthesis, Chebyshev`s method, structural error.

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. Roller follower, circular cam with straight, concave and convex flanks.

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.

Text Books:

1.

2. The Theory of machines – Thomas Beven., Third Edition – Pearson Publishers.
3. Theory of machines and Mechaisms Third Edition – John J. Uicker, Jr. Gordon R. Pennock, Josph E. Shigley, Oxford Publisher.

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:

- Understand the mechanism of linkages.
- Calculate and Analyze the relative velocity and acceleration of different linkages.
- Understand and analyze the gyroscopic effect on airplane, ships and vehicles.
- Drawing the cam profile for different types of motions.
- Understand the various gear trains and calculate velocity ratio for the gear trains.

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(R15A0521)WEB TECHNOLOGIES
(OPEN ELECTIVE – III)

Objectives:

- Giving the students the insights of the Internet programming and how to design and implement complete applications over the web.
- It covers the notions of Web servers and Web Application Servers, Design Methodologies with concentration on Object-Oriented concepts, Client-Side
- Programming, Server-Side Programming, Active Server Pages, Database Connectivity to web applications, Adding Dynamic content to web applications,
- Programming Common Gateway Interfaces, Programming the User Interface for the web applications.

UNIT I:

Web Basics and Overview: Introduction to Internet, World wide web, Web Browsers, URL, MIME, HTTP, Web Programmers Tool box.

HTML Common tags: List, Tables, images, forms, Frames; Cascading Style sheets. Introduction to Java Scripts, Objects in Java Script, Dynamic HTML with Java Script.

UNIT II:

Introduction to XML: Document type definition, XML Schemas, Document Object model, Presenting XML ,Introduction to XHTML, Using XML Processors: DOM and SAX.

Java Beans: Introduction to Java Beans, Advantages of Java Beans, BDK Introspection, Using Bound properties, Bean Info Interface, Constrained properties Persistence, Customizes, Java Beans API, Introduction to EJB‘s.

UNIT III:

Web Servers and Servlets: Tomcat web server, Installing the Java Software Development Kit, Tomcat Server & Testing Tomcat, Introduction to Servlets: Lifecycle of a Servlet, JSDK, The Servlet API, The javax. Servlet Package, Reading Servlet 150 parameters, Reading Initialization parameters. The javax.servlet HTTP package, Handling Http Request & Responses, Using Cookies-Session Tracking, Security Issues.

UNIT IV:

Database Access: Database Programming using JDBC, JDBC drivers, Studying Javax.sql.* package, Accessing a Database from a Servlet. Introduction to JSP: The Problem with Servlet. The Anatomy of a JSP Page, JSP Processing. JSP Application Design with MVC Setting Up and JSP Environment.

UNIT V:

JSP Application Development: Generating Dynamic Content, Using Scripting Elements Implicit JSP Objects, Conditional Processing : Displaying Values Using an Expression to Set an Attribute, Declaring Variables and Methods Error Handling and Debugging Sharing Data Between JSP pages, Requests, and Users Passing Control and Date between Pages – Sharing Session and Application Data – Memory Usage Considerations, Accessing a Database from a JSP page, Deploying JAVA Beans in a JSP Page, Introduction to struts framework.

Text Books:

1. Web Programming, building internet applications, Chris Bates 2nd edition, WILEY Dreamtech (UNIT s 1, 2)
2. Core SERVLETS ANDJAVASERVER PAGES VOLUME 1: CORE TECHNOLOGIES By Marty Hall and Larry Brown Pearson (UNITs 3,4,5)

Reference Books:

1. Programming world wide web-Sebesta,Pearson Education ,2007.
2. Core SERVLETS ANDJAVASERVER PAGES VOLUME 1: CORE TECHNOLOGIES By Marty Hall and Larry Brown Pearson
3. Internet and World Wide Web – How to program by Dietel and Nieto PHI/Pearson Education Asia.
4. Jakarta Struts Cookbook, Bill Siggelkow, S P D O'Reilly for chap 8.
5. March's beginning JAVA JDK 5, Murach, SPD
6. An Introduction to Web Design and Programming –Wang-Thomson

Outcomes:

- Analyze a web page and identify its elements and attributes.
- Create web pages using XHTML and Cascading Styles sheets.
- Installation and usage of Server software's.
- Database Connectivity to web applications
- Build web applications using Servlet and JSP

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(R15A2182)AERODYNAMICS AND PROPULSION LAB

Objectives:

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

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. Flow visualization on symmetric airfoil
7. Efficiency of Vanes in Centrifugal blower

PROPULSION

8. Performance estimation for single cylinder four stroke Petrol engines.
9. Performance estimation and heat balance test for single cylinder four stroke Diesel engines.
10. Determination of Port timing and sketching for two stroke petrol engine.
11. Determination of Valve timing and sketching for four stroke diesel engine.
12. Estimating the efficiency of centrifugal compressor.
13. Estimating the properties of fuel.
14. 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

- Analyze aerodynamic performance of various models
- Ability to understand details of piston and gas turbine engine
- Ability to characterize various aircraft fuels
- Ability to analyze the performance of 2 stroke and 4 stroke engines
- Ability to estimate the efficiency of compressors

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0	-/3/-	2

(R15A2183) AEROSPACE STRUCTURES LAB

Objectives:

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

LIST OF EXPERIMENTS:-

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

Note: Any10 Experiments should be conducted

Equipment needed

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

Reference Books:

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

Outcomes:

- Analyze the theoretical and experimental results of beams with various end conditions
- Investigate the Maxwell's Reciprocal theorem and Principle of superposition using beams under various load conditions.
- Analyze the shear centre for open and closed sections.

- Ability to evaluate unsymmetrical bending stresses under various loading conditions
- Ability to analyze the defects in materials by performing NDT

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(R15A2112) FINITE ELEMENT ANALYSIS

Objectives:

- It covers the fundamental theoretical approach beginning with a review of differential equations, boundary conditions, integral forms, interpolation, parametric geometry, numerical integration, and matrix algebra.
- Next, engineering applications to field analysis, stress analysis and vibrations are introduced. Time dependent problems are also treated.
- Students are also introduced, by means of selected tutorials, to the commercial finite element system SolidWorks which is similar to one they could be expected to use upon graduation. Graduate students will also be introduced to the more powerful (and difficult to use) Ansys system.

UNIT – I

Introduction to Finite Element Method for solving field problems. Stress and Equilibrium. Strain – Displacement relations. Stress – strain relations. One Dimensional problems : Finite element modeling coordinates and shape functions. Potential Energy approach : Assembly of Global stiffness matrix and load vector. Finite element equations, Treatment of boundary conditions, Quadratic shape functions.

UNIT – II

Analysis of Beams : Element stiffness matrix for two node, two degrees of freedom per node beam element. Finite element modelling of two dimensional stress analysis with constant strain triangles and treatment of boundary conditions.

UNIT – III

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. Analysis of a uniform shaft subjected to torsion.

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:

- Describe the general steps used in the finite element analysis to model problems in engineering.
- Develop stiffness matrices for spring, truss, beam, plane stress problems and three-dimensional problems
- Develop the finite element formulations for heat transfer problems
- Describe the concept of direct equilibrium method and potential energy method for structural mechanics problems.
- Develop the finite element formulation for dynamic loadings

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(R15A2113) CONTROL THEORY FOR AIRCRAFT

Objectives:

- To acquire the student with method of modeling,
- Performance analysis of control system and
- Application to aircraft control system.

UNIT I: Control System modeling and feedback control:
Basic components of control system, open loop system, closed loop system, effect of feed back on overall gain, stability, sensitivity & on noise, Linear Vs Non linear system, Time-invariant Vs time varying systems. Modeling of dynamical system by differential equations. Linearization of non-linear system. System type, steady state error, error constant. Composition, reduction of block diagrams of complex systems-rules and conventions. Control system components- sensors, transducers, servomotors, actuators, filters, modeling, transfer function.

UNIT-II: **Time Domain & Frequency Domain Analysis.**
Control system performance, time domain description, output response to control inputs. Characteristic parameters-relation to system parameters. Review of Laplace transform , applications to differential equations, Poles and zeroes, partial fraction decomposition of transfer function. Frequency domain analysis, specification: resonant peak, resonant frequency and band width. Bode Plot, Polar plot. Experimental determination of transfer function by frequency response measurement.

UNIT-III:Design of Control System.
Control system performance requirements, transient and steady state specification. Example of first and second order system. Method of determining stability- Routh-Hurwitz Criterion. Design of controllers: active, passive, series, feed forward, feed back controller. Proportional, integral. Proportional plus derivative control. Lead, lag, lead-lag, wash-out, notch filters: properties and transfer functions. Gain scheduling, Adaptive control-definition, merits. Stability of closed loop system, Root Locus method of analysis and compensation. Nyquist Criterion, gain margin and phase margin.

UNIT-IV :Aircraft response to control- Flying Qualities, Stability and Control Augmentation, Auto pilots.
Approximation to aircraft transfer functions, Flying qualities of aircraft, relation to airframe transfer function. Pilot opinion rating. Stability Augmentation system- displacement & rate feed back, Full authority fly-by-wire control, need for automatic control. Auto pilots- purpose, functioning,

displacement auto pilot, pitch, yaw, bank, altitude and velocity hold auto pilot. Auto pilot design by displacement feedback & series PID Controller- Zeigler and Nichols method.

UNIT-V:Modern Control Theory

Limitations of classical control system modeling, multi input multi output systems. State space modeling of dynamical systems, state variable-definition-stateequations. The output variable-the output equation. Representation by vector matrix first order differential equations. Matrix transfer function, state transition matrix- matrix exponential ,properties, Numerical solutions of state equations, examples. Canonical transformation of state equations, Eigen values, real distinct, repeated. Controllability and observability- definition-significance. Digital control system: over view-advantages, disadvantages.

Text Books:

1. KUO, BC. Automatic Control systems, prentice hall India, 1992 ISBN 0-87692-B3-0
2. Nelson R.C. Flight Stability and Automatic control, second edition, tata McGraw-hill2007 ISBN 0-07-666110-3
3. Yechout, T.R , Introduction to flight Mechanics, AIAA,2003,ISBN 1-56347-577-4

Reference Book: Mc Lean, D. Automatic flight Control Systems, prentice hall, 1990

Outcomes:

- Define the basic concepts associated with control Theory and its application
- Understand the control system performance with the time domain description
- Analyze the steady state response and application of feedback in augmentation controls
- Determine the flying qualities of aircraft and requirements.
- Explain the displacement and rate feedback determination of gains conflict with pilot inputs resolution.

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4	-/-/-	3

(R15A2114) FLIGHT VEHICLE DESIGN

Objectives:

- Students can acquire knowledge of designing a model of aircraft
- Sizing of different components of aircraft can be done
- Performance of different flights can be estimated

UNIT I

DESIGN PROCESS OVERVIEW AIRFOIL AND GEOMETRY SELECTION,THRUST TO WEIGHT RATIO,WING LOADING

Phases of aircraft design. Aircraft conceptual design process, project brief / request for proposal, problem definition information retrieval, aircraft requirements, configuration options Integrated product development and aircraft design. empty weight estimation –historical trends, fuel fraction estimation, mission profiles, mission segment weight fractions. Airfoil selection, airfoil design, design lift coefficient, stall, airfoil thickness ratio airfoil considerations. Wing geometry and wing vertical location, wing tip shapes Tail geometry and arrangements. Thrust to weight ratio - statistical estimation, thrust matching. Wing loading

UNIT II

INITIAL SIZING & CONFIGURATION LAYOUT

Sizing with fixed engine and with rubber engine. 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, structuralload paths. Radar, IR, visual detect ability, aural signature.

UNIT III

CREW STATION, PASSENGERS &PAYLOAD, LANDING GEAR &SUBSYSTEMS
AERODYNAMIC &PROPULSION, 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. The baseline design layout and report of initial specifications, aircraft loads, Flight loads- atmospheric, maneuver- construction of flight envelope. Wing loads, Empennage loads, Fuselage loads. Propulsion system selection, jet engine integration, engine dimensions, Nozzle integration, Aircraft materials, design data- allowable, allowable bases. Failure theory.

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. Multivariable design optimization methods. Measures of merit Determination of final baseline design configuration, preparation of type specification report

UNIT V

EVOLUTION OF DESIGN

Design of the DC – 1, DC – 2, DC- 3 aircraft, Boeing B-47 and 707, General Dynamics F-16, SR-71 Black bird Northrop-Grumman B-2 Stealth Bomber. A survey of the Indian aircraft design effort Design of VTOL aircraft, helicopters, hypersonic vehicles, delta and double delta wings, forward swept wings, uninhabited air vehicles.

Outcomes:

- Define the design process overview followed during the design of the aircraft.
- Demonstrate initial sizing and layout preparation and handwork for geometric sizing.
- Discuss material properties, geometry, size and systems requirement to construct flight envelope.
- Understand performance and trade studies which allows to distinguish type of engine and design to be adopted.
- Interpret importance of design on stability and control of the aircraft.

Text books

1. Raymer ,D.P., Aircraft Design : A Conceptual Approach, 3rd edn., AIAA Education series, AIAA, 1999,ISBN: 1-56347-281-0

2. Howe, D., Aircraft Conceptual Design Synthesis, Professional Engineering Publishing,London,2000,ISBN:1-86058-301-6

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(R15A2115) AIRCRAFT SYSTEMS

Objectives:

- To impart knowledge of the hydraulic and pneumatic systems components and types of instruments and its operation to the students

UNIT - I

HYDRAULIC & PNEUMATIC AND LANDING GEAR SYSTEMS

Study of typical workable system – Components – Hydraulic system controllers –Modes of operation Pneumatic systems – Advantages – Working principles – Typical air pressure system – Brake system – Typical pneumatic power system – Components Landing gear systems – Classification – Shock absorbers – Retractive mechanism.

UNIT – II

AIRPLANE CONTROL & MODERN CONTROL SYSTEMS

Conventional systems – Power assisted and fully powered flight controls – Power actuated systems – Engine control systems – Push pull rod system, Flexible push full rod system – Components. Digital fly by wire systems – Auto pilot system active control technology,

UNIT - III

ENGINE CONTROL & FUEL SYSTEMS.

Fuel system for piston and jet engines - Components of multi engines – Lubricating systems for piston and jet engines. Starting and Ignition systems – Typical examples for piston and jet engines. Full authority control systems. Engine monitoring-sensors, indicators.

UNIT - IV

AIR CONDITIONING AND PRESSURIZING SYSTEMS

Basic air cycle systems – Vapor cycle systems, Boost – strap air cycle system – Evaporative vapor cycle systems – Evaporative air cycle systems – Oxygen systems – Fire protection systems, De-icing and anti-icing systems.

UNIT - V

ELECTRICAL SYSTEMS

Electrical loads in aircraft. Electrical power generation and control of AC and DC. Bus bars, power distribution of different voltages AC & DC. over/under load protection devices-speed and frequency protection devices. Electrical load measurement systems.

Text Books:

1. McKinley, J.L., and Bent, R.D., Aircraft Maintenance & Repair, McGraw Hill, 1993.
2. Transportation, Federal Aviation Administration The English Book Store, New Delhi, 1995
3. Moir, I and Seabridge, A., Aircraft Systems: Mechanical,Electrical and Avionics Subsystems Integration, 3rd edn, John Wiley,2008, ISBN 978-0-470-05996-8.

Reference Books:

1. McKinley, J.L.and Bent, R.D., Aircraft Power Plants, McGraw Hill 1993.
2. Pallet, E.H.J., Aircraft Instruments & Principles, Pitman & Co 1993.
3. Treager, S., Gas Turbine Technology, McGraw Hill 1997.

Outcomes:

- Knowledge of the Hydraulic and Pneumatic Systems, Components and types of Instruments and its operation.
- Impart the Airplane Control and Modern Control Systems and Understanding of Auto Pilot System.
- Provide the Knowledge of Fuel System for Piston and Jet Engines
- Understanding of the Air Conditioning Systems and Pressurization Systems in Aircraft.
- Impart the Aircraft Electrical Systems.

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(R15A2116)LAUNCH VEHICLE AND MISSILE TECHNOLOGY
(CORE ELECTIVE – II)

Objectives:

- 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

LAUNCH VEHICLE: Role and military functions of space launch vehicle, Types, missions, mission profile, Thrust profile, propulsion system, and staging employed in the vehicle, guidance and control requirements, and performance measurements. Design process employed in launch vehicle, construction procedure, some successful launch vehicles, Description of a typical space launch vehicle procedure, Description of space shuttle engine, Propellant slosh - Propellant hammer, Geysering effect in cryogenic rocket engines

UNIT-II

MISSILES: Types of Missiles, simililarities and differences with launch vehicle, types controls for missiles, Airframe components of rockets and missiles- Forces acting on a missile while passing through atmosphere. Method of describing aerodynamic forces and moments, Lateral aerodynamic moments, Lateral damping moment and longitudinal moment of a rocket-Lift and drag forces, Drag estimation- Body upwash and downwash in missiles-Rocket dispersion.

UNIT-III

VEHICLE DYNAMICS: Tsiolskovsky's rocket equation- range, gravitational field, inclined motion, flight path at constant pitch angle. Multi staging, Earth launch trajectories-vertical segment, gravity turn, constant pitch trajectory. Actual launch vehicle trajectory, types. Examples, Reusable launch vehicles, Rocket thrust vector control - Methods of thrust vector control-Thrust magnitude control, Thrust Termination, Stage separation dynamics-Separation techniques.

UNIT-IV

PROPULSION: Solid propellant rocket motors, principal, applications, Solid propellant types, composition, properties, performance, Propellant grain, properties, configuration, prepartion, loading, structural design, Liners, insulators and inhibitors- functions, requirements, materials, Rocket motor casing- materials. Nozzle, types, design, construction, thermal protection, Igniters, types, construction, Description of modern solid boosters, Liquid propellants-types, composition, properties, performance, Propellant tanks, feed systems- pressurisation, turbo-pumps-valves and feed lines, injectors, starting and ignition, Engine cooling, system calibration, safety and environment concerns.

UNIT V

TESTING: Ground testing and flight testing- types, safe guards, control of toxic materials instrumentation and data management, Procedures- ground testing, flight, trajectory, post accident, Criteria for Selection of materials for rockets and missiles- requirements, Choice of materials at cryogenic temperatures, extremely high temperatures, Requirement of materials for thermal protection and pressure vessels.

Text Books:

1. Sutton, G.P., and Biblarz, O., Rocket Propulsion Elements, 7th edition, Wiley- Interscience, 2000.
2. Cornelisse, J. W., Schoyer H.F.R. and Wakker, K.F., Rocket propulsion and space flight Dynamics, Pitman, 1979.
3. Turner, M.J.L., Rocket and Spacecraft Propulsion, Springer, 2001.

Outcomes:

- 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 can able to design the conceptual requirements.

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(R15A2117) AIR TRANSPORTATION SYSTEMS
(CORE ELECTIVE – II)

Objectives:

- The subject will introduce the air transportation systems in detail.
- To study the basic governing bodies of ATS, its laws and regulations
- To understand the Airspace sectors, setting up Airport, Airlines and economic considerations involved in it

UNIT-I

Aviation industry & its regulatory authorities: Introduction, history of aviation-evolution, development, growth, challenges. Aerospace industry, air transportation industry-economic impact-types and causes. Airline Industry-structure and economic characteristics.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: 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. Aerodrome air traffic control equipment and operation-ICAO future air-navigation system service provides as businesses.Communication, navigation and surveillance systems (CNSS). Radio communications-VHF, HF, ACARS, SSR, ADS.Navigation- NDB, VOR, DME, area-navigation systems (R-Nav), ILS, MLS, GPS, INS.

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, typical operating costs. Effectiveness-wake-vortices, cabin dimensions, flight deck.

UNIT-IV

Airports: Setting up an airport-airport demand, airport siting, runway characteristics-length, declared distances, aerodrome areas, obstacle safeguarding. Runway capacity- evaluating runway capacity –sustainablerunway capacity. Runway pavement length, Maneuvering area- airfield lighting, aprons, Passenger terminals-terminal sizing and configuration. Airport demand, capacity and delay.

UNIT-V

Airlines: Setting up an airline-modern airline objectives. Route selection and development, airline objectives.Route selection and development, airline fleet planning, annual utilization and aircraft size, seating arrangements.Indirect operating costs. Aircraft- buy or lease. Revenue generation, Computerized reservation systems, yield management. Integrating service quality into the revenue-generation process.Marketing the seats.Airlinescheduling, Evaluating success-financial viability, regularity compliance, efficient use of resources, effective service.

Text Books:

1. Hirst, M., The Air Transport System,Wood head Publishing Ltd,Cambridge, England, 2008.

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:

- To understand the operational structure, establishment of the Airport
- To gain insights in to setting up Airport and the economic considerations involved in it
- To study the basic governing bodies of ATS, its laws and regulations
- To understand the economic and business outcomes of the ATS operations
- The student with acquire operational knowledge of air transport system

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(R15A2118) SPACE MECHANICS
(CORE ELECTIVE – III)

Objectives:

- Students will able to learn about various orbits, positioning of satellite in an orbit and consequences in flight dispersions.
- 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

BASIC CONCEPTS

Kepler's Laws of motion, the solar system-Reference frames and coordinate systems-The celestial sphere- The ecliptic-Motion of vernal equinox-Sidereal time-Solar Time-Standard Time-The earth's atmosphere

UNIT-II

THE GENERAL N-BODY PROBLEM

The many body problem-Lagrange-Jacobi identity-The circular restricted three- body problem-Libration points-Relative Motion in the N-body problem

UNIT-III

THE TWO-BODY PROBLEM

Equations of motion-General characteristics of motion for different orbits-Relations between position and time for different orbits-Expansions in elliptic motion-Orbital Elements-Relation between orbital elements and position and velocity

UNIT-IV

THE LAUNCHING OF A SATELLITE

Launch vehicle ascent trajectories-General aspects of satellite injection-Dependence of orbital parameters on in-plane injection parameters-Launch vehicle performances- Orbit deviations due to injection errors

PERTURBED SATELLITE ORBITS

Special and general perturbations- Cowell's Method-Encke's method-Method of variations of orbital elements-General perturbations approach

UNIT-V

INTERPLANETARY TRAJECTORIES

Two-dimensional interplanetary trajectories-Fast interplanetary trajectories-Threedimensional interplanetary trajectories-Launch of interplanetary spacecraft-Trajectory about the target planet

BALLISTIC MISSILE TRAJECTORIES

The boost phase-The ballistic phase-Trajectory geometry-Optimal flights-Time of flight-Re-entry phase-The position of the impact point-Influence coefficients.

LOW-THRUST TRAJECTORIES

Equations of Motion-Constant radial thrust acceleration-Constant tangential thrust(Characteristics of the motion, Linearization of the equations of motion- Performance analysis

Text Books:

1. ”Rocket Propulsion and Spaceflight Dynamics”, J.W.Cornelisse, H.F.R. Schoyer, and K.F. Wakker, Pitman, 1979
2. ”Spaceflight Dynamics”, William E.Wiesel, McGraw-Hill, 1997

Reference Books:

1. "Spacecraft Mission Design”, Charles D.Brown, AIAA Education Series, Published by AIAA, 1998
2. “Orbital Mechanics”, Vladimir A. Chobotov, AIAA Education Series, AIAA Education Series, Published by AIAA, 2002
3. ”Fundamentals of Astrodynamics and Applications”, David.A. Vellado, Microcosm and Kluwer, 2001
4. ”Fundamentals of Astrodynamics”, Rodger R. Bate, Donald .D. Muller 1971

Outcomes:

- Students can able to summarize the trajectory requirements for launching a vehicle or missile.

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(R15A0371) GREEN ENERGY SYSTEMS
(OPEN ELECTIVE-IV)

Objectives: To study important non-conventional energy resources and the technologies for harnessing these. Compare different non-conventional energy resources and choose the most appropriate based on local conditions.

UNIT -I

Introduction, Energy sources and availability, New energy techniques, Renewable energy sources Solar Energy; Solar constant, Radiation geometry, Solar energy collectors, Concentrated and flat plate, Energy balance and collector efficiency, Solar energy storage, Application to space heating, distillation, cooking and green house effect

UNIT -II

Wind Energy; Basic principle, site selection, Aerodynamic analysis of blades, Bio-energy; Biomass conversion technology, photosynthesis, Biogas plant, thermal gassification

UNIT- III

Geothermal Energy; Sources, hydrothermal sources, hot dry rock resources, geothermal fossil system, prime movers for geothermal energy Energy from ocean; Ocean thermal electric conversion, energy from tides, small scale hydroelectric development

UNIT -IV

Hydrogen energy sources; Production, storage, utilization, magneto hydrodynamic power, thermo ionic generation, Nuclear fusion energy, Energy storage. Energy conservation.

UNIT- V

Fuel cell Principle of working, construction and applications

Text Books:

1. G.D. Rai, Non-Conventional Energy Sources, Khanna Publishers, Delhi.
2. S Rao, B B Parulekar, Energy Technology: Non Conventional Renewable and Conventional, Khanna Publishers, Delhi.
3. H.P. Garg & Jai Prakash, Solar Energy: Fundamentals and Applications, Tata McGraw Hill, N Delhi.

Reference Books:

1. S P Sukhatme, Solar Energy: Principles of Thermal Collection and Storage, Tata McGraw Hill, N Delhi.
2. Sutton, Direct Energy Conversion, McGraw Hill Inc., 1966.
3. Duffie and Beckman, Solar Energy Thermal processes, John Wiley, 1974

Outcomes:

- Basic knowledge on Non conventional energy resources and their importance
- Ability to Design renewable/hybrid energy systems that meet specific energy demands
- Ability to analyze the economical feasibility

- Able to design energy resources to have a minimal impact on the environment
- Application of renewable energy

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4	-/-/-	3

(R15A0568) APPS DESIGN AND DEVELOPMENT (OPEN ELECTIVE – IV)

Objectives:

- Knowledge of basic software engineering fundamentals and practices.
- Introducing multimedia practices and graphic fundamental.
- Knowledge of basic java programming under client/server side and data base connection.

UNIT – I: Fundamental concepts

Software Processmodels**:** The waterfall model, Incremental process models, Evolutionary process models, The Unified process. Multimedia and hypermedia, World Wide Web, overview of multimedia software tools, Graphics data types, file formats, color in image and video: color models in images, color in video.

UNIT – II: HTML Common tags

List, Tables, images, forms, Frames; Cascading Style sheets.

UNIT - III: Introduction to Java Scripts

Objects in Java Script, Dynamic HTML with Java Script.

UNIT - IV: Web Servers

Introduction to Servlets: Lifecycle of a Servlet, The Problem with Servelet. The Anatomy of a JSP Page, JSP Processing, Environment: Installing the Java: Software Development Kit, Tomcat Server. Using Cookies-Session Tracking, Security Issues.

UNIT - V: Database Access

Database Programming using JDBC, Studying Javax.sql.* package, Accessing a Database from a JSP Page, TESTING: Types of software testing ,test cases.

Text Books:

1. Web Programming ,Building Internet Applications, CHRIS BATES Ii Edition, Wiley Dreamtech.
2. Programming world wide web ,SEBESTA,PEARSON.

Reference Books:

1. Core Servlets And Java Servlets Pages Vol-1:Core Technologies BY MARTY HALL,LARRY BROWN PEARSON.
2. Software Engineering ,ROGERS PRESSMEN,TATA McGraw-HILL.
3. Software Testing Techniques, BORIS BEIZER,DREAMTECH,II EDITION.
4. Java Complete Reference ,7TH EDITION ,HERBERTSCHILDT,TMH.

Outcomes:

- Ability to identify the minimum requirements for the development of application.

- Ability to apply different multimedia development tools to produce web based and stand-alone user interfaces.
- Gain knowledge of client side scripting, understanding of server side scripting with java.

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(R15A0062) SUPPLY CHAIN MANAGEMENT (OPEN ELECTIVE – IV)

Objectives:

- To introduce the major building blocks, major functions, major business processes, performance metrics, and major decisions (strategic, tactical, and operational) in supply chain networks.
- To provide an insight into the role of Internet Technologies and technical aspects of key ITEC components in supply chain management.

Unit-I

Understanding the Supply Chain: What is supply chain; objectives and importance of supply chain; decision phases in supply chain; process views of s supply chain; examples of supply chain.

Unit-II

Designing Distribution Networks: The role of distribution in the supply chain; factors influencing distribution network design; design options for distribution network; e-business and the distribution network; distribution channels for FMCG sector, commodities, and agricultural produce; factors influencing network design decisions; models for facility location and capacity allocation.

Unit-III

Demand Forecasting And Aggregate Planning: Methods and Characteristics of demand forecasting; forecasting in practice; the role of aggregate planning in SCM; aggregate planning strategies; aggregate planning using linear programming; the role of IT in aggregate planning; implementing aggregate planning in practice.

Unit-IV

Managing Inventories in Supply chains: Cycle inventory; estimating cycle inventory cost; economies of scale to exploit fixed costs and quantity discounts; short term discounting: trade promotions; safety inventory in supply chain and uncertainties; the role of IT in inventory management; estimating and managing safety inventory in practice. Nature of global supply chain management.

Unit-V

Transportation and Sourcing in SCM: Role of transportation in SCM; transportation infrastructure and policies; design options for transportation network and trade-offs; tailored transportation system; risk management; transportation decisions in practice; Sourcing in SCM: in-house or outsource; third and fourth party logistics; contracts, risk sharing and supply chain performance; vendor analysis; the procurement process. Lack of coordination and the Bullwhip Effect; obstacles to coordination in a supply chain; building strategic partnership and trust within a supply chain.

Text Books:

1. Chopra, S, and P. Meindl, 2010, Supply Chain Management - Strategy, Planning and Operation, 4th Edition, Pearson Education Inc.

Reference Books:

1. Raghuram, G. and N. Rangaraj, Logistics and Supply Chain Management: Cases and Concepts, Macmillan, New Delhi

2. Simchi-Levi, D., P. Kaminski and E. Simchi-Levi, 2003, Designing and Managing the Supply Chain: Concepts, Strategies and Case Studies, 2nd Edition, Irwin, McGraw-Hill.
3. Shapiro, J., 2001, Modelling the Supply Chain, Duxbury Thomson Learning.

Outcomes:

- Student will get awareness how to obtain customer sophistication, increasing network fragmentation, and fast-paced globalisation, the primary role of supply chain management, along with the coordination of material, information and cash flows, has become complex.

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2	-/-/-	0

(R15A0005) TECHNICAL COMMUNICATION AND SOFT SKILLS

(A Mandatory Course)

INTRODUCTION:

In view of the growing importance of English as a tool for global communication and the consequent emphasis on training students to acquire communicative competence, the syllabus has been designed to develop linguistic and communicative competencies of Engineering students.

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

Objectives:

- To improve the language proficiency of the students in English with emphasis on LSRW skills.
- To equip the students to approach academic subjects more professionally using the theoretical and practical components of the English syllabus.
- To develop the professional skills and communication skills in formal and informal situations and hone the required professional ethics.

Unit- 1: Factors affecting information and document design, Principles of effective writing , Technical Writing, Grammar and Editing- Technical writing process, Writing drafts and revising, Collaborative writing, technical writing style and language.

Unit- 2: Basics of grammar, study of advanced grammar, editing strategies to achieve appropriate technical style. Introduction to advanced technical communication.

Unit-3: Communication and Technical Writing- Public speaking, Group discussion, Oral; presentation, Interviews, Graphic presentation, Presentation aids. Writing reports, Email writing, official notes, business letters, memos, progress reports, minutes of meetings, event report.

Unit- 4: Self Development and Assessment- Self assessment, Awareness, Perception and Attitudes, Values and belief, Personal goal setting, career planning, self esteem.

Unit- 5: Ethics- Business ethics, , Personality Development in social and office settings, netiquettes, Telephone Etiquettes, Engineering ethics, Managing time, Role and responsibility of engineer, Work culture in jobs, Rapid reading, Complex problem solving, Creativity, leadership skills ,cubicle Etiquettes, team building.

Text Books:

1. David F. Beer and David Mc Murrey, Guide to writing as an Engineer, John Willey. New York, 2004
2. Diane Hacker, Pocket Style Manual, Bedford Publication, New York, 2003. (ISBN 0312406843)

Reference Books:

1. Dale Jung k, Applied Writing for Technicians, McGraw Hill, New York, 2004. (ISBN: 07828357-4)
2. Sharma, R. and Mohan, K. Business Correspondence and Report Writing, TMH New Delhi 2002.
3. Xebec, Presentation Book, TMH New Delhi, 2000. (ISBN 0402213)

Outcomes:

- Acquire the language proficiency of the students in with emphasis on LSRW skills.
- Utilize subjects more professionally using the theoretical and practical components of the English syllabus
- To develop the professional skills and communication skills in formal and informal situations
- Hone the required professional ethics and learn to be proficient formally
- To develop the attitude and plan for professional career

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III Year B. Tech, ANE-II Sem

	L	T/P/D	C
(R15A2184) FLIGHT VEHICLE DESIGN AND INSTRUMENTATION LAB	-	-/3/-	2

Objectives:

- This course is an introduction to aircraft design emphasizing on the conceptual design of civil transport and fighter aircraft.
- To impart the basic skills in flight vehicle designing and relevant skills in calculating sizes;

LIST OF EXPERIMENTS:-

The student is expected to conduct 10 exercises

1. Aircraft Conceptual 3D sketching
2. Creating Airfoil and sketching
3. Estimating Wing Loading
4. Initial sizing of an Transport Aircraft
5. Weight Estimation of Fighter Aircraft
6. Design of Crew compartment
7. Wing Design and Drag Estimation
8. Engine Sizing
9. Cost Estimation
10. Horizontal and Vertical Tail Design
11. Operation of Hydraulic Test Rig
12. Operation of Pneumatic Test Rig
13. Demonstration of Landing gear and Control surface retraction systems

Note: Minimum 10 experiments should be conducted.

Software Required: Microsoft Excel or MATLAB Programming or Equivalent software

Reference Books:

1. AIRCRAFT DESIGN: A Conceptual Approach AIAA Book ISBN:0-930403-51-7 by Daniel P Raymer

Outcomes:

- Students can perform the weight estimation and sizing of an a/c for a given mission profile
- Able to generate graphs for CL, CD
- Students will be able to generate airfoil, tail configurations
- Students acquire a knowledge of modelling 3D aircraft
- Acquire knowledge on the working of landing gear, hydraulic and pneumatic systems

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L	T/P/D	C
0	-/3/-	2

(R15A2185)PROGRAMMING LANGUAGE FOR MATHEMATICAL MODELS LAB

Objectives:

The course should enable the students to:

- Learn the mathematical programming language.
- Learn the problem solving techniques
- Develop skills in programming language

LIST OF EXPERIMENTS:-

1. Introduction to modeling software.
2. Programs using mathematical functions and plotting functions.
3. Program to solve differential equations.
4. Program to solve system of equations using numerical methods.
5. Program to 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 in 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. Program to generate poles and zeros of a transfer function.
13. Program to generate time response, rise time and maximum overshoot of a second order control system.

Note: Any 10 Experiments can be conducted.

Equipment Needed:

1. **Computers**: Core 2 duo processor with 1 GB RAM
2. **Softwares:** Matlab or scilab 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. Fundamentals of Aerodynamics by John D Anderson
4. Strength of materials by Ramarutham Dhanpath Rai publications

Outcomes:

- Basic knowledge on mathematical programming language
- Develop skills in programming language
- Ability to model aerospace problems through mathematical models

- Revise computational strategies for developing applications
- Ability to develop Simple to Complex applications using programming language

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IV Year B. Tech, ANE-I Sem

L	T/P/D	C
5	1/-/-	4

(R15A2119)COMPUTATIONALAERODYNAMICS

Objectives:

- 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 – Why Computational Fluid Dynamics? What is CFD? CFD - Research tool – Design Tool, 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, the momentum equation, the energy equation, physical boundary conditions. Form of Governing equation suited for CFD - Conservation form - shock fitting and shock capturing.impact of partial differential eqautions 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.

UNIT-III – DISCRETIZATION TECHNIQUES

Introduction, Finite differences and formulas for first and second derivatives, difference equations, Explicit and implicit approaches, multidimensional finite difference formulas, finite difference formulas on non-uniform grids. 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- Two dimensional finite volume method with example.

UNIT-IV - GRID GENERATION

Need for grid generation. Structured grids- Cartesian grids, stretched (compressed) 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. Surface and volume estimations, grid quality and best practice guidelines.

UNIT-V – CFD TECHNIQUES

Lax-Wendroff technique, MacCormack's technique, Crank Nicholson technique, Relaxation technique- aspects of numerical dissipation and dispersion, Alternating-Direction-Implicit (ADI) Technique. Pressure correction technique Numerical procedures- SIMPLE, SIMPLER algorithms

SIMPLEC and PISO algorithms Boundary conditions for the pressure correction method. Parallel Computing.

Text Books:

2. John .D. Anderson “Computational Fluid Dynamics”, McGraw Hill
3. Charles Hirsch “Numerical computation of internal and external flows” Second Edition Butterworth-Heinemann is an imprint of Elsevier

Reference Books:

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.
4. Introduction to Computational Fluid Dynamics, Chow CY, John Wiley, 1979

Outcomes:

- Solve differential equations governing fluid flow problems.
- "The student will demonstrate an ability to recognize the type of fluid flow that is occurring in a particular physical system and to use the appropriate model equations to investigate the flow"
- Generation of grid according to geometry of flow and complexity of flow.
- The student can bale to select appropriate discretization method to solve given problem
- Application of CFD techniques for aerospace problems

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(R15A2120) AIRFRAME STRUCTURAL DESIGN

Objectives:

- To know about detailed structural components present in aircraft
- To acquire the knowledge about the design parameters how why and where they will be used in manufacturing
- Students can acquire the knowledge about the loading conditions done on the structure

UNIT I

INTRODUCTION

Principal structural components of aircraft. Design requirements- structural integrity, stiffness, service life. Baseline aerodynamic configuration, external loading, weight, operating conditions, conformity to government regulations. Design procedure- structural lay out, structural modeling, design criteria, load estimation, stress analysis, choice of materials, sizing- estimation of strength, stiffness, mass . optimization, trade-off. Structural index- use in design. Idealization of structures, materials- constitutive relations- equilibrium, compatibility conditions significance. Sizing of structural elements of given geometry and loading Analysis of box beams- single cell, multi cell- in bending, shear, torsion- normal stresses, shear flow, deformation- restraint against warping, secondary stresses.

Unit II

FASTENERS AND STRUCTURAL JOINTS

Fasteners and fittings- role , significance, general design considerations, criteria for allowable strength. Margine of safety. Fastener systems, types, fastener information, dimensions, materials, allowable strength- tensile, shear, bending. Rivets, bolts and screws, nuts-detail design consideration. Fastener selection. fittings- lugs, bushings and bearings-loading design and analysis. Joints – splices, eccentric, gusset, welded, brazed, bonded- types, methods of joining, failure modes. Fatigue design considerations. Stress concentration- causes, methods of reduction. Fastener load distribution and by pass load-severity factor, structural joint life prediction. Shim control and requirement

UNIT III

DESIGN OF WINGAND TAIL STRUCTURES

The wing- role- summary of wing loads, structural components- wing box, leading and trailing edges. Wing layout- location of spars, ailerons and flaps, rib spacing and direction, root rib bulkhead, span wise stiffeners, wing covers- skin-stringer panels, integrally stiffened panels, access holes, attachment of leading edge and trailing edge panels Spars- general rules of spar design. Ribs and bulkheads- rib spacing and arrangement .Wing root joints, carry through structure. Fighter wing design- problems with swept wings Wing box- loads, stress .Wing box,root bulkhead-estimation of loads, stress analysis, design parameters, optimization, sizing, margin of safety.. Leading and trailing edge assembly- control surfaces, flaps- structure. Tail unit- horizontal, vertical tail, elevator, rudder-configuration, structural layout, design considerations.

UNIT IV

DESIGN OF FUSELAGE AND LANDING GEAR

Function of fuselage- loading, general requirements. Ultimate strength of stiffened cylindrical structure. Principal structural components –skin and stringers, frame and floor beam, pressure bulkheads, wing & fuselage intersection- layout, stress analysis, sizing. Forward fuselage, aft, fuselage structures, fuselage openings- windows, doors- design considerations. Landing gear- purpose, types, general arrangement, loads- design considerations- ground handling, take-off, landing, braking, pavement loading, support structure. stowage and retraction, gear lock- kinematic design Shock absorbers- function, types, components, operation, loads, materials, design. Wheels and brakes, tire selection .

UNIT V

FATIGUE LIFE, DAMAGE TOLERANCE, FAIL SAFE- SAFE DESIGN-WEIGHT CONTROL AND BALANCE

Catastrophic effects of fatigue failure- examples- modes of failure- design criteria- fatigue stress, fatigue performance, fatigue life. Fatigue design philosophy- fail-safe, safe life. Service behaviour of aircraft structures- effect of physical and load environment design and of detail of fabrication Structural life- methods of estimation- the scatter factor- significanceFail-safe design- the concept, requirements, damage tolerance- estimation of fatigue strength

Text Books:

1. NIU.M.C. Airframe Structural Design, second edition, Hongkong Conmlit Press, 1988, ISBN: 962-7128-09-0
2. NIU.M.C. Airframe Stress Analysis And Sizing, second edition, Hongkong Conmlit Press, 1987, ISBN: 962-7128-08-2

Out comes:

- The student will be able to describe overall flight loads acting an aircraft with safe life and fail safe conditions.
- Different types of fasteners and joints on aeronautical field.
- Define complete knowledge about wing and tail unit functions, structural components and their design criteria.
- Students will be attained complete knowledge about fuselage and landing gear functions, structural components and their design criteria.
- History of Aircraft materials,fatigue analysis and different failure theories.

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(R15A0368) MECHANICAL VIBRATIONS AND STRUCTURAL DYNAMICS

Objectives:

- To gain fundamental knowledge on vibration and related systems in the context of Aircraft Structures
- To give Exposure on damped and undamped vibratory systems.
- Basic knowledge on dynamic balancing of rotor system

UNIT-I

FUNDAMENTALS OF VIBRATION: Brief history of vibration, Importance of the study of vibration, basic concepts of vibration, classification of vibrations, vibration analysis procedure, spring elements, mass or inertia elements, damping elements, harmonic analysis. FREE VIBRATION OF SINGLE DEGREE OF FREEDOM SYSTEMS: Introduction, Free vibration of an undamped translational system, free vibration of an undamped torsional system, stability conditions, Raleigh's energy method, free vibration with viscous damping, free vibration with coulomb damping, free vibration with hysteretic damping.

UNIT-II

HARMONICALLY EXITED VIBRATIONS: Introduction, Equation of motion, response of an undamped system under harmonic force, Response of a damped system under harmonic force, Response of a damped system under harmonic motion of the base, Response of a damped system under rotating unbalance, forced vibration with coulomb damping, forced vibration with hysteresis damping.

UNIT-III

VIBRATION UNDER GENERAL FORCING CONDITIONS: Introduction, Response under a general periodic force, Response under a periodic force of irregular form, Response under a non periodic force, convolution integral. Two Degree of Freedom Systems: Introduction, Equation of motion for forced vibration, free vibration analysis of an undamped system, Torsional system, Coordinate coupling and principal coordinates, forced vibration analysis.

UNIT-IV

MULTIDEGREE OF FREEDOM SYSTEMS: Introduction, Modeling of Continuous systems as multi degree of freedom systems, Using Newtons second law to derive equations of motion, Influence

coefficients, Free and Forced vibration of undamped systems, Forced vibration of viscously damped systems. Determination Of Natural Frequencies and Mode Shapes: Introduction, Dunkerleys formula, Rayleighs 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, critical speed of rotors.

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:

- Identifies various vibrating systems and brief introduction on vibration terminology.
- Understand the response of harmonically excited vibrating systems.
- Analyze response of a vibration systems under various forcing conditions.
- Evaluate frequencies and responses of higher order degree systems using numerical methods.
- Devise solutions for application based real time solutions.

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4	-/-/-	3

(R15A2121) AVIONICS

Objectives:

To introduce the student the

- Avionics System
- Instruments system installed on aircraft.
- Aircraft Control System e.g. Auto-Pilot

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 taracking 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, data recorders

UNIT III: Inertial sensors and Global Positioning System.

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 components.
Global navigation satellite systems-GPS-description and basic principles. Integration of GPS and INS, Differential GPS, Future Augmented Satellite navigation systems.

UNIT IV: Air Data Systems, Navigation and Landing System

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. Principles of Navigation- types of navigation systems- radio navigation systems- VHF omni-range, distance measuring equipment, automatic direction finders. Inertial navigation System-Initial alignment and gyro compassing, strap down INS computing. Landing System- localizer and glide-slope-marker systems. Categories of ILS.

UNIT V: Surveillance and Auto flight Systems:

Traffic alert and collision avoidance systems(TCAS)-Enhanced ground proximity warning system, Mode S Transponder, Weather radar system. Autopilots-Basic principle, height control, heading control, ILS coupled autopilot control, satellite landing system, speed control and auto throttle systems. Flight management systems-principles-flight planning-navigation and Guidance, performance prediction and flight path optimization.

Text Books:

1. Collinsion, 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:

- Define the Importance and role of Avionics in modern aircraft
- Understand the use of Helmet mounted displays, Head tracking systems and Head down displays
- Classify principles of gyroscope and accelerometers and Air data sensors and computing
- Determine types of Navigation systems used in airplanes
- Explain flight planning-navigation and Guidance, performance prediction and flight path optimization

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(R15A2122) AIRCRAFT NOISE AND AEROACOUSTICS
(CORE ELECTIVE - III)

Objectives:

- To provide students in-depth knowledge of the noise generation mechanisms of aircraft noise and its environmental issues.
- Analysis using aeroacoustic theory will be introduced.

UNIT – I

Noise Radiation from Aircraft: Aircraft noise descriptors. Human response to aircraft noise. Actions against aircraft noise. Noise certification and regulation. Atmospheric Propagation: Introduction, Geometrical Spreading, Effects Due to the Presence of the Ground, Refraction by Vertical Gradients of Wind and Temperature, Atmospheric Turbulence, DiffractionLarge-Amplitude Waves, Pulses, and Sonic Booms

UNIT - II

Introduction to Aeroacoustic Theory: Equation of linear acoustics. Free-space Green's function. Acoustics of point sources. Lighthill's acoustic analogy and its extensions. Acoustics of turbulence near a rigid body. Radiation from compact and non-compact sources. Fuselage dynamics and cabin noise.

UNIT - III

Noise Source Mechanisms: Airframe noise. Propeller noise Characteristics, Generating Mechanisms, Prediction Methods for Propeller Harmonic Noise and Broadband Noise, Propagation Effects. Fan and compressor noise. Turbine noise. Jet noise. Combustor noise. Sonic boom. Helicopter noise. Interior noise.

UNIT - IV

Noise Control: Noise control at sources. Jet Noise Suppression Concepts, Jet Noise Reduction Techniques, Control of Propeller Noise, Sonic Boom Minimization, Cabin noise control. Interior Noise Control Application.

UNIT – V

Quiet Aircraft Design and Operational Characteristics

Scope Airplane Noise Level Design Requirements and Objectives, Major Design Considerations, Major Operational Considerations, The Design and Development Process, Noise Engineering of Other Flight Vehicles.

Textbooks:

1. Crighton, D. G., Dowling, A. P., Ffowcs Williams, J. E., Heckl, M., Leppington, F. G., Modern Methods in Analytical Acoustics – Lecture Notes, Springer, latest edition.
2. Goldstein, M. E., Aeroacoustics, McGraw-Hill, latest edition.
3. Howe, M. S., Theory of Vortex Sound, Cambridge University Press, latest edition.
4. Hubbard, H. H. (Ed.), Aeroacoustics of Flight Vehicles – Theory and Practice, Vols. 1 & 2, Acoustical Society of America, latest edition.

Outcomes:

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

- Students can gain knowledge on geometric, surface and solid modelling, and its tools
- Provides essential knowledge of CNC machines and its applications
- Gains knowledge on basic part programming
- Acquires information about flexible manufacturing systems and quality control
- Extend their ability to integrate various noise suppression techniques in achieving quiet design and operation of aircraft

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(R15A2123)FLIGHT SCHEDULING AND OPERATIONS
(CORE ELECTIVE – III)

Objectives:

- Students will able to know about the operations of an airline
- Will analyze how the scheduling is done for flights
- Will know about crew duties and passengers boarding procedures

UNIT I

AIRLINE NETWORK AND AIRCRAFT ROUTING

Complexity of airline planning, operations and dispatch- need for optimization- Networks-definitions, network flow models shortest path problem, minimum cost flow problem maximum flow problem, multi-commodity problem. Integer programming models- set covering/ partitioning problems, traveling salesman problem- mathematical formulation- decision variables, objective function, constraints. Goal of aircraft routing- maintenance requirements, other constraints Routing cycles, route generators Mathematical models of routing- decision variables, objective functions, alternatives, constraints- flight coverage and aircraft available Example problems and solutions

UNIT II

FLIGHT AND FLEET SCHEDULING

Significance of flight scheduling. The route system of the airlines- point-to-point flights, hub and spoke flights Schedule construction- operational feasibility, economic viability Route development and flight scheduling process- load factor and frequency Case study. Purpose of fleet assignment. Fleet types, fleet diversity, fleet availability- performance measures Formulation of the fleet assignment problem- decision variables, objective function, constraints, solution Scenario analysis, fleet assignment models.

UNIT III

CREW AND MANPOWER SCHEDULING

Crew scheduling process- significance Development of crew pairing- pairing generators-mathematical formulation of crew pairing problem- methods of solution. Crew rostering- rostering practices .The crew rostering problem-formulation, solutions. Man power scheduling- modeling, formulation of the problem, solutions.

UNIT IV

GATE ASSIGNMENT AND AIRCRAFT BOARDING STRATEGY

Gate assignment- significance- the problem- levels of handling-passenger flow, distance matrix-mathematical formulation, solution Common strategies for aircraft boarding process, mathematical model, interferences, model description, aisle interferences.

UNIT V

AIRLINE IRREGULAR OPERATION, DISRUPTION OF SCHEDULE AND RECOVERY COMUTATIONAL COMPLEXITY-CASE STUDIES

The problem statement, the time band approximation model formulation of the problem the scenarios- solution.Complexity theory, heuristic procedures Case studies of airline operation and scheduling study through simulation modeling- use of available software.

Text Books:

1. Bazargan,M.,'Airline Operations and Scheduling'2nd edn., Ashgate Publishing ltd, 2010

Outcomes:

- Students can schedule different operations done by airport authorities.
- Students can schedule different operations done by airlines authorities.
- They will be getting a knowledge about the functioning of airports

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(R15A0331) CAD/CAM
(CORE ELECTIVE - III)

Objectives:
The student able to know about the CAD/CAM software, computer graphics, drafting, numerical control, group technology, CIM and computer aided quality controls

UNIT – I
Computers in Industrial Manufacturing, Product cycle, CAD / CAM Hardware, Basic structure, CPU, Memory types, input devices, display devices, hard copy devices, storage devices.
Computer Graphics: Raster scan graphics coordinate system, database structure for graphics modeling, transformationof geometry, 3D transformations, mathematics of projections, clipping, hidden surface removal.

UNIT – II
Geometric modeling: Requirements, geometric models, geometric construction models, curve representation methods,surface representation methods, modeling facilities desired.

UNIT – III
Drafting and Modeling systems: Basic geometric commands, layers, display control commands, editing, dimensioning,solid modeling.
Numerical control: NC, NC modes, NC elements, NC machine tools, structure of CNC machine tools, features ofMachining center, turning center, CNC Part Programming fundamentals, manual part programming methods, Computer Aided Part Programming.

UNIT – IV
Group Tech: Part family, coding and classification, production flow analysis, advantages and limitations, ComputerAided 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 PublishersComputer Numerical Control Concepts and programming / Warren S Seames / Thomson Publishers

Outcomes:

- Students can gain knowledge on geometric, surface and solid modelling, and its tools
- Provides essential knowledge of CNC machines and its applications
- Gains knowledge on basic part programming
- Acquires information about flexible manufacturing systems and quality control
- The learning outcomes are assessed through the assignment and various practical performed modeling,drafting, computer aided quality control and computer integrated manufacturing systems.

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(R15A2124) CIVIL AVIATION RULES AND REGULATIONS (CORE ELECTIVE - IV)

Objectives:

- civil aircraft rules
- Regulations pertaining to DGCA.
- Various Log Books maintained by civil operators.

UNIT I: AIRCRAFT RULES AND CATEGORIES OF AME LICENCE

Knowledge of Aircraft Rules as far as they relate to airworthiness and safety of aircraft. Knowledge of Privileges and responsibilities of the various categories of AME License and approved persons.

UNIT II: CIVIL AIRWORTHINESS REQUIREMENT

Knowledge of "Civil Airworthiness Requirements", "Aero nautical Information Circulars (relating to airworthiness)", "Advisory Circulars" and AME Notices issued by DGCA. Knowledge of various mandatory documents like Certificate of Registration, Certificate of Airworthiness, Flight Manual, Export Certificate of Airworthiness. Method of identifying approved material on Aircraft.

UNIT III: LOG BOOKS AND STORES.

Knowledge of various documents/ certificates issued to establish airworthiness of Aircraft parts. Various logbooks required to be maintained for Aircraft. Method of maintaining the logbook. Procedure for making entries in logbooks; Journey logbook, Technical logbook etc. Use of schedules, its certification, preservation, Stores, Bonded and Quarantine stores, storage of various aeronautical products including rubber goods, various fluids.

UNIT IV: CERTIFICATE OF FLIGHT

Knowledge of various terms such as Certificate of Flight Release, Certificate of Maintenance, Approved Certificates. Condition under which Aircraft is required to be test flown; Certificate to be issued by AME for test flight. Circumstances under which C of A is suspended. Ferry Flight, MEL, CDL. Minimum equipments, instruments required for various types of operation.

UNIT V: AIRCRAFT MODIICATIONS AND TYPE APPROVAL

Modification, concession, Airworthiness Directive, Service Bulletins.Approval of Organisation. Documents required to be carried on board.Issue of Type Approval. Registration markings. Human performance and limitations relevant to the duties of an aircraft maintenance engineer, license holder.

Text books:

1. Aircraft Act, 1934
2. Aircraft Rules

3. DGCA CAR Section 1 and Section 2

Reference Books:

1. Aeronautical information Circular

Outcomes:

- Student will have good knowledge of Civil Aircraft rules.
- Student can write civil AME license.
- He will be familiar with procedures for operation and certification of civil aircraft.

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(R15A2125) AIRCRAFT MAINTENANCE ENGINEERING
(CORE ELECTIVE - IV)

Objectives:

- To introduce the knowledge of the maintenance and repair procedures followed for overhaul ofaero 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:

- Introduce the knowledge of Maintenance Programs
- Understand the procedure of Aviation Certification Requirements and Documentation for Maintenance and Engineering and also for overhaul of Aero-Engine.
- Analysis of the function of Engineering Department, Production Planning and Control. Improve the knowledge of Training Courses in Aviation Industry.
- Ability in Maintenance and Line operation and also Material Support.
- Ability to Prepare Aircraft Maintenance Manuals and Art & Science of Trouble Shooting.

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(R15A2126) HYPERSONIC AERODYNAMICS
(CORE ELECTIVE – IV)

Objectives:

The course should enable the students to:

- Formulate and apply appropriate aerodynamic models to predict the forces on and performance of realistic three-dimensional configurations in hypersonic flows.
- Understand about current aerospace problems like Aerodynamic heating.
- Know about experimental methods for hypersonic flows.

UNIT-I - FUNDAMENTALS OF HYPERSONIC FLOWS AND APPROXIMATIONS

Importance/properties of hypersonic flow-Basic equations boundary conditions for inviscid flow, concept of equilibrium and nonequilibrium flows, transport properties. Basic conservation equations and species continuity equation, hypersonic shock and expansion relations, hypersonic similarity parameters. Newtonian, modified Newtonian.

UNIT-II - HYPERSONIC SMALL DISTURBANCE THEORY

Flow over a wedge and a cone- Blast wave analogy,-Newtonian impact theory- Busemann centrifugal correction -Shock expansion method- Tangent cone and tangent wedge methods Pressure distribution in separated regions and in reacting flows.

UNIT-III - BASIC ASPECTS OF HYPERSONIC VISCOUS FLOWS AND AERODYNAMIC HEATING

Introduction to viscous flow and pressure interactions over flat plate- Boundary layers Reference temperature method-Entropy layer effects on aerodynamic heating.

UNIT-IV - HYPERSONIC VEHICLE DESIGN

Supersonic Inlet design Strong and weak interactions-Shock wave/ boundary layer interactions Concept of SERN, Design aspects of various Hypersonic vehicles like X-43, HSTDV, Hyshot

UNIT-V - EXPERIMENTAL METHODS FOR HYPERSONIC FLOWS:

Arc Jet facilities, Impulse facilities, hypersonic wind tunnels, shock tunnels, gun tunnels, freepiston shock tunnels, expansion tubes etc. Flow visualization techniques, model testing.

Text Books

1. “Hypersonic and High Temperature Gas Dynamics”, Anderson, J.D,McGraw-Hill, 1989.
2. “Hypersonic Aerothermodynamics”, Bertin, J.J., AIAA, 1994.

Reference Books:

1. “Introduction to Hypersonic flow”, Cherni C G, Academic Press,1961
2. “Hypersonic Flow Theory”, Hayes W D and Problein R F, Academic Press 1959
3. “Elements of Hypersonic Aerodynamics”, Cox R N and Crabtree L P, London 1965

Outcomes:

The student should be able to

- Estimation of aerodynamic characteristics of different geometries in hypersonic conditions.
- Application aerodynamic theories in the design hypersonic vehicles.
- Validation of experimental results with analytical results.

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(R15A2186)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. Solution for the one dimensional wave equations using explicit method of lax using finite

Difference method (code development)

2. Solution for the one dimensional heat conduction equation using explicit method using finite difference method (code development)
3. Generation of the Algebraic Grid (code development)
4. Generation of the Elliptic Grids (code development)
5. Numerical simulation of Flow over an airfoil using commercial software
6. Numerical simulation of Supersonic flow over a wedge using commercial Software
7. Numerical simulation of Flat plate boundary layer using commercial software
8. Numerical simulation of Laminar flow through pipe using commercial software
9. Numerical simulation of Flow past cylinder using commercial software
10. Numerical simulation of flow through nozzle using commercial software
11. Numerical simulation of flow over wing using commercial software
12. Numerical simulation of combustion using commercial software

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:

- Experience in computing aerodynamic problems and understanding flow physics over the objects.
- Knowledge in estimating flow analysis for different mach numbers.

- Determining the aerodynamic forces like mainly lift and drag.
- Analyze the coefficient of pressure, lift, drag and moment for different bodies for different flow conditions.
- Develop a programme for solving the One dimensional equations using explicit method of lax equations using finite difference method

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(R15A2187)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 ofThickened Thin Walled Open Section Panel.
2. Torsional Strength and Shear Forceof 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. ComputationalAnalysis of Landing Gear.
7. Computational Analysis of Nose Cone.
8. ComputationalAnalysis of Tapered Wing Structure.
9. Computational Analysis of Fuselage Structure
10. ComputationalAnalysis of Nozzle.

Note: Total 10 experiments are to be conducted.

Equipment Needed:

1. **Computers**: Core 2 duo processor with 1 GB RAM
2. **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:

- Students will gain the knowledge of various structural elements and structural analysis under ANSYS platform.
- Student gains knowledge about one dimensional element and respective mesh selection for a beam analysis.
- Can able to understand 2D and 3D element and respective mesh. Also define compressive strength of plate with and without cutouts.

- Students can understand the knowledge about open and closed thin wall structure behavior. Further, gives knowledge about design and analysis of 3D structures like wingbox and fuselage.
- Structural analysis of column-beam can understand by students pictorially.

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L	T/P/D	C
5	1/-/-	4

(R15A2127)HELICOPTER ENGINEERING
(CORE ELECTIVE - V)

Objectives:

- To understand the basic concepts of Helicopter flying, different configurations
- To understand the difference between Aircraft and Helicopter principles, mechanisms
- To understand the principles, theories and stability and control pertaining to it

UNIT I

INTRODUCTION.

Historical Development of Helicopters, Helicopter Configuration, Control Requirements, Types of Rotor Systems, Basic Power Requirements.

UNIT II

INTRODUCTION TO HOVERING THEORY.

Momentum Theory, Blade Element Theory, Combined Blade Element and Momentum theories for non-uniform inflow calculation, Ideal Rotor vs. Optimum Rotor.

UNIT III

VERTICAL FLIGHT.

Various flow states of Rotor, Autorotation in Vertical Descent, Ground Flight.

UNIT IV

FORWARD FLIGHT.

Momentum Theory, Variable Inflow Models, Blade Element Theory, Rotor Reference Planes, Hub Loads, Power variation with forward speed, Rotor Blade flapping Motion: Simple Model.

UNIT V

HELICOPTER TRIM AND STABILITY.

Equilibrium condition of helicopter, Trim analysis, Basics of helicopter stability.

Text Books:

1. Gessow.A and Meyers G.C. Aerodynamics of Helicopter,Macmillan& co ., N.Y.1987
2. Johnson W Helicopter theory, Princeton University pres 1980
3. MccormickB.W.Aerodynamics,Aeronautics& Flight mechanics ,John Wiley ,1995
4. Gupta. L Helicopter Engineering, Himalayan Books 1996
5. Bramwell A.R.S Helicopter Dynamics Edward Arnold Publications London 1976
6. Stepniewski W.Z Rotary Rotary wing Aerodynamics Vol 1 & 2 Dover publications 1984

Outcomes:

- Understand the basic concepts of Helicopter flying, different configurations
- Understand the difference between Aircraft and Helicopter principles, mechanisms
- Understand the principles, theories and stability and control pertaining to it

- Acquire the knowledge of rotor operations.
- The significance of Stability and Control in different conditions

	L	T/P/D	C
IV Year B. Tech, ANE-II Sem	**5**	**1/-/-**	**4**

(R15A2128)ADVANCED COMPUTATIONAL AERODYNAMICS
(CORE ELECTIVE – V)

Objectives:

- Application of panel methods to find aerodynamic characteristics of flow over geometries.
- Understand method of characteristics governing aerodynamic flows.
- Numerical methods to solve fluid flow problems

UNIT - I

PANEL METHODS

Introduction to panel method, Basic aspects of uniform source and vortex flows, Source panel method – Non-lifting flows over arbitrary two-dimensional bodies. Vortex panel method – Lifting flows over arbitrary two-dimensional bodies.

UNIT – II

METHOD OF CHARACTERISTICS

Introduction to numerical techniques for steady supersonic flows, Philosophy of method of characteristics. Determination of characteristic lines – Two-dimensional irrotational flow. Determination of the compatibility equation and unit processes. Regions of influence and Domains of dependence.

UNIT – III

TRANSONIC RELAXATION METHOD

Theoretical aspects of transonic flows, Small Perturbation flows - Transonic small perturbation equations - Central and Backward difference schemes, Shock capturing vs. shock fitting techniques: Conservation vs. non conservation forms of governing equations, Line relaxation techniques.

UNIT - IV

BOUNDARY LAYER EQUATION

Introduction to boundary layer equations and their solutions. Description of the boundary layer equations. Transformation of boundary layer equations and the numerical solution method. Choice of discretization model and the generalized Crank- Nicholson Scheme. Discretization of boundary layer equations and illustration of solutions of a tridiagonal system of linear algebraic equations.

UNIT - V

TIME DEPENDENT METHODS

Stability of Solution, Explicit time dependent methods - Euler, Backward Euler, One step trapezoidal, Backward differencing, methods, Leap Frog method.

Text Books:

1. John .D. Anderson “Computational Fluid Dynamics”, McGraw Hill

2. Anderson, Dale A., John C. Tanhill and Richard H.P Letcher, “Computational Fluid Mechanics and Heat transfer”, McGraw Hill, New York 1984, Volumes I & II.

Reference Books:

1. Hoffmann, K.A: Computational Fluid Dynamics for Engineers, Engineering Education System, Austin, Tex., 1989
2. Kreyszig, E., Advanced Engineering Mathematics, Wiley, New York
3. Introduction to Computational Fluid Dynamics, Chow CY, John Wiley, 1979
4. Bose, T.K., Computation Fluid Dynamics, Wiley Eastern Ltd., 1988.

Outcomes:

- Solve differential equations governing fluid flow problems.
- CFD Techniques for boundary layer problems.
- Application of Time dependent techniques for transient aerospace problems.

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(R15A0323) HEAT TRANSFER
(CORE ELECTIVE – V)

Objectives: The objective of this subject is to provide knowledge about Heat transfer through conduction, convection and radiation.

Codes/Tables: Heat and Mass Transfer data book

UNIT-I:

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

Unsteady state Heat Transfer conduction- Transient heat conduction- Lumped system analysis, and use of Heisler charts.

UNIT-II:

Convection: Continuity, momentum and energy equations- Dimensional analysis- Boundary layer theory concepts- Free, and Forced convection- Approximate solution of the boundary layer equations- Laminar and turbulent heat transfer correlation- Momentum equation and velocity profiles in turbulent boundary layers- Application of dimensional analysis to free and forced convection problems- Empirical correlation.

UNIT-III:

Radiation: Black body radiation- radiation field, Kirchoff's laws- shape factor- Stefan Boltzman equation- Heat radiation through absorbing media- Radiant heat exchange, parallel and perpendicular surfaces- Radiation shields.

UNIT-IV:

Heat Exchangers: Types of heat exchangers- Parallel flow- Counter flow- Cross flow heat exchangers- Overall heat transfer coefficient- LMTD and NTU methods- Fouling in heat exchangers- Heat exchangers with phase change.

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

UNIT-V: Mass Transfer: Conservation laws and constitutive equations- Isothermal equimass, Equimolal diffusion- Fick's law of diffusion- diffusion of gases, Liquids- Mass transfer coefficient.

Text Books

1. Heat Transfer, by J.P.Holman, Int.Student edition, McGraw Hill Book Company.
2. Fundamentals of Heat and Mass Transfer- Incropera and Dewitt
3. Heat transfer by Sukhatme

Reference Books:

1. Heat and Mass Transfer- Arora and Domkundwar
2. Essential of Heat Transfer by Christopher A. Long
3. Heat transfer by Yunus A Cengel

Outcomes:

- Knowledge and understanding how heat and energy is transferred between the elements of a system for different configurations, Solve problems involving one or more modes of heat transfer**.**

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(R15A2129)AEROELASTICITY
(CORE ELECTIVE – VI)

Objectives:

The course should enable the students to:

- To elucidate the aero elastic Phenomena and formulations
- Find solution techniques for aerospace vehicles in flight and to incorporate the spin off benefits.
- Understand the application of aero elasticity and its effect on aircraft components.

UNIT-I INTRODUCTION TO AEROELASTICITY

Definition and historical background, Static and dynamic aeroelastic phenomenon, integretion of aerodynamic, elastic and inertia forces, influence of aeroelstic phenomenon on air craft design, Comparison of critical speeds.

UNIT-II DIVERGENCE OF LIFTING SURFACE

The phenomenon of divergence, divergence of 2-D wing section, divergence of an idealized cantilever wing, solution based on semi-rigid assumptions, solution to generalized co-ordinates Method of successive approximation, use of Numerical Methods.

UNIT-III STEADY STATE AERO-ELASTICITY PROBLEMS IN GENERAL

Loss and reversal of aileron Control: 2D case, aileron reversal general case. Lift distribution on a rigid and elastic wing. Effect on Static Longitudinal stability of airplane.

UNIT-IV INTRODUCTION TO FLUTTER AND BUFFETING

The phenomenon of flutter, flutter of a cantilever wing. Approximate determination of critical speed by Galerkin's Method, buffeting and stall flutter.

UNIT-V NON AERONAUTICAL PROBLEMS

Some typical example in civil engineering, Flow around an oscillating circular cylinder applications to H-shaped sections, Prevention of aero-elastic instabilities.

Text Books:

1. Fung Y.C. an introduction to the Theory of Aeroelasticity John Wiley and Sons, New York, 1985.
2. Bisphlinghoft R. C. Ashlay. H and Halfmam. R Aero-elasticity – Addition Werley Publishing Company.

3. Scnlan R.H. and Rosenbaum. R Introduction to the study of Aircraft Vibrations and Flutter McGraw Company New York 1981.

Reference Books:

Bisphlinghoft R. C. and Ashely, Principles of Aeroelasticity Johnwiley Company. 1998.

Outcomes:

The student should be able to:

- Understand the formation of Aileron reversal, flutter and wing divergence.
- Control aero elastic problems on fight stability and control.
- Application Aero elastic theories to Non aeronautical problems.

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(R15A0370)FATIGUE AND FRACTURE MECHANICS
(CORE ELECTIVE – VI)

Objectives:

- To study the concepts of estimation of the endurance and failure mechanism of components
- Failure investigation has been based on Fatigue and fracture mechanics.
- To predict the critical loads that will cause catastrophic failure in a structure.

UNIT I

FATIGUE OF STRUCTURES: S.N. curves - Endurance limits - Effect of mean stress, Goodman, Gerber and Soderberg relations and diagrams - Notches and stress concentrations - Neuber's stress concentration factors - Plastic stress concentration factors - Notched S.N. curves.

UNIT II

STATISTICAL ASPECTS OF FATIGUE BEHAVIOUR: Low cycle and high cycle fatigue - Coffin - Manson's relation - Transition life - cyclic strain hardening and softening - Analysis of load histories - Cycle counting techniques –Cumulative damage - Miner's theory - Other theories.

UNIT III

PHYSICAL ASPECTS OF FATIGUE: Phase in fatigue life - Crack initiation - Crack growth - Final Fracture - Dislocations – fatigue fracture surfaces.

UNIT IV

FRACTURE MECHANICS: Strength of cracked bodies - Potential energy and surface energy - Griffith's theory - Irwin - Orwin extension of Griffith's theory to ductile materials - stress analysis of cracked bodies – Effect of thickness on fracture toughness - stress intensity factors for typical geometries.

UNIT V

FATIGUE DESIGN AND TESTINIG: Safe life and Fail-safe design philosophies - Importance of Fracture Mechanics in aerospace structures - Applica¬tion to composite materials and structures.

Text Books:

1. Elements of fracture mechanics by Prasanth Kumar –– Wheeter publication, 1999.
2. Fatigue of aircraft structure by Barrois W, Ripely, E.L., Pergamon press. Oxford, 1913.

Reference Books:

1. Mechanics of fracture Vol. I by Sin, C.G., Sijthoff and w Noordhoff International Publishing Co., Netherlands, 1919.
2. Fundamentals of Fracture Mechanics by Knott, J.F., Buterworth & Co., Ltd., London, 1913

Outcomes:

- Application of fracture mechanics to engineering issues.
- The subjects covered by this special collection include the fatigue life of structural elements.
- Exposure on nonlinear fracture-mechanics parameters, such as the J and T integrals.

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(R15A2130) AIRLINE AND AIRPORT MANAGEMENT
(CORE ELECTIVE – VI)

Objectives:
To understand and acquire a sound understanding on basic management aspect of airport and airlines system such as airports layout, air traffic control, landing procedure, scheduling, flight planning and other economic and commercial activities.

UNIT I
AIRPORT SYSTEMS: An introduction, Airports and airport systems: Organization and administration. A historical and Legislative perspective.

UNIT II
AIRPORT OPERATIONS MANAGEMENT: The airfield, Airspace and air traffic management, Airport operations management under FAR Part 139, Airport terminals and ground access, Airport security.

UNIT III
AIRPORT ADMINISTRATIVE MANAGEMENT: Airport financial management, The economic, political, and social role of airports, Airport planning, Airport capacity and delay, The future of airport management.

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: Fleet Planning, Route Evaluation, Schedule Development, Pricing, Revenue Management

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:

- Understand the functioning of the airline industry.
- Focus on the underlying marketing, financial, operational and competitive factors that influence airline viability.
- Investigate how the sensitivity of airline profitability impacts airline management decisions
- Analyze the principles of airline economics, costs and pricing.
- The student and assess the individual characteristics of low-cost carriers and business only airlines.