

AUTONOMOUS

SYLLABUS

V & VI Semesters

B.E in Aeronautical Engineering

2023

MITE



Invent Solutions

**MANGALORE INSTITUTE OF
TECHNOLOGY & ENGINEERING**



MANGALORE INSTITUTE OF TECHNOLOGY & ENGINEERING

(A Unit of Rajalaxmi Education Trust®, Mangalore)

Autonomous Institute affiliated to VTU, Belagavi, Approved by AICTE, New Delhi

Accredited by NAAC with A+ Grade & ISO 9001:2015 Certified Institution

Institute Vision

*“To attain perfection in providing **Globally Competitive Quality Education** to all our Students and also benefit the global community by using our strength in **Research and Development**”*

Institute Mission

*“To establish world class educational institutions in their respective domains, which shall be **Centers of Excellence** in their stated and implied sense. To achieve this objective we dedicate ourselves to meet the challenges of becoming **Visionary and Realistic, Sensitive and Demanding, Innovative and Practical, Theoretical and Pragmatic; ALL at the same time**”*

Department Vision

To be recognized as an innovative leader in Aeronautical engineering through excellence in education by imparting the values of research and developments in the upcoming fields of Aeronautics.

Department Mission

- *The Department imparts the technical knowledge, practical skills, entrepreneurial skills to students and the channelized guiding in the varied activities with the aim of transforming the graduates into able engineers of tomorrow.*
- *Aeronautical laboratories are specifically designed and laid up in order to develop adaptable students with a strong foundation in skills that are relevant to the challenging world.*
- *To provide students with strong concepts of their core subjects and an application- oriented overview in their stipulated courses.*

Program Educational Objectives (PEOs)

After successful completion of the program,

- *Graduates will have the scientific and technical knowledge to have successful career in Aeronautical industry.*
- *Graduates will have competency to analyze challenges and advancements in the focus areas of Propulsion, Structures, Aerodynamics, Flight Mechanics and Avionics.*
- *Graduates will be motivated and confident to pursue advanced education, research and development and other creative efforts in aeronautical engineering and allied areas.*
- *Graduates will have higher order thinking and leadership skills to become technology leaders of tomorrow.*

Program Specific Outcomes (PSOs)

At the end of the program,

- *Graduates will excel in their professional career in Aeronautical industry and research with highest professional and ethical standards to their activities by acquiring knowledge in basic engineering, mathematics, science and Aeronautical engineering.*
- *Graduates will exhibit professionalism, teamwork in their chosen profession and adapt to current trends, technologies and industrial scenarios by pursuing lifelong learning.*

LIST OF COURSES

V / VI Semester Courses			
Sl. No.	Course Code	Course Title	Sem
HUMANITIES & SOCIAL SCIENCE COURSES			
1.	23HMCC301	Entrepreneurship, Management & Finance	V
PROFESSIONAL CORE COURSES			
2.	23AEPC302	Aircraft Propulsion	V
3.	23AEPC303	Aircraft Structural Design	V
4.	23AEPC304	Systems Engineering	V
5.	23AEPC305	Flight Simulation Laboratory	V
6.	23AEPC306	Aircraft Design	VI
7.	23AEPC307	Aircraft Performance	VI
8.	23AEPC308	Modelling & Simulation Laboratory	VI
SKILL ENHANCEMENT COURSE			
9.	23AESE309	Project Phase - I	
PROFESSIONAL ELECTIVE COURSES			
10.	23AEPE311	Finite Element Method	V
11.	23AEPE312	Unmanned Aerial Vehicles	V
12.	23AEPE313	Wind Tunnel Design and its Applications	V
13.	23AEPE321	Avionics	VI
14.	23AEPE322	Theory of Vibrations	VI
15.	23AEPE323	Computational Fluid Dynamics	VI
OPEN ELECTIVE COURSES			
16.	23AEOE311	Introduction to Aerospace Technology	V
17.	23AEOE312	Basics of Unmanned Aerial Vehicles	V
18.	23AEOE313	Aviation Management	V
19.	23AEOE321	Introduction to Airport & Airlines	VI
20.	23AEOE322	Aircraft Transportation Systems	VI
21.	23AEOE323	Civil Aviation Requirement	VI
NON CREDIT MANDATORY COURSES			
22.	23NMCC321	Yoga-III	V
23.	23NMCC322	Physical Education-III	V
24.	23NMCC323	National Service Scheme-III	V
25.	23NMCC324	Arts-III	V
26.	23NMCC325	Yoga-IV	VI
27.	23NMCC326	Physical Education-IV	VI
28.	23NMCC327	National Service Scheme -IV	VI
29.	23NMCC328	Arts-IV	VI



MANGALORE INSTITUTE OF TECHNOLOGY & ENGINEERING

(A Unit of Rajalaxmi Education Trust®, Mangalore)

Autonomous Institute affiliated to VTU, Belagavi, Approved by AICTE, New Delhi

Accredited by NAAC with A+ Grade & ISO 9001:2015 Certified Institution

V Semester (2023 Scheme): Aeronautical Engineering

Sl. No.	Course Code	Course Title	Category	Teaching Dept.	Teaching Hrs /Week			Exam Marks			Duration of Exam (SEE) in Hrs	Credits
					L	T	P	CIE	SEE	Total		
1.	23HMCC301	Entrepreneurship, Management & Finance	Humanities & Social Sciences	MBA/Any Department	3	0	0	50	50	100	3	3
2.	23AEPC302	Aircraft Propulsion	Professional Core Course	AE	3	0	2	50	50	100	3	4
3.	23AEPC303	Aircraft Structural Design	Professional Core Course	AE	3	0	0	50	50	100	3	3
4.	23AEPC304	Systems Engineering	Professional Core Course	AE	2	0	2	50	50	100	3	3
5.	23AEPC305	Flight Simulation Laboratory	Professional Core Course	AE	0	1	3	50	50	100	2.5	2
6.	23AEPE31X	Professional Elective –I*	Discipline Specific Electives	AE	3	0	0	50	50	100	3	3
7.	23AEOE31X	Open Elective –I**	Open Electives	AE	3	0	0	50	50	100	3	3
8.	23NMCC32X	Yoga/Physical Education/ NSS /Arts**	Non Credit Mandatory Course	Yoga Teacher/ PED/ NSS Coordinator/ Cultural Coordinator	0	0	1	100	-	100	-	-
Total Credits											21	

Note: MOOC Courses

MOOC Requirement:

- Students are required to register and successfully complete one MOOC (Massive Open Online Course) of 8 or 12 weeks duration, offered through the NPTEL/SWAYAM platforms, between the 6th and 7th semesters.
- The list of eligible courses shall be approved and notified by the Board of Studies (BoS) of the respective discipline at least 15 days before the start of the semester.



MANGALORE INSTITUTE OF TECHNOLOGY & ENGINEERING

(A Unit of Rajalaxmi Education Trust®, Mangalore)

Autonomous Institute affiliated to VTU, Belagavi, Approved by AICTE, New Delhi

Accredited by NAAC with A+ Grade & ISO 9001:2015 Certified Institution

- The successfully completed MOOC will be considered equivalent to a Professional Elective carrying 2 credits, which will be accounted for in the 8th semester.
- Students must submit the course completion certificate and the official scorecard issued by NPTEL as proof of completion.
- **Failure Policy:** Students who are unable to clear the MOOC in two consecutive attempts during the 6th and 7th semesters will be allowed to register for a Professional Elective course offered by the department in online mode during the 8th semester to earn the required 2 credits. SEE will be conducted by the department in the offline mode.

*Professional Elective Course -I

Sl. No.	Course Code	Course Title
1.	23AEPE311	Finite Element Method
2.	23AEPE312	Unmanned Aerial Vehicles
3.	23AEPE313	Wind Tunnel Design and its Applications

**Open Elective Course-I

Sl. No.	Course Code	Course Title
1.	23AEOE311	Introduction to Aerospace Technology
2.	23AEOE312	Basics of Unmanned Aerial Vehicles
3.	23AEOE313	Aviation Management

***Yoga/Physical Education/ National Service Scheme/Arts:

Sl. No.	Course Code	Course Title
1.	23NMCC321	Yoga- III
2.	23NMCC322	Physical Education-III
3.	23NMCC323	National Service Scheme -III
4.	23NMCC324	Arts-III



MANGALORE INSTITUTE OF TECHNOLOGY & ENGINEERING

(A Unit of Rajalaxmi Education Trust®, Mangalore)

Autonomous Institute affiliated to VTU, Belagavi, Approved by AICTE, New Delhi

Accredited by NAAC with A+ Grade & ISO 9001:2015 Certified Institution

VI Semester (2023 Scheme): Aeronautical Engineering

Sl. No.	Course Code	Course Title	Category	Teaching Dept.	Teaching Hrs /Week			Exam Marks			Duration of Exam (SEE) in Hrs	Credits
					L	T	P	CIE	SEE	Total		
1.	23AEPC306	Aircraft Design	Professional Core Course	AE	3	0	0	50	50	100	3	3
2.	23AEPC307	Aircraft Performance	Professional Core Course	AE	3	0	2	50	50	100	3	4
3.	23AEPC308	Modelling & Simulation Laboratory	Professional Core Course	AE	0	1	3	50	50	100	2.5	2
4.	23SEAE309	Project Phase - I	Project	AE	0	0	6	100	-	100	3	3
5.	23AEPE32X	Professional Elective –II*	Discipline Specific Electives	AE	3	0	0	50	50	100	3	3
6.	23AEOE32X	Open Elective -II**	Open Electives	AE	3	0	0	50	50	100	3	3
7.	23NMCC32X	Yoga/Physical Education/ NSS /Arts***	Non Credit Mandatory Course	Yoga Teacher/ PED/ NSS Coordinator/ Cultural Coordinator	0	0	1	100	-	100	-	-
Total Credits											18	



MANGALORE INSTITUTE OF TECHNOLOGY & ENGINEERING

(A Unit of Rajalaxmi Education Trust®, Mangalore)

Autonomous Institute affiliated to VTU, Belagavi, Approved by AICTE, New Delhi

Accredited by NAAC with A+ Grade & ISO 9001:2015 Certified Institution

*Professional Elective Course -II

Sl. No.	Course Code	Course Title
1.	23AEPE321	Avionics
2.	23AEPE322	Theory of Vibrations
3.	23AEPE323	Computational Fluid Dynamics

**Open Elective Course-II

Sl. No.	Course Code	Course Title
1.	23AEOE321	Introduction to Airport & Airlines
2.	23AEOE322	Aircraft Transportation Systems
3.	23AEOE323	Civil Aviation Requirement

***Yoga/Physical Education/ National Service Scheme /Arts:

Sl. No.	Course Code	Course Title
1.	23NMCC325	Yoga- IV
2.	23NMCC326	Physical Education-IV
3.	23NMCC327	National Service Scheme -IV
4.	23NMCC328	Arts-IV

INDEX

V Semester

Sl. No.	Course Code	Course title	Page No.
1.	23HMCC301	Entrepreneurship, Management & Finance	1
2.	23AEPC302	Aircraft Propulsion	3
3.	23AEPC303	Aircraft Structural Design	5
4.	23AEPC304	Systems Engineering	7
5.	23AEPC305	Flight Simulation Laboratory	10
6.	23AEPE31X	Professional Elective –I*	11 - 15
7.	23AEOE31X	Open Elective –I**	16 - 21
8.	23NMCC32X	Yoga/Physical Education/ National Service Scheme /Arts***	22 - 27

VI Semester

Sl. No.	Course Code	Course title	Page No.
1.	23AEPC306	Aircraft Design	28
2.	23AEPC307	Aircraft Performance	30
3.	23AEPC308	Modelling & Simulation Laboratory	32
4.	23AESE309	Project Phase -I	33
5.	23AEPE32X	Professional Elective –II*	36 – 41
6.	23AEOE32X	Open Elective-II**	42 – 47
7.	23NMCC32X	Yoga/Physical Education/ National Service Scheme/Arts***	48 - 53

Entrepreneurship, Management & Finance			
Semester	V	CIE Marks	50
Course Code	23HMCC301	SEE Marks	50
Teaching Hours/Week (L:T: P)	3:0:0	Exam Hrs	03
Total Hours	42	Credits	03
<p>Course Learning Objectives: This course is designed to</p> <ol style="list-style-type: none"> 1. Impart key competencies, qualities, and skills of entrepreneurship 2. Provide insights into the pathways to new venture creation 3. Acquaint with the various concepts of management in organizations 4. Emphasize the importance of the various functions of management in the business 5. Familiarize the financial aspects of the various forms of organizations 			
Module 1: Entrepreneur and Entrepreneurship			No. of Hrs: 8
<p>Entrepreneur: Definition, Entrepreneurial competencies, Characteristics of Entrepreneurs, Qualities of an entrepreneur, Entrepreneurial skills. Developing Entrepreneurial competencies, Classification of Entrepreneurs, Entrepreneur vs Professional Managers</p> <p>Entrepreneurship: Concept, Phases of Entrepreneurship Development, Fostering Entrepreneurship, Barriers to Entrepreneurship, Factors influencing Entrepreneurship</p> <p>Textbook 1: Chapter 2, 3 and 10</p>			
Module 2: Opportunities and pathways to Entrepreneurship			No. of Hrs: 8
<p>Opportunity identification, Sources of Innovative ideas, Entrepreneurial imagination, and creativity: Concept of Creativity, Rules, Components, Process or phases of creativity, the critical thinking process</p> <p>Pathways to new ventures: Creating New ventures, Acquiring an established venture, Franchising</p> <p>Textbook 2: Chapter 5 and 6</p>			
Module 3: Introduction to Management			No. of Hrs: 8
<p>Management: Nature, Objectives, Importance. Difference between administration and management. Levels of management, Types of managers, Managerial skills, Managerial Competencies, Scope, or Functional areas of management</p> <p>Textbook 3: Chapter 1</p>			
Module 4: Management Functions			No. of Hrs: 9
<p>Functions of Management: Planning, Organizing, Staffing, Directing and Controlling</p> <p>Planning: Meaning, Features, Importance, Types, and steps. Organizing: Meaning, Need, Principles, and Process</p> <p>Staffing: Meaning, Nature, and Process. Directing: Meaning, Need, Elements and Techniques. Controlling: Meaning, Need, Characteristics, Steps, and Types</p> <p>Textbook 3: Chapter 3, 4, 5 and 6</p>			
Module 5: Business Organizations and Finance			No. of Hrs: 9
<p>Forms of Business Organization: Sole proprietorship, Partnership, Cooperative Society, and Company, Financial decisions in a firm, Goal of Financial Management, Fundamental principle of finance, building blocks of modern finance, Risk-return tradeoff, Emerging role of financial manager in India, Cost profit volume analysis; Profit volume ratio, Break Even Analysis and Margin of safety</p> <p>Textbook 4: Chapter 1- Section 1.1, 1.2,1.3, 1.4, 1.5, 1.6 and 1.11 Chapter 13 – Section 13.4</p>			

Course Outcomes: At the end of the course, the student will be able to

1. Outline the entrepreneurial skills & qualities required for business development and growth.
2. Summarize the processes of opportunity identification, creativity, and pathways to establishing new ventures.
3. Explain the fundamental concepts of management.
4. Apply the functions of management in decision-making.
5. Apply the knowledge of financial concepts in solving business Problems.

Textbooks:

1. Vasanth Desai, “The Dynamics of Entrepreneurial Development and Management”, 6th edition, Himalaya Publishing House, 2018
2. Donald F. Kuratko and T.V. Rao, “Entrepreneurship: A South Asian Perspective”, 1st Edition, Cengage Learning, 2017
3. Chandrani Singh and Aditi Khatri, “Principles and Practices of Management and Organizational Behavior”, 5th Edition, Sage Texts, 2021
4. Prasanna Chandra, “Financial Management- Theory and Practice”, 10th Edition, Mc Graw Hill, 2022

Reference Books:

1. Deepener Sharma, “Entrepreneurship in India”, 1st Edition, Routledge India, 2023
2. Robert D. Hisrich, Michael P. Peters, Dean A. Shepherd, and Sabyasachi Sinha, “Entrepreneurship”, 11th Edition, McGraw Hill, 2022
3. Charanthimath Poornima M, “Entrepreneurship Development and Small Business Enterprises”, 3rd Edition, Pearson, 2018

Web links:

1. Introduction to Entrepreneur: <https://www.youtube.com/watch?v=rbmz5VEW90A>
2. Pathways to new creations: <https://www.youtube.com/watch?v=zkgbss81QKE>
3. Concepts of Management: <https://www.youtube.com/watch?v=GZ2dmbDmB5I>
4. Functions of Management: <https://www.youtube.com/watch?v=Vq8GChMK5Zg>
5. Types of Business Organizations: <https://www.youtube.com/watch?v=UGSIED1Jx1Y>

Aircraft Propulsion			
Semester	V	CIE Marks	50
Course Code	23AEPC302	SEE Marks	50
Teaching Hrs/Week(L:T:P)	3:0:2	Exam Hrs	03
Total Hrs	64	Credits	04
<p>Course Learning Objectives: This course is designed to</p> <ol style="list-style-type: none"> 1. Discuss the basic principles and theory of aircraft propulsion. 2. Present the design features of inlets and perform necessary calculations 3. Impart knowledge in the design features of combustors 4. Illustrate the working principles of different nozzles used in aircraft propulsion 5. Impart knowledge and expertise in Advanced propulsion technology 			
Module1: Fundamentals of Air Breathing Engines			No. of Hrs.: 8+4
<p>Principles of aircraft propulsion, types of power plants, working of gas turbine engine – the thrust equation – factors affecting thrust – effect of pressure, velocity and temperature changes of air entering compressor, methods of thrust augmentation, cycle analysis of jet engines</p> <p>Laboratory Component: Study of performance of a propeller.</p>			
Module2: Inlets for jet engines			No. of Hrs.: 10+4
<p>Subsonic Inlets: Internal flow and stall in subsonic inlets, diffuser performance–T-S diagram, Isentropic efficiency calculations, properties variation in diffuser – boundary layer separation</p> <p>Supersonic inlets: supersonic inlets–internal, external and mixed compression–starting problem on supersonic inlets–shock swallowing by area variation, – modes of inlet operations–critical, subcritical and supercritical</p> <p>Laboratory Component: Cascade testing of a model of axial compressor blades</p>			
Module3: Combustors for Jet Engines			No. of Hrs.: 8+4
<p>Classification of combustion chambers, combustion process, important factors affecting combustion chamber design – flame Stability, emission control, fuel injection and atomization – combustion chamber performance –combustion efficiency, stability and ignitability, aircraft fuels – jet fuels, future of aircraft fuels, emissions and Pollutants</p> <p>Laboratory Component: Measurement of burning velocity of a premixed flame</p>			
Module4: Nozzles for jet engines			No. of Hrs.: 8+4
<p>Theory of flow in isentropic nozzles– choked flow condition, convergent nozzles, C-D nozzles, over-expanded, correctly expanded and under-expanded nozzles, – losses in nozzles – equilibrium flow and frozen flow in nozzles–thrust reversal–thrust vectoring systems (in modern/military aircraft), Clamshell Door Reversers</p> <p>Laboratory Component: Measurement of subsonic nozzle flow for wall jet Study of supersonic open free jets</p>			
Module5: Advanced Propulsion systems			No. of Hrs.: 10+4
<p>Ramjets–thermodynamic cycle of a ramjet, reusable space systems, pulsejets–valved Pulsejet, valveless Pulsejet, combined cycle engines– turbo-ramjet, air turbo-rocket (ATR) –need, principle, construction, operation, performance. introduction to electric – battery, fuel cell and solar-electric propulsion – hybrid propulsion systems–series, parallel and series-parallel(power-split) hybrid</p> <p>Laboratory Component: Modeling and analysis of ramjet inlet using ANSYS</p>			



MANGALORE INSTITUTE OF TECHNOLOGY & ENGINEERING

(A Unit of Rajalaxmi Education Trust[®], Mangalore)

Autonomous Institute affiliated to VTU, Belagavi, Approved by AICTE, New Delhi

Accredited by NAAC with A+ Grade & ISO 9001:2015 Certified Institution

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

1. Apply the principles of aircraft propulsion and gas turbine engine operation
2. Apply knowledge of jet engine inlets and nozzles to determine airflow characteristics
3. Describe combustion chamber classification, design considerations and performance factors
4. Compare the performances of ramjet, pulsejet, and hybrid propulsion systems in real-world aerospace applications.
5. Compute the performance characteristics of ramjet engines to determine their suitability and effectiveness for propulsion in high-speed aircraft applications

Text books:

1. Ahmed F. El-Sayed, "Aircraft Propulsion and Gas Turbine Engines", 2nd Edition, CRC Press, Taylor & Francis group, 2017
2. Hill, P.G. & Peterson, C.R., "Mechanics & Thermodynamics of Propulsion" 2nd Edition, Addison – Wesley Longman INC, 1999

Reference Books:

1. Bhaskar Roy, "Aircraft propulsion", 2nd edition, Elsevier, 2011
2. S. M. Yahya, "Fundamentals of Compressible Flow with Aircraft and Rocket propulsion", 4th Edition, New Age International Publications, New Delhi, 2014
3. H. Cohen, G.F.C. Rogers, and Saravanamuttoo "Gas Turbine Theory" 7th Edition, Pearson, 2017
4. Rathakrishnan., E, " Gas Dynamics", 6th edition, PHI Learning, 2017
5. Haran K, Madavan N, O'Connell TC, eds. Electrified Aircraft Propulsion: Powering the Future of Air Transportation. Cambridge University Press; 2022

Web links:

1. Jet engine cycle analysis: <http://nptel.ac.in/courses/101101001/>
2. Ramjets and pulsejets: <https://nptel.ac.in/courses/101101002>
3. Inlets & nozzles, combustion chambers: <https://archive.nptel.ac.in/courses/112/103/112103281/>
4. Electrified aircrafts: <https://www.collinsaerospace.com/what-we-do/capabilities/electrified-aircraft>

Aircraft Structural Design			
Semester	V	CIE Marks	50
Course Code	23AEPC303	SEE Marks	50
Teaching Hours/Week (L: T: P)	3:0:0	Exam Hrs	03
Total Hours	42	Credits	03
<p>Course Learning Objectives: This course is designed to</p> <ol style="list-style-type: none"> 1. Familiarize the concepts of static strength, theories of failure and stress concentration 2. Impart Knowledge on loads acting on aircraft and bending stresses in unsymmetrical beams 3. Impart knowledge on shear flow in thin-walled beams, design criteria and structural idealization principles 			
Module 1: Failure Theories			No. of Hrs: 9
Design for Static Strength: Static loads and factor of safety, failure of brittle and ductile materials. Theories of failure: Maximum normal stress theory, Maximum shear stress theory, Maximum strain theory, Strain energy theory and Distortion energy theory. Stress concentration and Determination of Stress concentration factor.			
Module 2: Loads on Aircraft and VN Diagram			No. of Hrs: 8
Loads on Aircraft: Structural nomenclature, Types of loads, load factor, Aerodynamics loads, Symmetric manoeuvre loads, Velocity Load factor diagram, Function of structural components.			
Module 3: Unsymmetrical Bending			No. of Hrs: 8
Unsymmetrical Bending: Bending Stresses in beams of unsymmetrical sections-bending of symmetric sections with skew load. Symmetrical bending, unsymmetrical bending, direct stress distribution due to bending, position of the neutral axis, calculation of section properties, approximation for thin-walled sections.			
Module 4: Shear of open section beams and Torsion of Closed Thin-Walled Beams			No. of Hrs: 9
General stress, strain, and displacement relationship for open and single-cell closed section thin-walled beams, shear of open section beams, shear centre. Torsion of close section beam and displacement associated with the Bredt-Batho shear flow.			
Module 5: Design Criteria and Structural Idealization			No. of Hrs: 8
Design Criteria: Safety Factor, Design life criteria, Analysis method, Life Assessment procedures, Design Principle, Two bay crack criteria, Widespread Fatigue damage. Structural Idealization: Structural idealization Principle, Idealization of a panel, Effect of idealization on the analysis of open and closed section beams. Bending of open and closed section idealized beams, Shear of open section and closed section idealized beams.			
<p>Course Outcomes: At the end of the course, the student will be able to</p> <ol style="list-style-type: none"> 1. Explain the theories of failure, stress concentration and loads on aircraft 2. Apply the concepts on static strength design, stress concentration and unsymmetrical bending for design of aircraft structural components 3. Determine the shear flow and shear center in thin-walled beams subjected to shear and torsion 4. Describe the design criteria, life assessment procedure and fatigue damage 5. Apply structural idealization principles for wing and fuselage section 			
<p>Textbooks:</p> <ol style="list-style-type: none"> 1. T.H.G Megson, "Aircraft Structures for Engineering Students", 7th Edition, Butterworth-Heinemann Inc, 2021. 2. Lalit Gupta & Dr. O.P. Sharma., "Fundamentals of Flight (Vol.2) - Aircraft Structures", Himalayan Books, 2015. 			



MANGALORE INSTITUTE OF TECHNOLOGY & ENGINEERING

(A Unit of Rajalaxmi Education Trust[®], Mangalore)

Autonomous Institute affiliated to VTU, Belagavi, Approved by AICTE, New Delhi

Accredited by NAAC with A+ Grade & ISO 9001:2015 Certified Institution

Reference Books:

1. V.B. Bhandari, "Design of Machine Elements", 2nd Edition, Tata McGraw Hill Publishing Company Ltd., New Delhi, 2020.
2. Donaldson, B.K., "Analysis of Aircraft Structures – An Introduction", 2nd Edition, Cambridge University Press, 2012.

Web links:

1. V-N Diagram: <https://youtu.be/WCEsOI9m97o>
2. Loads on Aircraft: <https://youtu.be/WoolUTm7-5g>

Systems Engineering			
Semester	V	CIE Marks	50
Course Code	23AEPC304	SEE Marks	50
Teaching Hours/Week (L: T: P)	2:0:2	Exam Hrs	03
Total Hours	50	Credits	03
<p>Course Learning Objectives: This course is designed to</p> <ol style="list-style-type: none"> 1. Impart fundamental Systems Engineering principles and their application to real-world engineering problems 2. Familiarize system life cycle approach and functional & feasibility analysis 3. Teach simulation tools and techniques to explore, validate, and optimize system performance requirements 4. Familiarize with verification and validation strategies to ensure system reliability, effectiveness, and successful deployment 			
Module 1: Foundations of Systems Engineering (SE)			No. of Hrs: 6 +4
<p>Introduction, systems engineering & traditional engineering, functions, examples, challenges, perspectives, systems domains, fields, approaches, activities and products</p> <p>Textbook 1: Chapter 1</p> <p>Practice sessions:</p> <ol style="list-style-type: none"> 1. Case Study on breaking down a complex mechanical system (e.g., car engine) and map its components to Systems Engineering concepts 2. Role-playing exercises with assigned roles (e.g., systems engineer, project manager) and discuss solutions to common challenges 			
Module 2: System Development Process			No. of Hrs:6+4
<p>Systems engineering life cycle, concept development stage, engineering development stage, post-development stage, and systems engineering methods, Systems Engineering Standards: ISO15288, IEC61508, DO178/B/C</p> <p>Textbook 1: Chapter 4 - Section 4.1, 4.2, 4.4</p> <p>Practice sessions:</p> <ol style="list-style-type: none"> 1. Life cycle Model Creation using software tools (Systems Modeling Language -SysML) to visually represent a system's life cycle (e.g., HVAC system). 2. System Lifecycle Analysis of a given system (e.g., industrial robot) and identify necessary engineering tasks at each lifecycle phase 			
Module 3: Concept Development			No. of Hrs: 4+6
<p>Needs analysis, originating a new system, operations analysis, functional analysis, feasibility definition, needs validation, system operational requirements</p> <p>Textbook 1: Chapter 6 - Section 6.1, 6.2, 6.3, 6.4, 6.5 & 6.6</p> <p>Practice sessions:</p> <ol style="list-style-type: none"> 1. Conduct a need analysis (by interviewing potential users, analyzing market trends, and considering technical feasibility) for a new mechanical product (e.g., an energy-efficient vehicle) and present their findings. 2. Develop a functional flow block diagram by breaking down a system based on functionality 			
Module 4: Simulation & Model-Based System Engineering			No. of Hrs: 6+4



MANGALORE INSTITUTE OF TECHNOLOGY & ENGINEERING

(A Unit of Rajalaxmi Education Trust[®], Mangalore)

Autonomous Institute affiliated to VTU, Belagavi, Approved by AICTE, New Delhi

Accredited by NAAC with A+ Grade & ISO 9001:2015 Certified Institution

Developing the system requirements, operational requirements analysis, performance requirements formulation, implementation of concept exploration, performance requirements validation
Operational Simulation, System Effectiveness Simulation, Mission, Types of Simulation - Physical, Hardware - in - the - Loop, Engineering, Environmental & Virtual Reality; Simulation Verification and Validation Quality of great models, stitching the models, model-based attribute tradeoffs & decision making

Textbook 1: Chapter 7 - Section 7.1, 7.2, 7.3, 7.4 & 7.5
Chapter 9 - Section 9.4

Practice sessions:

1. Use simulation software to develop a simple model of a system component (e.g., a mechanical subsystem) and experiment with different parameters and analyze the system's behavior under various conditions
2. Develop performance requirements for a new system (e.g., wind turbine) and use simulation results to validate the requirements

Module 5: Integrating, Testing, and Evaluating the Total System

No. of Hrs: 4+6

Integration and evaluation phase in a system life cycle, Systems Engineering Method in Integration and Evaluation, System Integration - Physical Test Configuration, Subsystem Integration, Total System Integration, Operational Test and Evaluation

Textbook 1: Chapter 13

Practice sessions:

1. Verification & Validation of a Project by developing and executing test plans for a mechanical system (e.g., a mechanical arm) and performing unit, integration, and system testing
2. Deployment strategies for a system (e.g., a factory automation line), including testing, installation, and validation phases

Course Outcomes: At the end of the course, the student will be able to

1. Explain fundamental Systems Engineering principles and their relevance to engineering challenges
2. Apply the system life cycle approach to design and evaluate engineering systems
3. Identify system needs and perform feasibility analysis to define operational requirements
4. Demonstrate the application of simulation tools to validate and optimize system performance
5. Develop verification and validation strategies for testing and deploying engineering systems

Textbooks:

1. Kossiakoff, A., Sweet, W. N., Seymour, S. J., & Biemer, S. M., "Systems engineering principles and practice", 2nd Edition, Wiley, 2011

Reference Books:

1. Dennis M. Buede, "The Engineering Design of Systems: Models and Methods", 20th Edition, Wiley-Interscience, 2011
2. Reinhard Haberfellner, Olivier de Weck, Ernst Fricke, Siegfried V, "Systems Engineering: Fundamentals and Applications", Springer Nature link, 2019
3. Wasson C. S., "System engineering: Analysis, design, and development", 2nd Edition, Wiley, 2015



MANGALORE INSTITUTE OF TECHNOLOGY & ENGINEERING

(A Unit of Rajalaxmi Education Trust[®], Mangalore)

Autonomous Institute affiliated to VTU, Belagavi, Approved by AICTE, New Delhi

Accredited by NAAC with A+ Grade & ISO 9001:2015 Certified Institution

Web links:

1. Module 1: <https://ocw.mit.edu/courses/16-842-fundamentals-of-systems-engineering-fall-2015/pages/lecture-notes/>
2. Module 2: <https://www.youtube.com/watch?v=-gmDkEHI004>
3. Module 3: <https://www.youtube.com/watch?v=H2WQ2qH2G3M>
4. Module 4: <https://www.youtube.com/watch?v=pmUkmawKrMA>
5. Module 5: <https://www.youtube.com/watch?v=avMnK9FpZd0>
6. Design Architectures and Activity Diagram for Mobile Robot :
<https://in.mathworks.com/help/systemcomposer/ug/design-architectural-models.html>
7. Modeling System Architecture of Keyless Entry System:
<https://in.mathworks.com/help/systemcomposer/ug/modeling-system-architecture-of-keyless-entry-system.html>

Flight Simulation Laboratory			
Semester	V	CIE Marks	50
Course Code	23AEPC305	SEE Marks	50
Number of Lecture Hours/Week (L:T:P: S)	0:1:3	Exam Hours	2.5
Total Hours	36	Credits	02
<p>Course objectives: This course is designed to</p> <ol style="list-style-type: none"> 1. Impart knowledge of root locus and bode plot 2. Inculcate knowledge on spring mass damper and servo mechanism systems with feedback 3. Provide the use of computational tools to model aeronautical vehicle dynamics 			
Sl.No.	EXPERIMENTS		
1.	Draw Pole-Zero map of dynamic system model with plot customization option		
2.	Plot root locus with variables in transfer function & dynamic system through MATLAB		
3.	Draw Bode plot from a transfer function in MATLAB and explain the gain and phase margins		
4.	Simulate a spring- mass- damper system with and without a forcing function though SIMULINK		
5.	Simulate a simple servo-mechanism motion with feedback- in the 'time' domain and in 's' domain		
6.	Simulate a bomb drop from an aircraft on a moving tank in pure pursuit motion		
7.	Design of basic PID controller using MATLAB and plotting of step response of the closed-loop system to visualize its performance		
8.	Simulate stall of aircraft and show the effect of variation in static margin on stalling characteristics		
<p>Course Outcomes (COs): At the end of the course the students will be able to</p> <ol style="list-style-type: none"> 1. Analyze the dynamic behavior of control systems by plotting Pole-Zero maps, Root Locus and Bode plots in MATLAB to assess system stability and performance. 2. Apply simulation techniques using MATLAB/SIMULINK to model and study spring-mass-damper systems and servo mechanisms in both time and frequency domains. 3. Analyze aircraft motion characteristics by simulating PID controller and bomb drop trajectories, assessing the impact of system parameters on stability and control. 4. Analyze aircraft motion characteristics by simulating stall effects assessing the impact of system parameters on stability and control. 			

Finite Element Method			
Semester	V	CIE Marks	50
Course Code	23AEPE311	SEE Marks	50
Teaching Hrs/Week (L:T: P)	3:0:0	Exam Hrs	03
Total Hrs	42	Credits	03
<p>Course Learning Objectives: This course is designed to</p> <ol style="list-style-type: none"> 1. Familiarize fundamental concepts, principles and mathematical formulations of FEM 2. Impart knowledge on discretization techniques and shape function formulation for 1D bar, beam and truss elements 3. Inculcate knowledge on role and characteristics of higher-order elements in FEM analysis 4. Familiarize iso, sub, sub-parametric and axisymmetric formulations in FEM modeling 5. Provide governing equations of heat transfer in FEM analysis 			
Module 1: Introduction to Finite Element Method			No. of Hrs: 8
Introduction, stresses and equilibrium, plane stress, plane strain, basic equations and potential energy, Rayleigh - Ritz method, Galerkin's method, FEM applications, discretisation process, simple elements in FEM, polynomial selection, shape functions, use of global/cartesian, local and natural coordinates, compatibility and convergence requirements of shape functions			
Module 2: FEM analysis for Bars, Beams and Trusses			No. of Hrs: 9
Construction of shape functions for 1-D bar element in various coordinates, stiffness matrix, problems on bar elements under varying loading and geometrical conditions, truss and beam element analysis: problems on various loadings and boundary conditions			
Module 3: Analysis of Higher Order Elements			No. of Hrs: 8
Shape functions of triangular (TRIA 3), quadrilateral elements (QUAD 4), different types of higher order elements (TRIA 6, QUAD 8), four-noded tetrahedral element (TET 4), eight-noded hexahedral element (HEXA 8), tetrahedral elements, hexahedral elements, Serendipity family, Lagrange family			
Module 4: Theory of Iso-parametric and Axisymmetric Elements			No. of Hrs: 8
Iso-parametric, sub-parametric and super-parametric elements, characteristics of Iso-parametric quadrilateral elements, structure of computer program for FEM analysis, phases of FEM, familiarization with commercial FEM software's, axisymmetric formulation: finite element modelling of triangular and quadrilateral element			
Module 5: FEM analysis of Heat Transfer and Dynamics			No. of Hrs: 9
Introduction, 1-D and 2-D heat conduction governing equation, stiffness matrix, steady state heat transfer problems, Hamilton's principle			
<p>Course Outcomes: At the end of the course, the student will be able to</p> <ol style="list-style-type: none"> 1. Describe basic equations, stress conditions and discretization process in FEM 2. Derive stiffness matrices for bars, beams, and trusses under different loading and boundary conditions 3. Apply different types of higher-order elements in FEM 4. Describe iso-parametric, quadrilateral and axisymmetric elements for modeling 5. Compute nodal temperatures for multi-dimensional heat transfer 			
<p>Textbooks:</p> <ol style="list-style-type: none"> 1. Chandrupatla T. R., "Finite Elements in Engineering", 2nd edition, PHI publisher, 2007. 2. Bhavikatti "Finite element Analysis", 3rd edition, New Age International, 2015. 			
<p>Reference Books:</p> <ol style="list-style-type: none"> 1. P Seshu "Textbook of Finite element analysis", 1st edition, PHI publisher, 2004. 2. Bathe. K.J, "Finite Element Procedures", 1st edition, PHI publisher, 2007. 3. Rao S. S, "Finite Elements Method in Engineering", 5th edition, Elsevier, 2008. 			



MANGALORE INSTITUTE OF TECHNOLOGY & ENGINEERING

(A Unit of Rajalaxmi Education Trust[®], Mangalore)

Autonomous Institute affiliated to VTU, Belagavi, Approved by AICTE, New Delhi

Accredited by NAAC with A+ Grade & ISO 9001:2015 Certified Institution

Web links:

1. Introduction to FEM: https://archive.nptel.ac.in/content/syllabus_pdf/105105041.pdf
2. Discretization process: <https://youtu.be/KR74TQesUoQ?si=Hmx9QBq2YFQF77cs>
3. Nodes, Elements & Shape Functions: <https://youtu.be/tH1ygapKG2g>

Unmanned Aerial Vehicles			
Semester	V	CIE Marks	50
Course Code	23AEPE312	SEE Marks	50
Teaching Hrs/Week(L:T:P)	3:0:0	Exam Hrs	03
Total Hrs	42	Credits	03
<p>Course Learning Objectives: This course is designed to</p> <ol style="list-style-type: none"> 1. Provide the fundamentals of aviation history and the components of UAV systems 2. Familiarize the fundamentals of aircraft performance to UAVs 3. Impart knowledge in stability and control, sources of power to UAVs 4. Inculcate the basic aerodynamics principles of UAVs 			
Module 1: Introduction			No. of Hrs: 9
Aviation History and Overview of UAV systems, Classes and Missions of UAVs, Definitions and Terminology, UAV fundamentals, Examples of UAV systems-very small, small, Medium and Large UAV			
Module 2: The Air Vehicle-Basic Aerodynamics			No. of Hrs: 9
Basic Aerodynamics equations, Aircraft polar, the real wing and Airplane, Induced drag, the boundary layer, Flapping wings, Total Air-Vehicle Drag			
Module 3: The Air Vehicle-Performance			No. of Hrs: 8
Overview, Climbing flight, Range and Endurance – for propeller driven aircraft, range- a jet-driven aircraft, Guiding Flight			
Module 4: Stability and Control			No. of Hrs: 8
Overview, Stability, longitudinal, lateral, dynamic stability, Aerodynamics control, pitch control, lateral control, Autopilots, controller, actuator, airframe control, Flight-Control Classification, Sensors Supporting the Autopilot.			
Module 5: Propulsion			No. of Hrs: 8
Overview, Thrust Generation, Powered Lift, Sources of Power, The Two-Cycle Engine, The Rotary Engine, The Gas Turbine, Electric Motors, Sources of Electrical Power			
<p>Course Outcomes: At the end of the course, the students will be able to</p> <ol style="list-style-type: none"> 1. Describe the suitable aircraft frameworks, stability and control for UAV systems 2. Describe the historical developments in aircraft and their significance in aviation 3. Compare the various propulsion systems for UAV applications 4. Apply the fundamental aerodynamic principles in UAV design and operation 5. Determine the performance of UAV systems, including their applications in various fields 			
Textbooks:			
<ol style="list-style-type: none"> 1. Paul Gerin Fahlstrom, Thomas James Gleason, “Introduction To UAV Systems”, 5th Edition, Wiley Publication, 2022 2. Landen Rosen, “Unmanned Aerial Vehicle”, 1st Edition, Alpha Editions, 2015 			
Reference Books:			
<ol style="list-style-type: none"> 1. Kimon P. Valavanis, “Advances in Unmanned Aerial Vehicles: State of the Art and the Road to Autonomy”, 1st Edition Springer, 2007 2. Vasillis Tzivaras “Building a Quadcopter with Arduino”, 1st Edition, Packt Pub Ltd 2015 3. Scholar’s Choice “Unmanned Aerial Vehicles: DOD’s Acquisition Efforts”, 1st Edition, Scholar’s Choice Publisher, 2015 			
Web links:			
<ol style="list-style-type: none"> 1. UAV in engineering applications https://onlinecourses.swayam2.ac.in/ntr24_ed12/preview 2. Design of fixed wing unmanned aerial vehicles https://archive.nptel.ac.in/courses/101/104/101104073/ 			

Wind Tunnel Design and Its Applications			
Semester	V	CIE Marks	50
Course Code	23AEPE313	SEE Marks	50
Teaching Hours/Week (L:T: P)	3:0:0	Exam Hrs	03
Total Hours	42	Credits	03
<p>Course Learning Objectives: This course is designed to</p> <ol style="list-style-type: none"> 1. Impart the knowledge of Model Testing 2. Emphasize the concept of Testing in Wind Tunnels with various Mach Numbers 3. Provide comprehensive understanding of Calibration Techniques in Wind Tunnels 4. Disseminate the knowledge about measurements in Wind Tunnels 5. Develop the knowledge about the Flow Visualization Techniques 			
Module 1: Principles of Model Testing			No. of Hrs: 9
Buckingham Theorem, Non-dimensional numbers, Scale effects, Types of similarities- Geometric Similarity, Dynamic Similarity and Kinematic Similarity. Renolds Number, Numerical			
Module 2: Wind Tunnels			No. of Hrs: 9
Classification, Challenges of testing in subsonic, transonic, supersonic and hypersonic speed regions, Water tunnels: Advantages, limitations and configurations for various applications, Layouts, Sizing, design parameters and loss estimation. Model making; Optimization of wind tunnel and water tunnel design by using CFD			
Module 3: Calibration of Wind Tunnels			No. of Hrs: 8
Test section speed, Horizontal buoyancy, Flow angularities, Turbulence measurements, Associated instrumentation, Calibration of low and high speed wind tunnels and water tunnels			
Module 4: Wind Tunnel Measurements			No. of Hrs: 8
Pressure, velocity and temperature measurements on and off model surfaces using conventional probes, fast response pressure transducer probes, thermal and optical anemometry, Temperature measurements; Pressure, temperature and shear stress sensitive paints; Model supports, Force measurements, Three component and six component balances and Internal balances			
Module 5: Flow Visualization			No. of Hrs: 8
Surface and flow field visualization methods for wind tunnels and water tunnels; Optical methods of flow visualization, Photography techniques; Use of Data Acquisition System in wind tunnel operation, control, calibration, measurements and flow visualization			
<p>Course Outcomes: At the end of the course, the student will be able to</p> <ol style="list-style-type: none"> 1. Understand the current challenges in model testing 2. Apply the fundamental knowledge of model design, manufacturing and testing 3. Apply the concept of calibration of wind tunnels with various speeds 4. Solve the problems in the various measurement techniques 5. Apply the various methods of flow visualization techniques 			
<p>Textbooks:</p> <ol style="list-style-type: none"> 1. Rathakrishnan E., “Instrumentation, Measurements and Experiments in Fluids”, 2nd Edition., CRC Press, CAT#KE37758, 520 pages, 2016 2. Barlow Jewel B., William H. Rae and Alan Pope, “Low-Speed Wind Tunnel Testing”, 3rd Edition, Wiley, 728 pages, 2010 			
<p>Reference Book:</p> <ol style="list-style-type: none"> 1. Bruno Chanetz., “Experimental Aerodynamics”- Springer Nature Switzerland, 2022 			



MANGALORE INSTITUTE OF TECHNOLOGY & ENGINEERING

(A Unit of Rajalaxmi Education Trust[®], Mangalore)

Autonomous Institute affiliated to VTU, Belagavi, Approved by AICTE, New Delhi

Accredited by NAAC with A+ Grade & ISO 9001:2015 Certified Institution

Web links:

1. Principles and Calibration of Wind Tunnel - [https://ocw.mit.edu/courses/16-100-wind tunnel techniques-fall-2020/](https://ocw.mit.edu/courses/16-100-wind-tunnel-techniques-fall-2020/)
2. Wind Tunnel Measurements - <https://guides.libraries.psu.edu/c.php?g=374719&p=2537010>
3. Calibration of Wind Tunnels - [https://ocw.mit.edu/courses/16-100-wind tunnel techniques-fall-2020/](https://ocw.mit.edu/courses/16-100-wind-tunnel-techniques-fall-2020/)
4. Wind Tunnel Measurements - <https://guides.libraries.psu.edu/c.php?g=374719&p=2537010>

Introduction to Aerospace Technology			
Semester	V	CIE Marks	50
Course Code	23AEOE311	SEE Marks	50
Teaching Hrs/Week (L:T: P)	3:0:0	Exam Hrs	03
Total Hrs	42	Credits	03
<p>Course Learning Objectives: This course is designed to</p> <ol style="list-style-type: none"> 1. Familiarize the key milestones in the history of aviation development 2. Provide fundamental principles of flight and the evolution of propulsion systems 3. Impart knowledge on different aircraft materials based on their properties and applications 4. Provide the structural aspects of aircraft for the design requirements 5. Familiarize the historical advancements in aircraft instrumentation and their impact on modern aviation 			
Module 1: Historical Developments in Aeronautics			No. of Hrs: 8
Early Developments, Ornithopter, Balloon Flight, Sir George Cayley, True Inventor of Airplane, Interregnum, Otto Lilienthal, The Glider Man, Percy Pilcher, Extending the Glider Tradition. Wilbur and Orville Wright , Inventors of First Practical Airplane, Aeronautical Triangle – Langley, Wrights and Glenn Curtiss, Issues of Propulsion, Faster and Higher			
Module 2: Classification of Aircraft and Basic Principles of Flight			No. of Hrs: 9
Classification of Aircraft, Basic Components of Aircraft, Classification of Control Surfaces, Properties of Atmosphere, Airspeed, Airfoil Nomenclature, NACA Series Airfoil, Typical Wing Planform, Forces Acting on Airplane, Airflow Over Wing section and Generation of Lift, Types of Drag			
Module 3: Basics of Propulsion			No. of Hrs: 9
Basics of Power Plant, Brayton Cycle, Classification and Principles of - Reciprocating Engine, Air Breathing Engine, Working Principle of Turbojet, Turboprop, Turbofan, Turboshift, Ramjet, Pulsejet, Scramjet, Types of Propeller, Characteristics of Propeller			
Module 4: Aircraft Structures and Materials			No. of Hrs: 8
Structural Stresses, Types of Fuselage Constructions, Wing Structure, V-n Diagram, Classification of Materials, Different Metallic Properties, Metallic and Non-Metallic Aircraft Materials			
Module 5: Aircraft Instruments			No. of Hrs: 8
Instrument Panels and Layouts, Flight Instrument Grouping, Power-Plant Instruments, Vertical Speed Indicator, Turn and Bank Indicator, Gyroscopic Instruments, Global Position System, Instrument Landing System, Navigation System			
<p>Course Outcomes: At the end of the course, the student will be able to</p> <ol style="list-style-type: none"> 1. Describe the historical developments in aircraft and their significance in aviation 2. Apply the knowledge of aircraft forces and atmospheric effects on aircraft performance 3. Explain the different types of propulsion systems used in the aeronautical field 4. Apply suitable aircraft frameworks and materials to ensure stability, strength and performance in different flight conditions 5. Describe the advancements in aircraft instrumentation and their impact on flight operation 			
<p>Textbooks:</p> <ol style="list-style-type: none"> 1. R G Grant “Flight: The complete History of Aviation” 1st Edition, New York: DK Publishing, Smithsonian Institution ,2017. 2. J D Anderson “ Introduction to Flight : Its Engineering & History” 1st Edition McGraw-Hill Companies, T.H.E. 			
<p>Reference Books:</p> <ol style="list-style-type: none"> 1. Anne Marie-Millbroke “Aviation History” 1st Edition, Jeppesen Publisher 2006 . 2. Jim Winchester “ A chronology of Aviation :A Day-by-day History of a century1st Edition ,Amber Books Ltd 2013. 			



MANGALORE INSTITUTE OF TECHNOLOGY & ENGINEERING

(A Unit of Rajalaxmi Education Trust[®], Mangalore)

Autonomous Institute affiliated to VTU, Belagavi, Approved by AICTE, New Delhi

Accredited by NAAC with A+ Grade & ISO 9001:2015 Certified Institution

Web links:

1. Introduction to Aerospace Engineering: <https://youtu.be/zKzCd1mbrb4?si=PSS-h0Uq2jlnJ7c6>
2. Introduction and Historical Development of Flights:
<https://youtu.be/ohmyMEwfp5g?si=yvqM7iPQ88UIZ977>
3. Introduction to Aircraft Systems : <https://youtu.be/3QYVrLQFd5I?si=VLsDTwG8tqF6FIIdO>
4. Accident Case Study: <https://youtu.be/yYWThUkkmIk?si=9JRhM0sZwGHOfV1T>

Basics of Unmanned Aerial Vehicles			
Semester	V	CIE Marks	50
Course Code	23AEOE312	SEE Marks	50
Teaching Hrs/Week (L:T: P)	3:0:0	Exam Hrs	03
Total Hrs	42	Credits	03
<p>Course Learning Objectives: This course is designed to</p> <ol style="list-style-type: none"> 1. Impart knowledge on basic evolution and technological advancements of drones 2. Provide fundamental concepts of aerodynamics, stability, control, and propulsion systems in UAVs 3. Familiarize the key components and hardware requirements essential for UAV mission planning 4. Provide regulatory frameworks and certification aspects in governing UAV operations 			
Module 1: Introduction to Aerial Vehicles			No. of Hrs: 8
Definition of DRONE, UAV, RPA, Overview of UAV Systems, Classifications and Applications of UAV Newton's Law, Degrees of Freedom, Forces of Flight, Basic Maneuvers, Airframe-Creating a Frame, Materials, Various Frame Shapes			
Module 2: Mission Planning & Control			No. of Hrs: 9
Air Vehicle and Payload Control, Reconnaissance, Surveillance Payloads, Weapon Payloads, Other Payloads, Launch Systems, Recovery Systems			
Module 3: Hardware Anatomy of UAV			No. of Hrs: 8
Propellers, Flight Control Unit, Motors-Total Lift, Electronic Speed Controllers, Flight Battery, Radio Transmitter & Receiver, GPS, Compass, Position of Payload, Connectors, Mounting of Propellers and Powering up.			
Module 4: Basics of Aerodynamics, Stability & Control, Propulsion			No. of Hrs: 9
Basic Aerodynamics Equations, Aircraft Polar, Induced Drag, Boundary Layer, Flapping wings, Total Air-Vehicle Drag, Static & Dynamic Stability, Autopilot Systems, Sensors supporting the Autopilot, I C Engine, Rotary Engine, Gas Turbine Engine, Electric Motors, Sources of Electric Power			
Module 5: Airworthiness			No. of Hrs: 8
DGCA Rules and Regulations, Pilot Licensing Requirements, NPNT Compliance-DRONE Registration, Permission to Take-off, Verification. Certifications-Remote Pilot License, Unmanned Aircraft Operator Permit.			
<p>Course Outcomes: At the end of the course, the student will be able to</p> <ol style="list-style-type: none"> 1. Describe the fundamental concepts and applications of UAV systems 2. Explain the mission planning process and control mechanisms of UAV systems 3. Apply UAV hardware anatomy to optimize component integration and performance 4. Apply the basic principles of aerodynamics, stability, control and propulsion system for DRONE 5. Describe the regulatory and certification aspects in governing UAV operations 			
<p>Textbooks:</p> <ol style="list-style-type: none"> 1. Paul Gerin Fahlstrom & Thomas James Gleason "Introduction to UAV Systems", 4th Edition, Wiley Publication, 2012. 2. Terry Kilby & Belindia Kelby " Make: Getting Started with Drones-Build and Customize your own Quadcopter", 1st Edition, Shroff/Make Community ,2024 			



MANGALORE INSTITUTE OF TECHNOLOGY & ENGINEERING

(A Unit of Rajalaxmi Education Trust[®], Mangalore)

Autonomous Institute affiliated to VTU, Belagavi, Approved by AICTE, New Delhi

Accredited by NAAC with A+ Grade & ISO 9001:2015 Certified Institution

Reference Books:

1. Landen Rosen, "Unmanned Aerial Vehicle", 1st Edition, Alpha Editions Publisher, 2015.
2. Scholar's Choice "Unmanned Aerial Vehicles: DOD's Acquisition Efforts", 1st Edition, Scholar's Choice Publisher, 2015.
3. Vasillis Tzivaras "Building a Quadcopter with Arduino", 1st Edition, Packt Pub Ltd 2015.
4. John Baichtal "Building your own DRONES : A Beginners Guide to DRONES, UAVs and ROVs", 1st Edition , Que Publisher, 2016.

Web links:

1. Design of Fixed Wing Unmanned Aerial Vehicles , IIT Kanpur :
<https://youtu.be/9c769xiEXn0?si=2QIq-b2XwSqde0Lh>
2. UAV Design : <https://youtu.be/AjkbzL7KjW0?si=p7SZXdcZChMmYkrF>
3. DRONE Pilot Training: <https://youtu.be/jnyQJVzRiyg?si=mLS8V9o4Mq2b0He5>

Aviation Management			
Semester	V	CIE Marks	50
Course Code	23AEOE313	SEE Marks	50
Teaching Hrs/Week (L: T: P)	3:0:0	Exam Hrs.	03
Total Hrs.	42	Credits	03
<p>Course Learning Objectives: This course is designed to</p> <ol style="list-style-type: none"> 1. Impart knowledge of leadership, TQM and process improvement for effective aviation management 2. Provide insights into customer satisfaction, employee involvement and airline operations 3. Build the foundation of the aviation business, entrepreneurship and regulatory frameworks 			
Module 1: Leadership and Core Values in Total Quality Management			No. of Hrs: 8
Definition of Leadership, Characteristics of Quality Leaders, Concept of Leadership, Characteristics of Effective People, Ethics, Deming Philosophy, Role of TQM leaders and Implementation, Core Values of Leadership, Strategic Planning, Communication and Decision-Making			
Module 2: Continuous Process Improvement			No. of Hrs: 8
Continuous Process, Juran Trilogy, Improvement Strategies, Types of Problems, PDSA Cycle, Problem-Solving Methods, Kaizen Method, Reengineering, Six Sigma Rules Benchmarking, Quality Management Systems, Environmental Management Systems, Quality Function Deployment, Failure Mode and Effect Analysis, Total Productive Maintenance			
Module 3: Customer Satisfaction and Employee Involvement			No. of Hrs: 9
Customer - Perception of Quality, Feedback, Service, Translating Needs into Requirements, Retention and Case Studies Employee - Involvement, Motivation, Surveys, Empowering, Suggestion System, Recognition and Reward, Performance Appraisal, Case studies			
Module 4: Airline Operations and Management			No. of Hrs: 8
Airline Operation and Scheduling, Data Analysis for Business Decisions, Economic Analysis for Business Decisions, Aircraft Rules and Regulation, Airline Business in the 21st Century, Human Resources Management, Organizational Behavior, Accounting for Management, Airline Economics, Airline Advertising and Sales Promotion			
Module 5: Aviation Business Management and Entrepreneurship			No. of Hrs: 9
Business Application Software, Communication Skills and Business Correspondence, Research Methods in Business, International Business Management, Aviation Systems, Management of the Integrated and Value Chain Aviation Law, Aviation Safety Management and Accident Investigations, Entrepreneurship Development, Role and Importance of Entrepreneurs in the Growth of Country			
<p>Course Outcomes: At the end of the course, the student will be able to</p> <ol style="list-style-type: none"> 1. Describe role of TQM leadership, communication and decision-making for effective Aviation Management 2. Illustrate Juran Trilogy, PDSA Cycle, problem-solving and Six Sigma in Continuous Process Improvement 3. Apply strategies for empowerment, rewards and appraisal in Customer Satisfaction and Employee Involvement 4. Apply airline operations and management knowledge in Airline Operations and Management 5. Describe research methods, aviation systems and entrepreneurship in Aviation Business Management and Entrepreneurship 			

Textbooks:

1. Andreas Wald, Christoph Fay, Ronald Gleich, LIT Verlag Munster, “Introduction to Aviation Management”, 1st Edition, LIT Verlag, 2023.
2. Arijit Das “Aviation Management”, 1st Edition, Kendall Hunt, 2021.
3. Dale H. Bester field, “Total Quality Management”, 3rd Edition, Publisher Pearson Education India, Paperback, 2009.

Reference Books:

1. Ratandeep Singh “Aviation Management”, 1st Edition, Global and National Perspectives Hardcover, 2008.
2. Mark J. Pierotti “Aviation Leadership”, 1st Edition, Illustrations, 2021.

Web links:

1. Rules and Regulations for Civil Aviation Part 1:
<https://youtu.be/CoLWYZP9BkY?si=EKbMLcp0a4wJkkQR>
2. Rules and Regulations for Civil Aviation Part 2:
<https://youtu.be/jFBpQuvRauY?si=sW6f35uOE8VUuiY9>
3. Continuous Process Improvement: https://youtu.be/anA_TiUfmbM?si=zmLzqG8LJiekU1MZ
4. Entrepreneurship Development:
https://youtu.be/aLoRz6hidCM?si=dGBmJS7uPT_q84Ny

Yoga - III			
Semester	V	CIE Marks	100
Course Code	23NMCC321	SEE Marks	-
Teaching Hours/Week (L:T: P)	0:0:1	Exam Hrs	-
Total Hours	13	Credits	-
<p>Course Learning Objectives: This course is designed to</p> <ol style="list-style-type: none"> 1. Empower students to achieve and maintain good health 2. Promote the practice of mental hygiene 3. Facilitate students in attaining emotional stability 4. Impart moral values and higher level of consciousness 			
Contents			No. of Hrs: 13
<ul style="list-style-type: none"> • Ashtanga Yoga <ol style="list-style-type: none"> 1. Asana 2. Pranayama 3. Pratyahara • Suryanamaskar 13 count- 3 rounds of practice • Asana its meaning by name, technique, precautionary measures and benefits of each asana • Different types of Asanas <ol style="list-style-type: none"> a) Sitting <ol style="list-style-type: none"> 1. Ardha Ushtrasana 2. Vakrasana 3. Yogamudra in Padmasana b) Standing <ol style="list-style-type: none"> 1. UrdhvaHastothanasana 2. Hastapadasana 3. Parivritta Trikonasana 4. Utkatasana c) Prone line <ol style="list-style-type: none"> 1. Padangushtha Dhanurasana 2. Poorna Bhujangasana d) Supine line <ol style="list-style-type: none"> 1. Sarvangasana 2. Chakraasana 3. Navasana/Noukasana 4. Pavanamuktasana • Revision of Kapalabhati practice 30 strokes/min 3 rounds • Meaning by name, technique, precautionary measures and benefits of each Pranayama <ol style="list-style-type: none"> 1. Ujjayi 2. Sheetali 3. Sheektari 			

Course Outcomes: At the end of the course, the student will be able to:

1. Describe the meaning, aim and objectives of Yoga
2. Perform Suryanamaskar and able to analyze its benefits
3. Exhibit the different Asanas by name, its importance, methods and benefits
4. Perform Kapalabhati
5. Perform the different types of Pranayama by its name, precautions, procedure and uses

Textbooks:

1. Ajitkumar , “Yoga Pravesha in Kannada”, 1st Edition, Raashthrothhaana Saahithya, 2017
2. BKS Iyengar, “Light on Yoga”, 1st Edition, Thorsons, 2017
3. Dr. M L Gharote & Dr. S K Ganguly, “Teaching Methods for Yogic practices”, 1st Edition, Kaivalyadhama, 2001

Reference Book:

Yamini Muthanna, “Yoga for Children step by step”, 1st Edition, Om Books International, 2022

Web links:

1. My Life My Yoga <https://youtu.be/KB-TYlgd1wE>
2. Adiyoga, <https://youtu.be/aa-TG0Wg1Ls>

Scheme & Assessment of students for auditing the course & Grades

Sl. No.	Activity	Marks
1.	Quiz	20
2.	Practical demonstration	50
3.	Final Report	30
	Total	100

Physical Education - III			
Semester	V	CIE Marks	100
Course Code	23NMCC322	SEE Marks	-
Teaching Hours/Week (L: T: P)	0:0:1	Exam Hrs	-
Total Hours	13	Credits	-
<p>Course Learning Objectives: This course is designed to</p> <ol style="list-style-type: none"> 1. Impart the fundamental concepts and skills of Physical Education, Health, Nutrition and Fitness 2. Familiarization of health-related Exercises, Sports for overall growth and development 3. Build a strong foundation for the professionals in Physical Education and Sports 			
Contents			No. of Hrs: 13
<ul style="list-style-type: none"> • Ethics in Sports & Moral Values in Sports and Games • Sports Training Methods and its Impacts: Continuous Training, Interval Training, Circuit Training, Weight Training. • FITT Implementing FITT principles to design personalized fitness programs. (Lectures & Practical Sessions) • Specific Games (Students continue prior semester's game by practicing Intermediate Skills) <p>Basket Ball Crossover dribble - Between-the-legs dribble - Bounce pass and no-look pass Shooting with form from mid-range - Defensive stance and footwork</p> <p>Cricket Advanced batting shots (cover drive, square drive, pull shot) - Swing and seam bowling variations - Fielding positions and strategies - Game sense and awareness</p> <p>Football Shielding the ball - Crossing the ball - Long passing and through balls - Tackling techniques (sliding & standing) - Shooting with power and accuracy - Playing different positions</p> <p>Hockey Stickhandling in tight spaces - Slapshot and sweep shot techniques - Passing with speed and accuracy - Dodging defenders - Defensive positioning and checking</p> <p>Kabaddi Advanced raiding techniques (frog jump, jump over) - Diverse raiding holds (frog kick, thigh hold) - Anticipation and countering defense - Effective raiding strategies - Advanced team defense formations</p> <p>Karate Kihon (repetition of basic techniques) - Kata (forms to practice technique and flow) - Combinations of punches and kicks - Footwork and movement - Basic kumite (sparring) techniques</p> <p>Table Tennis Looping technique (forehand and backhand) - Topspin and backspin serves - Footwork for attacking and defense - Blocking and countering techniques - Match strategy and tactics</p> <p>Throwball Long throws and bounce passes - Fake passes and deception moves - Dodging techniques to create space - Defensive positioning and guarding techniques - Team offense and set plays</p> <p>Volleyball Attack, Block, Service, Upper Hand Pass and Lower hand Pass</p>			
<p>Course Outcomes: At the end of the course, the student will be able to</p> <ol style="list-style-type: none"> 1. Develop strategies to promote ethical conduct and a positive sporting culture 2. Understand the importance of ethics and moral values in sports and games 3. Perform in the selected sports or athletic events 			
<p>Textbooks:</p> <ol style="list-style-type: none"> 1. Muller, J. P., "Health, Exercise and Fitness", 1st Edition, Sports Publication, 2018 2. Uppal, A.K., "Physical Fitness", Friends Publication New Delhi, 1992 3. Russell R.P., "Health & Fitness through Physical Education: Human Kinematics", Human Kinetics Publishers, 1994 			

Reference Books:

1. Anaika , “Play Field Manual”, Friends Publication New Delhi, 2005
2. IAAF Manual
3. Pinto John & Roshan Kumar Shetty, “Introduction to Physical Education”

Web links:

1. <https://www.youtube.com/watch?v=wvlztaJYKYI>
2. <https://www.youtube.com/playlist?list=PLHCNPOIaj2Wc8P5xAWq9g2DUrbixoTOK>
3. https://www.youtube.com/watch?v=K9X_wB1Yu84
4. https://www.youtube.com/watch?v=HEHggOOds1w&list=PLgVaM7Baa_8myp4njEDcoYyZkBq-542S5

Scheme & Assessment of students for auditing the course & Grades

SI. No.	Activity	Marks
1.	Participation of students	20
2.	Quizzes-2, each of 15 marks	30
3.	Final presentation/Exhibition/Participation in Competitions (Certificate of participation in National/International)	50
	Total	100

National Service Scheme - III			
Semester	V	CIE Marks	100
Course Code	23NMCC323	SEE Marks	-
Teaching Hours/Week (L:T: P)	0:0:1	Exam Hrs	-
Total Hours	13	Credits	-
<p>Course Learning Objectives: This course is designed to</p> <ol style="list-style-type: none"> 1. Develop discipline, character, brotherhood, the spirit of adventure and ideals of selfless service amongst young citizens 2. Develop youth leadership in the students 3. Induce social consciousness among students through various societal activities 4. Impart knowledge in finding practical solutions to individual and community problems 			
NSS -Contents		No. of Hrs: 13	
<p>Introduction:</p> <ul style="list-style-type: none"> • Promoting a healthy lifestyle among youth • Nutrition education, stress management and mental health activities <p>Activities:</p> <ul style="list-style-type: none"> • Village awareness programs on women hygiene, various superstitious beliefs, avoiding self-medication, etc. • Helping local schools to achieve good results and enhance their enrolment in Higher/technical/vocational education <p>Note:</p> <ul style="list-style-type: none"> • Students in individual or in a group should select any one activity in the beginning of each semester till end of that respective semester for successful completion as per the instructions of NSS officer with the consent of HOD of the department. • At the end of every semester, activity report should be submitted for evaluation. 			
<p>Course outcomes: At the end of the course, the student will be able to</p> <ol style="list-style-type: none"> 1. Understand the importance of nation building and individual contribution to the betterment of the society. 2. Discover grassroots challenges of community and solve them by technological intervention. 3. Create societal impact by upholding the value of one for all and all for one. 4. Maintain discipline and team spirit. 			
<p>Textbooks:</p> <ol style="list-style-type: none"> 1. Ministry of Youth Affairs & Sports, Government of India (2022) “National Service Scheme Manual” 2. Rajiv Gandhi National Institute of Youth Development, Ministry of Youth Affairs & Sports, Government of India, (2017)“Introduction Training Module for National Service Scheme (NSS) Program officers”, 3. Gurmeet Hans (1996), “Case material as Training Aid for field workers” TISS 			
<p>Reference Books:</p> <ol style="list-style-type: none"> 1. Dr. G R Bannerjee, (2012), Social service opportunities in Hospitals, TISS 2. Ram Ahuja (Third Edition) 2014, Social Problems in India, Rawat publications 			
<p>Web links:</p> <ol style="list-style-type: none"> 1. History of NSS https://thebetterindia.com/140/national-service-scheme-nss/ 2. NSS – an introduction https://www.youtube.com/@nationalserviceschemeoffic4034/videos 			
Scheme & Assessment of students for auditing the course & Grades			
Sl. No.	Activity	Marks	
1.	Participation of students	30	
2.	Individual contribution to success of the program	40	
3.	Report preparation	30	
			Total
			100

Arts - III											
Semester	V	CIE Marks	100								
Course Code	23NMCC324	SEE Marks	-								
Teaching Hours/Week (L: T: P)	0:0:1	Exam Hrs	-								
Total Hours	13	Credits	-								
<p>Course Learning Objectives: This course is designed to</p> <ol style="list-style-type: none"> 1. To impart an understanding of the creative process from initial concept to final execution. 2. Create and demonstrate proficiency in a chosen arts discipline through practical application. 3. Analyze and appreciate diverse art forms and styles 4. To participate in art competitions at regional, state, national, and international levels, as well as in cultural events 											
Contents		No. of Hrs: 13									
<p>Note: Student will continue the arts form selected in previous semester.</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <tbody> <tr> <td style="width: 20%; text-align: center;">Performing Arts (Dance)</td> <td>Orientation, Cinema Acting Basics, Facial Expression Exercises, Body Language, Camera Angles, Characterization demo and Practice, Individual Presentations, Evaluation.</td> </tr> <tr> <td style="text-align: center;">Music</td> <td>Orientation, Film Songs, Karaoke Singing, Rhythm Fusion and voice, Individual Presentation, song styles demo and practical, Evaluation.</td> </tr> <tr> <td style="text-align: center;">Arts & Crafts</td> <td>Orientation, Craft Forms, Paper Craft, Mask Making, Model Making, Thermocol Art, Finger Puppet Making, Group Presentation, Evaluation.</td> </tr> <tr> <td style="text-align: center;">Theatre</td> <td>Orientation, Introduction to Theatre Sets and properties, Practical use of properties, Set Designing, Costume Design, Headgears and Masks, Theatre Makeup, Evaluation.</td> </tr> </tbody> </table>				Performing Arts (Dance)	Orientation, Cinema Acting Basics, Facial Expression Exercises, Body Language, Camera Angles, Characterization demo and Practice, Individual Presentations, Evaluation.	Music	Orientation, Film Songs, Karaoke Singing, Rhythm Fusion and voice, Individual Presentation, song styles demo and practical, Evaluation.	Arts & Crafts	Orientation, Craft Forms, Paper Craft, Mask Making, Model Making, Thermocol Art, Finger Puppet Making, Group Presentation, Evaluation.	Theatre	Orientation, Introduction to Theatre Sets and properties, Practical use of properties, Set Designing, Costume Design, Headgears and Masks, Theatre Makeup, Evaluation.
Performing Arts (Dance)	Orientation, Cinema Acting Basics, Facial Expression Exercises, Body Language, Camera Angles, Characterization demo and Practice, Individual Presentations, Evaluation.										
Music	Orientation, Film Songs, Karaoke Singing, Rhythm Fusion and voice, Individual Presentation, song styles demo and practical, Evaluation.										
Arts & Crafts	Orientation, Craft Forms, Paper Craft, Mask Making, Model Making, Thermocol Art, Finger Puppet Making, Group Presentation, Evaluation.										
Theatre	Orientation, Introduction to Theatre Sets and properties, Practical use of properties, Set Designing, Costume Design, Headgears and Masks, Theatre Makeup, Evaluation.										
<p>Course Outcomes: At the end of the course, the student will be able to</p> <ul style="list-style-type: none"> • To be capable of creating choreography and delivering live performances for an audience. • Employ a range of acting techniques and use them to create a performance. • Evolve into creative, effective, independent, and reflective individuals capable of making informed decisions in both process and performance. • Acquire knowledge and comprehension of the roles and processes used in current theatre arts practice. 											
<p>Textbooks:</p> <ol style="list-style-type: none"> 1. Music in Theory and Practice by Bruce Benward and Marilyn Sake, McGraw-Hill Education,2014 2. Art Fundamentals: Theory and Practice by Otto G. Oevirk, Robert E. Stinson, Philip R. Wigg, Robert Bone, and David L. Cayton, McGraw-Hill Education,2012 3. The Viewpoints Book: A Practical Guide to Viewpoints and Composition by Anne Bogart and Tina Landau, Theatre Communications Group,2004 											
<p>Reference Books:</p> <ol style="list-style-type: none"> 1. Dance Composition: A practical guide to creative success in dance making, Jacqueline M. Smith 2. The Artist's handbook of method and materials by Ralph Mayer 3. Glimpses of Indian music and dance by Dr. Arun Bangre 											
<p>Web links: https://ccrtindia.gov.in/audio-visual-catalogue/</p>											
Scheme & Assessment of students for auditing the course & Grades											
Sl. No.	Activity	Marks									
1	Students Participation	20									
2	Quizzes-2 (each of 15 marks)	30									
3	Final presentation/Exhibition/Participation in Competitions	50									
Total			100								

Aircraft Design			
Semester	VI	CIE Marks	50
Course Code	23AEPC306	SEE Marks	50
Teaching Hours/Week (L:T:P)	3:0:0	Exam Hrs	03
Total Hours	42	Credits	03
<p>Course Learning Objectives: This course is designed to</p> <ol style="list-style-type: none"> 1. Impart knowledge on wing geometry and airfoil selection to the preliminary stages of aircraft design 2. Provide fundamentals of aerodynamics and structural loads on airframe design 3. Familiarize the propulsion system to meet the aircraft performance characteristics 4. Impart the knowledge of vehicle parameters and design aspects of subsystems 			
Module 1: Overview of Design Process & Airfoil Selection			No. of Hrs: 8
<p>Overview of Design Process: Introduction, Typical Requirements for Civil Transport and Military Fighter Aircraft, Phases of Design, Aircraft Conceptual Design Process, Take-Off Weight Build-Up, Empty Weight Estimation, Fuel Fraction Estimation, Take-Off Weight Calculation, Airfoil Selection: Airfoil Geometry, Airfoil Lift & Drag, Airfoil Families, Airfoil Design, Airfoil Lift Coefficient, Airfoil Thickness, Camber, Stall, Reynolds Number Effect</p>			
Module 2: Wing Geometry and Thrust to weight ratio			No. of Hrs: 9
<p>Geometry: Wing Geometry, Aspect Ratio, Sweep, Taper Ratio, Twist, Incidence, Dihedral, Vertical Location of Wing, Wingtips, Biplane Wings, Tail Geometry and Arrangement Thrust to Weight Ratio & Wing Loading: Thrust to Weight Definitions, Power Loading, Statistical Estimate of Thrust to Weight. Thrust Matching, Wing Loading & Its Effect On Stall Speed, Take-Off Distance, Catapult Take-Off, Landing Distance. Wing Loading For Cruise, Loiter, Endurance, Instantaneous Turn Rate, Sustained Turn Rate, Climb & Glide, Maximum Ceiling</p>			
Module 3: Initial Sizing, Configuration Layout & Loft			No. of Hrs: 9
<p>Initial Sizing: Rubber Engine Sizing, Fixed Engine Sizing, Geometry Sizing-Fuselage, Wing, Tail Volume Coefficient, Control Surface Sizing Configuration Layout & Loft: Conic Lofting, Conic Fuselage Development, Conic Shape Parameter, Wing-Tail Layout and Loft. Aerofoil Linear Interpolation. Aerofoil Flat-Wrap Interpolation. Wing Aerofoil Layout-Flap Wrap. Wetted Area Determination. Special Considerations in Configuration Layout: Aerodynamic, Structural, Detectability. Crew Station, Passenger, And Payload Arrangements.</p>			
Module 4: Aerodynamics, Propulsion & Structural Loads			No. of Hrs: 8
<p>Aerodynamics & Propulsion: A Brief Overview of Aerodynamic Coefficients & Forces, Types of Propulsion Systems, Jet Engine Thrust Considerations, Thrust-Drag Bookkeeping, Installed Thrust Methodology, Piston Engine-Performance- Propeller Performance and Piston-Prop Thrust Corrections Turboprop Performance Structural Loads: Structures Fundamentals, Loads Categories, Air Loads- Maneuver Loads, Gust Loads, Air Loads On Lifting Surface, Air Loads Due To Control Deflection, Inertial Loads, Power Plant Loads, Landing Gear Loads.</p>			
Module 5: Design Aspects of Subsystems			No. of Hrs: 8
<p>Design Aspects Of Subsystems: Flight Control System, Landing Gear and Subsystem, Propulsion And Fuel System Integration, Air Pressurization and Air Conditioning System, Electrical and Avionic Systems, Structural Loads, Safety Constraints, Material Selection Criteria.</p>			
<p>Course Outcomes: At the end of the course, the student will be able to:</p> <ol style="list-style-type: none"> 1. Apply aircraft design process and recognize the impact of airfoil characteristics on vehicle performance 2. Describe the essential principle of wing design and the variations in thrust to weight ratio affect an aircraft 			



MANGALORE INSTITUTE OF TECHNOLOGY & ENGINEERING

(A Unit of Rajalaxmi Education Trust[®], Mangalore)

Autonomous Institute affiliated to VTU, Belagavi, Approved by AICTE, New Delhi

Accredited by NAAC with A+ Grade & ISO 9001:2015 Certified Institution

3. Apply sizing, layout and lofting techniques to develop cohesive aircraft design
4. Apply aerodynamics, propulsion and structural load to optimize aircraft design for performance, safety and efficiency.
5. Describe the essential parameters of design principles and requirements of various aircraft subsystems

Text Books

1. Daniel P. Raymer “Aircraft Design - A Conceptual Approach- AIAA Education Series”, IV Edition, American Institute of Aeronautics and Astronautics,2006.
2. Thomas C Corke “Design of Aircraft” 1st Edition ,Pearson Publisher,2002.

Reference Books

1. J Roskam, “Aeroplane Design –Vol: 1 to 9” DAR Corporation ,2016.
2. John Fielding” Introduction to Aircraft Design” Cambridge University Press, 2009.
3. Editor Mark Davies “Standard Handbook for Aeronautical & Astronautical Engineers”, Tata McGraw Hill, 2010.

Web links:

1. Aircraft Design A Conceptual Approach : <https://www.sciencedirect.com/journal/aircraft-design>
2. Introduction to Aircraft Design : https://youtu.be/2MLqeDjyB_Y?si=BvSg8a6QY0yECvtj

Aircraft Performance			
Semester	VI	CIE Marks	50
Course Code	23AEPC307	SEE Marks	50
Teaching Hrs/Week (L: T: P)	3:0:2	Exam Hrs.	03
Total Hrs.	64	Credits	04
<p>Course Learning Objectives: This course is designed to</p> <ol style="list-style-type: none"> 1. Impart knowledge of turning performance, maneuver constraints and static longitudinal stability for Steady Unaccelerated Flight 2. Provide insights into equations of motion, power, thrust and their role in steady flight 3. Build the foundation of analytical and graphical methods for assessing flight performance 4. Inculcate the knowledge of factors affecting jet airplane performance in range, endurance, take-off, landing and climb for aircrafts 			
Module 1: Equations of Motion for Steady Unaccelerated Flight			No. of Hrs: 8+4
<p>Four forces of Flight, General Equation of Motion, Power available and Power required curves, Thrust available and Thrust required curves, Conditions for Power Required and Thrust Required for Minimum Condition, Thrust Available and Maximum Velocity, Power Available and Maximum Velocity, Altitude Effects on Power available and Power required</p> <p>Laboratory Component: Analysis of Pull-Up and Pull-Down Maneuver Performance of Aircraft Using a Mathematical Modeling Tool</p>			
Module 2: Steady Performance – Level Flight, Climb & Glide			No. of Hrs: 8+4
<p>Equation of Motion for Rate of climb (Graphical and Analytical Approach), Absolute Ceiling, Service Ceiling, Time to Climb (Graphical and Analytical Approach), Climb Performance Graph (Hodograph Diagram), Maximum Climb Angle and Rate of Climb Gliding flight, Equation for Range during Glide, Minimum Rate of Sink and Shallowest Angle of Glide</p> <p>Laboratory Component: Aircraft Takeoff Performance Calculation Using a Mathematical Modeling Tool</p>			
Module 3: Fundamental Airplane Performance Parameters			No. of Hrs: 8+6
<p>The Fundamental Parameters: Thrust to weight ratio, Wing loading, Drag polar, and lift-to-drag ratio, Minimum velocity, Aerodynamic relations associated with lift-to-drag ratio, Definition of Range and Endurance, Breguet equation for Range and Endurance, Conditions for Maximum Range and Endurance</p> <p>Laboratory Component: Estimation of Aircraft Range and Endurance Using a Mathematical Modeling Tool</p>			
Module 4: Aircraft Takeoff and Landing Performances			No. of Hrs: 8+6
<p>Take-off Performance: Calculation of Ground roll, Calculation of Distance while Airborne to clear Obstacle, Balanced field Length</p> <p>Landing Performance and Accelerated Climb: Calculation of Approach Distance, Calculation of Flare Distance, Calculation of Ground Roll, Ground Effects</p> <p>Laboratory Component: Analysis of the Four Forces of Flight (Lift, Drag, Thrust, Weight) Using a Mathematical Modeling Tool</p>			
Module 5: Aircraft Maneuver Performance			No. of Hrs: 8+4
<p>Turning performance: Level turn, Load Factor, Constraints on Load Factor, Minimum Turn Radius, Maximum Turn Rate, Pull-up and Pull-down Maneuvers (Turning rate, Turn radius), Limiting case for Large Load Factor, V-n diagram, Limitations of pull-up and push-over</p> <p>Laboratory Component:</p>			

Determination of Drag Polar and Lift-to-Drag Ratio for steady and level flight Using Wind Tunnel

Course Outcomes: At the end of the course, the student will be able to

1. Apply the power and thrust relationship and their effects on steady, unaccelerated flight performance
2. Illustrate the performance characteristics of climb, glide and level flight using graphical and analytical methods
3. Apply the principles of thrust-to-weight ratio, wing loading and lift-to-drag ratio to determine aircraft range and endurance
4. Demonstrate the use of standard performance equations to calculate range, endurance, take-off and landing characteristics
5. Apply maneuvering capabilities and static longitudinal stability criteria for aircraft maneuver performance

Textbooks:

1. John D. Anderson, Jr, "Aircraft Performance and Design", 1st Edition, Mc Graw-Hill, International, Aerospace Science/ Technology, 1999.
2. John D. Anderson, Jr, "Introduction to flight", 6th Edition, McGraw-Hill, International, Aerospace Science Technology, 2000.
3. Perkins, C.D, and Hage, R.E., "Airplane Performance Stability and Control", 1st Edition, John Wiley Son Inc, New York,1966.

Reference Books:

1. Perkins, C.D, and Hage, R.E, "Airplane Performance Stability and Control", 1st Edition, John Wiley Son Inc, New York, 2011.
2. Barnes W. McCormick, "Aerodynamics, Aeronautics, and Flight Mechanics", 2nd Edition, John Wiley & Sons, Inc. 1995.
3. Bandu N. Pamadi, "Performance, Stability, Dynamics and Control of Airplanes", 2nd Edition Series, 1998.
4. John D Anderson, Jr, "Introduction to flight", 9th Edition, McGraw-Hill, International, Aerospace Science Technology, 2000.

Web links:

1. Aircraft Stability and Control: <https://nptel.ac.in/courses/101104062>
2. Aircraft Performance: <https://nptel.ac.in/courses/101104007>

Modelling and Simulation Laboratory			
Semester	VI	CIE Marks	50
Course Code	23AEPC308	SEE Marks	50
Number of Lecture Hours/Week (L:T:P: S)	0:1:3	Exam Hours	2.5
Total Hours	36	Credits	02
<p>Course objectives: This course is designed to</p> <ol style="list-style-type: none"> 1. Impart basic understanding of modeling and analysis software 2. Equip students with practical skills in using ANSYS software for simulating and analyzing structural, thermal, and fluid dynamics 3. Learn basic principles of finite element analysis procedure 			
Sl.No.	EXPERIMENTS		
1.	Modeling of 2-D incompressible and in-viscid flow over symmetrical/cambered aerofoil, and plotting of pressure distribution and velocity vectors for subsonic/supersonic Mach numbers.		
2.	Modeling of 2-D compressible and viscid flow over symmetrical/cambered aerofoil, and plotting of pressure distribution and velocity vectors for subsonic Mach numbers.		
3.	Isentropic flow analysis in a 2-D subsonic diffuser and a subsonic nozzle.		
4.	Isentropic flow analysis in a 2-D supersonic diffuser and a supersonic nozzle.		
5.	Geometric modeling and mesh generation of a 2-D pipe and modeling of steady/unsteady heat convection and conduction (Rayleigh flow).		
6.	Structural modeling of sandwich beam of rectangular cross-section and analyses for stress for unsymmetrical bending case.		
7.	Structural modeling and stress analysis of a fuselage frame.		
8.	A Plate fixed at one end has a hole in centre and has varying thickness, determine stresses developed due to applied static loads in vertical direction.		
<p>Course Outcomes (COs): At the end of the course the students will be able to</p> <ol style="list-style-type: none"> 1. Apply mathematical and computational techniques to construct models that simulate real-world systems and analyze their behavior under various conditions 2. Analyze the effect of in-viscid and viscous flow over airfoil 3. Analyze the flow through diffuser and nozzle with subsonic and supersonic flow 4. Calculate the stress developed in different structural members 			

PROJECT PHASE – I

Semester	VI	CIE Marks	100
Course Code	23AESE309	Credits	03
Hours/Week (L: T: P)	0:0:6	Mode	Experiential

Course Learning Objectives:

1. To develop the students' ability to independently or collaboratively identify a problem, review literature, define objectives, and propose a preliminary methodology for solving an engineering problem, which will be realized in Project Phase – II.
2. The course also aims to develop leadership and interpersonal communication skills within team members.

General Guidelines:

1. A project guide (faculty member) will be allocated by the department
2. The HoD shall appoint a project coordinator who will take the responsibility of monitoring all the activities related to the project execution.
3. The HoD shall constitute project evaluation/review committee(s) & the composition shall be as follows:
 - a. HOD or one of the HODs in case of an interdisciplinary project, shall be the Chairman of the committee
 - b. Project Coordinator shall be member - Convener
 - c. Project guide shall be the member
 - d. One/Two senior faculty members nominated by the HOD (may be from different departments in case of an interdisciplinary project jointly nominated by the HODs)
4. Each project team shall consist of 2 to 4 students from the same department or different departments.
5. Interdisciplinary projects may be allowed with prior approval from the concerned HODs only.
6. Project teams must arrive at problem statements that address either real-world challenges or research-related issues relevant to their domain of study. Each team must formulate an appropriate project title in consultation with their project guide.
7. Each project team shall maintain a project diary and record their project progress at regular interval of time. This shall carry signature of the students and the project guide.
8. There is no Semester End Examination (SEE) for this course and evaluation is based entirely on Continuous Internal Evaluation (CIE)
9. Marks may be equally or proportionally distributed among team members based on contribution assessed by the guide and committee.
10. A student shall obtain minimum of 40% of the total marks to pass this course
11. Plagiarism, data fabrication, or copying of work will result in stringent disciplinary action and /or penalties. (Note: Any disciplinary actions or penalties will be as per institutional policy.)

Deliverables:

1. Comprehensive Project Report comprising of:

- Abstract
- Introduction
- Literature Survey
- Problem Definition
- Proposed Methodology
- Design
- Summary and Work Plan for Phase-II
- References
- Appendices

The project report shall be prepared in the prescribed format provided by the institute.

2. A plagiarism report shall be obtained from the Department of Library. Acceptable similarity threshold is generally below 20%, and hence, the plagiarized content shall not exceed 20%. Similarity above 20% will require resubmission after proper revisions.

Review and Evaluation:

1. There shall be two reviews and a presentation. Total of 100 CIE marks is distributed as follows:

Review - 1

Topic approval, Problem Definition & Objectives	20 Marks
Literature Review	10 Marks
Innovation/Novelty	10 Marks
Total	40 Marks

Review - 2

Methodology & Design	15 Marks
Report Quality & Formatting	15 Marks
Total	30 Marks

Presentation

Presentation	20 Marks
Team work	10 Marks
Total	30 Marks

Grand Total 100 Marks

2. First review shall be conducted after one month from the start of the semester
3. Further, every department shall develop rubrics to assess performance of the students based on the above given parameters

Course Outcomes: At the end of the course, the student will be able to:

1. Identify an engineering or research problem through a thorough review of relevant literature.
2. Design an appropriate solution or methodology to address the identified problem.
3. Prepare a comprehensive project report.
4. Effectively present each component of the project report to a knowledgeable audience.
5. Collaborate and contribute effectively as a team member, recognizing the dynamics of both individual and group work.

Avionics			
Semester	VI	CIE Marks	50
Course Code	23AEPE321	SEE Marks	50
Teaching Hrs/Week (L: T: P)	3:0:0	Exam Hrs.	03
Total Hrs.	42	Credits	03
<p>Course Learning Objectives: This course is designed to</p> <ol style="list-style-type: none"> 1. Impart knowledge on fundamental concepts of avionics, airplane control systems, aircraft hydraulic and pneumatic systems 2. Familiarize operation of various aircraft engine and auxiliary systems 3. Provide key flight and engine instruments used in aircraft monitoring 4. Impart knowledge on structure and functions of aircraft power distribution systems 5. Inculcate knowledge on modern cockpit technologies, display systems and avionics integration in aircraft operation 			
Module 1: Fundamentals of Aircraft Avionic Systems			No. of Hrs.: 9
<p>Overview of Avionics: Definition, history and importance in aviation, airplane control systems, conventional Systems, power assisted systems, digital fly-by-wire systems, autopilot systems</p> <p>Aircraft Systems: Hydraulic systems, pneumatic systems, landing gear systems and classification of landing gears</p>			
Module 2: Aircraft Engine and Auxiliary Systems			No. of Hrs.: 8
<p>Engine Systems: Fuel systems for piston and jet engines, components of multi engines, lubricating systems, starting and ignition systems in aircraft</p> <p>Auxiliary Systems: Basic air cycle systems, Vapour cycle systems, fire protection systems, de-icing and anti-icing systems</p>			
Module 3: Aircraft Instruments and Measurement Systems			No. of Hrs.: 8
<p>Flight instruments, accelerometer, gyroscope, airspeed indicator, TAS, EAS, Mach meter, altimeter, tachometer, temperature gauges, pressure gauges and various types of engine instruments</p>			
Module 4: Power Distribution System			No. of Hrs.: 8
<p>Bus bar system, split bus bar system, special purpose cables, electrical diagram and identification scheme, circuit controlling devices, power utilization-typical application to avionics, need for avionics in civil and military aircraft</p>			
Module 5: Advanced Flight Deck Technologies and Avionics Integration			No. of Hrs.: 9
<p>Flight Deck and Cockpits: Control and display technologies CRT, LED, LCD, EL and plasma panel, touch screen, direct voice input, MFDs, HUD, MFK, HOTAS</p> <p>Avionics System Integration: Avionics equipment fit, electrical data bus system, communication systems, navigation systems, electronic warfare and fire control system, data buses: MIL-STD 1553 B</p>			
<p>Course Outcomes: At the end of the course, the student will be able to</p> <ol style="list-style-type: none"> 1. Summarize the working principles of avionics, airplane control systems, aircraft hydraulic and pneumatic systems 2. Apply principles of engine and auxiliary systems to assess their functionality in different aircraft configurations 3. Describe Role of Aircraft Instrumentation in flight monitoring 4. Apply knowledge of avionics power distribution systems 5. Illustrate principles of flight deck technologies and avionics system integration in civil and military aircraft 			
Textbooks:			
<ol style="list-style-type: none"> 1. Ian Moir and Allan Seabridge, "Aircraft Systems: Mechanical, Electrical and Avionics-Subsystem 			

Integration”, 3rd edition, Wiley India Pvt Ltd, 2012.

2. Pallet, E.H.J, “Aircraft Instruments and Integrated Systems”, 1st edition, Longman Scientific and Technical, 1996.
3. R.P.G. Collinson, "Introduction to Avionics Systems", 3rd edition, Springer, 2011.

Reference Books:

1. Lalit Gupta and OP. Sharma, “Aircraft Systems (Fundamentals of Flight Vol. IV)”, 1st edition, Himalayan Books, 2006.
2. Treager. S, “Gas Turbine Technology”, 3rd edition, McGraw-Hill, 2013.
3. R.W. Sloley and W.H. Coulthard, “The aircraft Engineers Handbook, No 4, Instruments”, 6th Edition, 2005.
4. SR. Majumdar, “Pneumatic Systems”, 1st Edition, Tata McGraw Hill Publishing Co, 2001.
5. William A Neese, “Aircraft Hydraulic Systems”, 1st edition, Himalayan Books, 2007.
6. Middleton, D.H., Ed., "Avionics Systems, Longman Scientific and Technical", 1st edition, Longman Group UK Ltd., England, 1989.

Web links:

1. Introduction to Avionics: <https://nptel.ac.in/courses/101104071>
2. Aircraft avionics & Navigation System: <https://www.youtube.com/live/EjUbtU6P6CI>
3. Flight deck & Cockpits: <https://www.iist.ac.in/departments/avionics-lab>

Theory of Vibrations			
Semester	VI	CIE Marks	50
Course Code	23AEPE322	SEE Marks	50
Teaching Hrs/Week (L:T: P)	3:0:0	Exam Hrs	03
Total Hrs	42	Credits	03
<p>Course Learning Objectives: This course is designed to</p> <ol style="list-style-type: none"> 1. Impart knowledge of free vibrations and simple harmonic motion 2. Provide the concepts of undamped and damped vibratory systems 3. Familiarize the working principles of vibration measuring instruments 4. Impart knowledge of numerical methods for multi-degree freedom systems 			
Module 1: Introduction to Vibrations			No. of Hrs: 8
Definitions, Periodic and Random Oscillation, Simple Harmonic Motion, Principle of Superposition applied to Simple Harmonic Motions, Types of Vibrations, Elements of Vibrating Systems, Beats, Fourier theorem			
Module 2: Undamped Free Vibrations			No. of Hrs: 9
Single degree of freedom systems – Newtons method, Energy method and Rayleigh’s method, Spring and Mass elements, Natural Frequency of free vibration, Compound Pendulum			
Module 3: Damped Free and Forced Vibrations			No. of Hrs: 9
<p>Free Vibrations: Single degree of freedom systems, Types of damping, Critical damping and its importance, Over Damped and Under Damped systems, Logarithmic decrement</p> <p>Forced Vibration: Single degree of freedom systems, Steady state solution with viscous damping due to Harmonic force</p>			
Module 4: Vibration Measuring Instruments and Systems with Two Degrees of Freedom			No. of Hrs: 8
<p>Vibration Measuring Instruments: Introduction, Vibration Measurement Scheme, Vibrometer, Accelerometer, Frequency measuring Instruments – Fullarton Tachometer, Frahm Tachometer,</p> <p>Systems with Two Degrees of Freedom: Introduction, Principal modes and Normal modes of vibration, Coordinate Coupling, Generalized and Principal co-ordinates, Free vibration in terms of initial conditions</p>			
Module 5: Numerical Methods for Multi-Degree Freedom Systems			No. of Hrs: 8
Influence coefficients, Maxwell Reciprocal theorem, Orthogonality principle, Rayleigh’s method, Dunkerley’s method, Stodola’s method, Holzer’s method, Matrix iteration			
<p>Course Outcomes: At the end of the course, the student will be able to</p> <ol style="list-style-type: none"> 1. Apply the principle of superposition to Simple Harmonic Motions 2. Apply the mathematical models for undamped free vibratory systems 3. Determine the system response for damped and forced vibratory systems 4. Comprehend the working principles of vibration measuring instruments 5. Apply the numerical methods for multi-degree freedom systems 			
<p>Textbooks:</p> <ol style="list-style-type: none"> 1. V.P. Singh “Mechanical Vibrations”, Dhanpat Rai & Company Pvt. Ltd, 2016 2. S.S. Rao, “Mechanical Vibrations”, 5th Edition, Pearson Education Inc, 2010 			
<p>Reference Books:</p> <ol style="list-style-type: none"> 1. W.T. Thomson and Marie Dillon Dahleh “Theory of Vibration with Applications”, 5th edition, Pearson Education, 2008 2. S. Graham Kelly "Mechanical Vibrations", Tata McGraw Hill, 2007 3. J.S. Rao & K. Gupta “Theory & Practice of Mechanical vibrations”, New Age International Publications, New Delhi, 2001 			



MANGALORE INSTITUTE OF TECHNOLOGY & ENGINEERING

(A Unit of Rajalaxmi Education Trust[®], Mangalore)

Autonomous Institute affiliated to VTU, Belagavi, Approved by AICTE, New Delhi

Accredited by NAAC with A+ Grade & ISO 9001:2015 Certified Institution

4. Leonanrd Meirovitch “Elements of Vibrations Analysis”, Tata McGraw Hill, 2007

Web links:

1. Control, Vibration, and Design of Dynamic Systems: <https://web.stanford.edu/class/me161/>
2. Mechanical Vibration: <https://www.sciencedirect.com/topics/physics-and-astronomy/mechanical-vibration>
3. Basic terminology in vibrations: <https://archive.nptel.ac.in/courses/112/103/112103111/>

Computational Fluid Dynamics			
Semester	VI	CIE Marks	50
Course Code	23AEPE323	SEE Marks	50
Teaching Hrs/Week (L:T: P)	3:0:0	Exam Hrs	03
Total Hrs	42	Credits	03
<p>Course Learning Objectives: This course is designed to</p> <ol style="list-style-type: none"> 1. Impart the Fundamental Concepts of CFD 2. Illustrate the basic Mathematical behavior of Partial Differential Equations to fluid flow 3. Impart the fundamentals of Grid Generation and Adaptive Grids 4. Familiarize the Discretization & Transformation concept using different methods. 5. Provide the knowledge of Finite Volume Technique and its Applications for the given fluid problem. 			
Module 1: Fundamental Concepts of CFD			No. of Hrs: 8
<p>CFD Applications. Need for Parallel Computers in CFD Algorithms. Models of flows. Substantial derivative. Divergence of velocity. Continuity, Momentum, and Energy Equations – Derivation in various forms. Integral versus Differential form of equations. Comments on governing equations. Physical boundary conditions. Forms of equations especially suitable for CFD work. Shock capturing and shock fitting.</p>			
Module 2: Mathematical Behavior of Partial Differential Equations			No. of Hrs: 8
<p>Classification of partial differential equations. Cramer Rule and Eigenvalue methods for classification. Hyperbolic, parabolic, and elliptic forms of equations. Impact of classification on physical and computational fluid dynamics. Case studies: Steady inviscid supersonic flow, unsteady inviscid flow, steady boundary layer flow, and unsteady thermal conduction. Steady subsonic inviscid flow.</p>			
Module 3: Grid Generation and Adaptive Grids			No. of Hrs: 8
<p>Need for grid generation and body-fitted coordinate systems. Structured grids essential features. And its generation techniques: Algebraic and numerical methods. Unstructured grids essential features and its generation techniques: Delaunay-Voronoi diagram, advancing front method. Surface grid generation, multi-block grid generation, and meshless methods. Grid quality and adaptive grids. Structured grids and unstructured grids adaptive methods.</p>			
Module 4: Discretization & Transformation			No. of Hrs: 10
<p>Discretization: Finite difference methods and difference equations. Explicit and implicit approaches. Unsteady problem – Explicit versus Implicit Scheme. Errors and stability analysis. Time marching and space marching. Reflection boundary condition. Relaxation techniques. Alternating direction implicit method. Successive over relaxation/under relaxation. Second-order Lax-Wendroff method, midpoint Leapfrog method, upwind scheme, numerical viscosity, and artificial viscosity.</p>			
Module 5: Finite Volume Technique and Some Applications			No. of Hrs: 8
<p>Spatial discretization: Cell-centered and cell-vertex techniques (overlapping control volume, dual control volume). Temporal discretization: Explicit time stepping and implicit time stepping. Time step calculation. Upwind scheme and high-resolution scheme. Flux vector splitting. Approximate factorization. Artificial dissipation and flux limiters. Unsteady flows and heat conduction problems. Upwind biasing.</p>			
<p>Course Outcomes: At the end of the course, the student will be able to</p> <ol style="list-style-type: none"> 1. Describe the flow phenomena corresponding to Continuity, Momentum, and Energy Equations in various forms 2. Apply Cramer Rule and Eigen value methods for classification of PDE and their impact on case studies 3. Explain the Structured and Unstructured grids, Generation and Adaptive Grids for flow problems with essential features and techniques 4. Apply the concept of discretization & transformation to a given flow governing equations in explicit 			

and implicit formulations

5. Solve the flow field problems by Finite Volume Technique

Textbooks:

1. R.H.Pletcher, J.C.Tannehill, and D.A.Anderson, “Computational Fluid Mechanics and Heat Transfer”, 3rd Edition, CRC Press - Taylor & Francis, 2013.
2. W.Versteeg and H. Malalasekara, “An Introduction to Computational Fluid Dynamics :The Finite Volume Method”, 2nd Edition, Pearson Education, 2010.

Reference Books:

1. J.D.Anderson, “Computational Fluid Dynamics: The Basics with Applications”, Indian Edition , McGraw Hill Education, 2017
2. John F. Wendt (Editor), “Computational Fluid Dynamics: An Introduction”, 3rd Edition, A Von Karman Institute Book, 2009
3. Suhas V Patankar, “Numerical Heat Transfer and Fluid Flow”, CRC Press Paperback 2017.
4. K. Muralidhar and T. Sundararajan (Editors), “Computational Fluid Flow and Heat Transfer”, 3rd Edition, Narosa Publishing House, 2009

Web links:

1. Introduction to CFD : <https://nptel.ac.in/courses/112105045>
2. The Theory and Basics to Computational Fluid Dynamics: <https://www.udemy.com/course/learning-computational-fluid-dynamics-cfd>

Introduction to Airport & Airlines			
Semester	VI	CIE Marks	50
Course Code	23AEOE321	SEE Marks	50
Teaching Hrs/Week (L: T: P)	3:0:0	Exam Hrs.	03
Total Hrs.	42	Credits	03
<p>Course Learning Objectives: This course is designed to</p> <ol style="list-style-type: none"> 1. Provide an understanding of airport systems, terminal operations, management structures, peak-demand and factors affecting airline scheduling. 2. Familiarize passenger processing, ground handling, airport security, cargo logistics and airport management practices. 3. Provide knowledge of Safety, Sustainability in Aviation and Airport Management. 			
Module 1: Introduction			No. of Hrs: 9
<p>Airport as a System, National Airport Systems, Function of the Airport, Centralized and Decentralized Passenger Terminal Systems, Complexity of the Airport Operation, Management and Operational Structures, Airport Peaks: Problem, Methods of Describing Peak, Factors and Constraints on Airline Scheduling.</p> <p>Textbook 1: Chapter 1, Chapter 2 – 2.1, 2.2, 2.4</p>			
Module 2: Aircraft Performance Characteristics & Operational Readiness			No. of Hrs: 8
<p>Introduction, Aircraft, Departure Performance, Approach and Landing Performance, Safety Considerations, Automatic Landing, Operations in Inclement Weather, Specific Implications of the Airbus A380, Aerodrome Certification, Operating Constraints, Operational Areas, Airfield Inspections, Maintaining Readiness.</p> <p>Textbook 1: Chapter 4 – 4.1 – 4.8, Chapter 5</p>			
Module 3: Ground Operations			No. of Hrs: 8
<p>Introduction, Passenger Handling, Ramp Handling, Aircraft Ramp Servicing, Baggage-Handling Processes, Equipment, Systems, and Technologies, Functions of the Passenger Terminal, Terminal Functions, Philosophies of Terminal Management, Direct Passenger Services, Airline-Related Passenger Services.</p> <p>Textbook 1: Chapter 6 - 6.1–6.4, Chapter 7 - 7.1–7.4, Chapter 8 - 8.1–8.5</p>			
Module 4: Airport Security, Cargo and Air Navigation Services			No. of Hrs: 9
<p>Importance of aviation security and ICAO framework, DGCA regulations, Passenger and baggage screening, access control and perimeter protection, Introduction to air cargo operations and global logistics, Role of Air Traffic Control, airport communications, navigation and meteorology in safe airport operations.</p> <p>Textbook 1: Chapter 9 - 9.1–9.5, 9.9–9.12, Chapter 10 - 10.1–10.4, Chapter 11 - 11.3–11.6</p>			
Module 5: Airport Management, Safety and Sustainability			No. of Hrs.: 8
<p>Airport emergency response and rescue operations, Airport access and multimodal connectivity, Introduction to airport operational performance and management, Basics of Safety Management Systems (SMS), Sustainable airport development, environmental impacts and carbon management.</p> <p>Textbook 1: Chapter 12 - 12.1–12.4, Chapter 13 - 13.1–13.4, Chapter 14 - 14.1–14.3, Chapter 15 - 15.1–15.2, Chapter 18.1–18.3</p>			

Course Outcomes: At the end of the course, the student will be able to

1. Describe the functions of the airport system, terminal configurations, operational complexities, and the factors defining airport peak conditions and airline scheduling.
2. Articulate aircraft performance characteristics, safety and certification requirements, and operational practices that determine aerodrome readiness under varying conditions.
3. Describe the key ground operation processes, baggage-handling systems, ramp servicing activities, and terminal management functions involved in supporting passenger and airline services.
4. Describe the major components of aviation security, cargo handling, and air navigation services that support safe airport operations.
5. Categorize the major elements of airport emergency response, operational management, safety systems, and sustainability initiatives that contribute to effective airport functioning.

Textbooks:

1. Norman J Ashford, H P Martin Stanton, Clifton A Moore, Pierre Coutu, John R Beasley, “Airport Operations”, Third Edition, McGrawHill Publications, 2013.

Reference Books:

1. Alexander T, Wells and Seth Young “Airport Planning and Management”, 7th Edition, McGraw Hill March 2019.
2. N.C. Singhal. “Aviation Law in India-Vol.-1”, 1st Edition, YS Books International, 2014.

Web links:

1. Airport Operations: <https://youtu.be/cjxn0z1f7Pk?si=vs-K4m5VfPzkppPB>
2. Introduction to Aviation: <https://youtu.be/USnPfaqcuT4?si=-jOUKJ2zcm4kjuzP>
3. Aircraft Control, Size & Site Selection: https://youtu.be/BzWA5q_n0Bw?si=2PwuAhObI1jTYlsp
4. Airport Operations Management: <https://youtu.be/E9fbEW9rnc0?si=DSWjuieWsvGJyzue>

Aircraft Transportation Systems			
Semester	VI	CIE Marks	50
Course Code	23AEOE322	SEE Marks	50
Teaching Hours/Week (L: T: P)	3:0:0	Exam Hrs	03
Total Hours	42	Credits	03
<p>Course Learning Objectives: This course is designed to</p> <ol style="list-style-type: none"> 1. Impart knowledge of the air transport system, evolution and regulatory framework. 2. Introduce aircraft characteristics, cabin design considerations and basic flight principles. 3. Familiarize air navigation services, surveillance and communication systems, environmental impacts and future challenges of air transport. 			
Module 1: Introduction and Historical Development			No. of Hrs: 8
<p>Introduction, Passenger expectations, Transport and Mobility, The Air Transport System Today Current Challenges of the Air Transport System, A Systematic Description of Air Transport, Air Transport System Performances</p> <p>The Dream of Flying, Physical Based Approach, Technical Based approach, Beginning of Civil Air Transportation, The Jet Age.</p> <p>Textbook 1: Chapter 1.1, 1.2, 1.3, 1.4, 1.5, 1.6, 1.7</p> <p>Textbook 1: Chapter 2.1, 2.2, 2.3, 2.4, 2.5</p>			
Module 2: Regulatory Framework			No. of Hrs: 8
<p>The Freedom of the Air, Regulations for Transportation, International and National Organizations: International Civil Aviation Organization (ICAO), Directorate General of Civil Aviation (DGCA), National and European Regulatory Organizations, Air Navigation Services, International Air Transport Association, Aviation Safety Philosophy, Standards for Safe Aircraft Operations, Security Aspects of Air Transportation</p> <p>Textbook 1: Chapter 4.</p>			
Module 3: Aircraft Characteristics			No. of Hrs: 8
<p>Classification of Flight Vehicles, Cabin Design Focus for the Airlines: Cabin Requirements, Passenger Requirements, Reference Passenger, Cabin Design, Fuselage Cross Section, Floor Area (2-D Aspects), Cabin Layout for Several Comfort Standards (3-D Cabin) Aircraft Cabin Systems, Basics of Flight Physics: ICAO Standard Atmosphere, Aircraft Forces: Lift, Weight, Drag, Thrust. Aerodynamic Efficiency, Thrust Requirements, Aircraft Stability and Control.</p> <p>Textbook 1: Chapter 5.1, 5.2, 5.3</p>			
Module 4: Air Navigation Services			No. of Hrs: 9
<p>Principles of Operation—The Role of the Air Navigation Services, Airspace Structures, Airspace and Airport Capacity, Aircraft Separation, Flight Guidance Systems, Navigation Systems. Future Trends in Navigation. Air Transport Surveillance, Communication Systems. Airborne Collision Avoidance Systems, Terrain Awareness and Warning System, Interfaces Between ATM and Aircraft</p> <p>Textbook 1: Chapter 9.1 to 9.7</p>			
Module 5: Environmental Aspects and Challenges			No. of Hrs: 9
<p>Air Transport Emissions Impact on the Climate: Aircraft Emissions, Emission Impact Assessment in Air Transport, Measures for Emission Reductions, alternate propulsion concepts: Hybrid-electric and electrical propulsion, Hydrogen-fueled aircraft. Noise and Sound of Air Transport: Basics of Noise and Aeroacoustics, Aircraft Noise Sources and Potential for Reduction.</p> <p>Global Challenges for Air Transport 2050, Future Energy Provision and Alternative Fuels for Air Transport, Competitive and Multimodal Air Transport, Future Air Transport, Flightpath 2050.</p> <p>Text book 1: Chapter 10.2, 10.3</p> <p>Text book 1: Chapter 11.1, 11.2, 11.3, 11.5, 11.6</p>			
Course Outcomes: At the end of the course, the student will be able to			

1. Articulate the evolution of air transport, concepts of flight, civil aviation development, mobility demands and air transport system performance.
2. Describe the regulatory framework of air transportation, air navigation services, aviation safety philosophy and security standards.
3. Articulate aircraft characteristics, cabin layout considerations, flight physics and stability and control.
4. Describe air navigation services and environmental aspects of air transport and challenges.
5. Apply standard atmosphere and aerodynamic principles to determine basic flight forces, thrust requirements and aerodynamic efficiency of an aircraft.

Textbooks:

1. Dieter Shmitt, and Valker Gollnick. "Air Transport System"- 6th Edition. M.C.Graw Hill, Newyark, 2016.

Reference Books:

1. Milica Kalic. "Introduction to Air Transportation Systems"-CRC Press, Taylor and Francis Group, 2022.
2. Jhon G Wensveen "Air Transportation A Management Prospective"- 2nd Edition. Ashgate Publishing Ltd, 2011.
3. Mike Hirst. "The Air Transportation System"- 1st Edition. Woodhead Publishing Ltd, England, 2008.
4. Nolan M.S., "Fundamentals of Air Traffic Control", 7th edition, Cengage Learning, 2022.

Web links:

1. Historical Development of Air Transport: Lec-27 Introduction of Air Transport <https://www.youtube.com/watch?v=WUq3uN4MDms>
2. Regulatory Framework (ICAO): NPTEL on ICAO & Aviation Regulations (search NPTEL playlist: https://www.youtube.com/results?search_query=NPTEL+ICAO+air+transport)
3. Environmental Aspects (Noise/Emissions): Airplane Design Aerodynamics Ch-7 Environmental Considerations : <https://archive.nptel.ac.in/content/storage2/courses/101106035/lec41.pdf>
4. Air Traffic Control Systems: Avionics and Future of Flying (ATC discussion at 13:20) <https://www.youtube.com/watch?v=EjUbtU6P6CI>
5. Challenges & Future Trends: NOC: Air Transportation: An Overview Playlist <https://nptel.ac.in/courses>

Civil Aviation Requirements			
Semester	VI	CIE Marks	50
Course Code	23AEOE323	SEE Marks	50
Teaching Hours/Week (L:T: P)	3:0:0	Exam Hrs	03
Total Hours	42	Credits	03
<p>Course Learning Objectives: This course is designed to</p> <ol style="list-style-type: none"> 1. Impart the knowledge of Civil Aviation Requirements 2. Emphasize the concept of Minimum Equipment List and Cockpit Check List 3. Provide comprehensive understanding of Approvals 4. Disseminate the knowledge about Air Facility Requirements & Infrastructure 5. Develop the knowledge of Airworthiness Certification 			
Module 1: C.A.R. SERIES A			No. of Hrs: 9
<p>Issuance of the Civil Aviation Requirements and revisions, Requirements to be complied with, Procedure for holding examinations, proficiency checks etc. for Defense personnel to fulfill the requirements for grant of civil licenses, Procedure for an appeal on orders issued under Rule 3B of the Aircraft Rules, 1937, Regulatory Document Management System, advisory circulars & A.M.E. notices by DGCA. Knowledge of aircraft act, 1934, aircraft rules, 1937 as far as they related to airworthiness and safety of aircraft. Knowledge of civil airworthiness requirements, aeronautical information circulars, aeronautical information publications-(relating to airworthiness)</p>			
Module 2: C.A.R. SERIES B AND C			No. of Hrs: 9
<p>C.A.R. series “B” – Minimum Equipment List (MEL), preparation and use of cockpit check list and emergency check list. C.A.R. series ‘C’ – Defect recording, reporting, investigation, rectification and analysis</p>			
Module 3:C.A.R. SERIES E, G AND M			No. of Hrs: 8
<p>C.A.R. Series E – approval of organizations: Approval in categories E & G; CAR M- Objective, Definitions, Continuing Airworthiness Requirement</p>			
Module 4: C.A.R. 145			No. of Hrs: 8
<p>CAR145-General, Scope, Terms of Approval, Facility Requirement, Personnel Requirement, Certifying Staff, Safety and Quality policy, maintenance procedures and quality system. CAR -21, Type certificate, Noise certificate, Approval of organizations in categories A, B, C, D, E, F& G; requirements of infrastructure at stations other than parent base</p>			
Module 5: C.A.R. SERIES F			No. of Hrs: 8
<p>C.A.R. Series “F” airworthiness and continued airworthiness: Procedure relating to Registration and deregistration of aircraft, Issue/validation and renewal of Certificate of Airworthiness, Issue/validation and suspension of Certificate of Airworthiness, Special Flight permits, Airworthiness requirements for Gliders, Design, Manufacture, Registration and Operation of Micro light Aircraft., Requirements for manufacture, registration and airworthiness control of hot air balloons, Age of Aircraft to be imported for Scheduled and Non Scheduled including Charter, General Aviation and other Operations, Load and trim sheet – requirements</p>			
<p>Course Outcomes: At the end of the course, the student will be able to</p> <ol style="list-style-type: none"> 1. Illustrate the current challenges in Civil Aviation Requirements 2. Apply the fundamental knowledge of minimum equipment list and defect recording 3. Illustrate the concept of approval of organizations 4. Describe the essential of the air facility requirements and infrastructure 5. Apply the basic need of airworthiness 			



MANGALORE INSTITUTE OF TECHNOLOGY & ENGINEERING

(A Unit of Rajalaxmi Education Trust[®], Mangalore)

Autonomous Institute affiliated to VTU, Belagavi, Approved by AICTE, New Delhi

Accredited by NAAC with A+ Grade & ISO 9001:2015 Certified Institution

Textbooks:

1. Aircraft manual (India) volume – latest edition, the English book store, 17-1, Connaught circus, New Delhi, 2022
2. Civil aviation requirements with latest amendment (section 2 airworthiness) – published by DGCA, the English book store, 17-1, Connaught circus, New Delhi, 2021

Reference Books:

1. Aeronautical information circulars (relating to airworthiness) from DGCA
2. Advisory circulars from DGCA

Web links:

1. C.A.R. SERIES A, C.A.R. SERIES B AND C: <https://ocw.mit.edu/courses/16-100-civil-aviation-requirements-fall-2020/>
2. C.A.R. SERIES E, G AND M, C.A.R. 145: <https://guides.libraries.psu.edu/c.php?g=374719&p=2537010>

Yoga - IV			
Semester	VI	CIE Marks	100
Course Code	23NMCC325	SEE Marks	-
Teaching Hours/Week (L:T: P)	0:0:1	Exam Hrs	-
Total Hours	13	Credits	-
<p>Course Learning Objectives: This course is designed to</p> <ol style="list-style-type: none"> 1. Empower students to achieve and maintain good health. 2. Promote the practice of mental hygiene. 3. Facilitate students in attaining emotional stability. 4. Impart moral values and higher level of consciousness. 			
Contents			No. of Hrs: 13
<ul style="list-style-type: none"> • Ashtanga Yoga 1. Dharana 2. Dhyana (Meditation) 3. Samadhi • Asana by name, technique, precautionary measures and benefits of each asana • Suryanamaskar 13 count- 4 rounds of practice • Different types of Asanas <ol style="list-style-type: none"> a) Sitting <ol style="list-style-type: none"> 1. Bakasana 2. Hanumanasana 3. Ekapada Rajakapotasana 4. Yogamudra in Vajrasana b) Standing <ol style="list-style-type: none"> 1. Vatayanasana 2. Garudasana c) Balancing <ol style="list-style-type: none"> 1. Veerabhadrasana 2. Sheershasana d) Supine line <ol style="list-style-type: none"> 1. Sarvangasana 2. Setubandha Sarvangasana 3. Shavasana (Relaxation posture). • Revision of Kapalabhati practice 40 strokes/min - 3 rounds • Meaning by name, technique, precautionary measures and benefits of Pranayama Bhramari. 			
<p>Course Outcomes: At the end of the course, the student will be able to:</p> <ol style="list-style-type: none"> 1. Describe the meaning, aim and objectives of Yoga 2. Perform Suryanamaskar and able to analyze its benefits 3. Exhibit the different Asanas by name, its importance, methods and benefits 4. Perform Kapalabhati. 5. Perform the different types of Pranayama by its name, precautions, procedure and uses 			
<p>Textbooks:</p> <ol style="list-style-type: none"> 1. Ajitkumar, "Yoga Pravesha in Kannada" 1st Edition, Raashthrothhaana Saahithya, 2017 2. BKS Iyengar, "Light on Yoga", 1st Edition, Thorsons, 2017 3. Dr. M L Gharote & Dr. S K Ganguly, "Teaching Methods for Yogic practices", 1st Edition, Kaivalyadhama, 2001 			
<p>Reference Book:</p> <p>Yamini Muthanna, "Yoga for Children step by step", 1st Edition, Om Books International, 2022</p>			



MANGALORE INSTITUTE OF TECHNOLOGY & ENGINEERING

(A Unit of Rajalaxmi Education Trust[®], Mangalore)

Autonomous Institute affiliated to VTU, Belagavi, Approved by AICTE, New Delhi

Accredited by NAAC with A+ Grade & ISO 9001:2015 Certified Institution

Web links:

1. My Life My Yoga , <https://youtu.be/KB-TYlgd1wE>
2. Adiyoga, <https://youtu.be/aa-TG0Wg1Ls>

Scheme & Assessment of students for auditing the course & Grades

Sl. No.	Activity	Marks
1.	Quiz	20
2.	Practical demonstration	50
3.	Final Report	30
	Total	100

Physical Education - IV

Semester	VI	CIE Marks	100
Course Code	23NMCC326	SEE Marks	-
Teaching Hours/Week (L: T: P)	0:0:1	Exam Hrs	-
Total Hours	13	Credits	-

Course Learning Objectives: This course is designed to

1. Impart the fundamental concepts and skills of Physical Education, Health, Nutrition and Fitness
2. Familiarization of health-related Exercises, Sports for overall growth and development
3. Build a strong foundation for the professionals in Physical Education and Sports

Contents	No. of Hrs: 13
-----------------	-----------------------

- Importance of nutrition for optimal performance and healthy eating habits. (Lectures)
- Mindfulness and stress management techniques like meditation. (Practical Sessions)
- Emphasis on teamwork, communication, and sportsmanship. (Practical Sessions)
- Specific Games (Students continue prior semester's game by practicing Advanced Skills)

Basket Ball Behind-the-back dribble - Spin moves - Alley-oop passes - Shooting off the dribble - Advanced footwork and shot creation techniques

Cricket Reverse swing and googly bowling - Spin bowling variations (leg spin, off spin) - Captaincy skills - Advanced batting techniques (switch hitting)

Football Advanced dribbling techniques (stepovers, fakes) - First touch passing and control - Volley control and shooting - Set pieces (free kicks, corner kicks) Advanced heading techniques - Goalkeeper diving and shot-stopping

Hockey Deke moves and advanced stickhandling - Aerial control - Passing variations (chip pass, scoop pass) - Penalty corner techniques - Advanced defensive strategies

Kabaddi Advanced raiding maneuvers (super raid) - Quick and deceptive raiding holds - Strategic raiding based on game situation - Strong team defense coordination - Advanced anti-raid tactics

Karate Advanced kumite strategies and tactics - Complex combinations of attacks and counters - Throwing and takedown techniques (sweeps, trips) -Advanced conditioning and strength training

Table Tennis Advanced footwork for quick movement - Smashing technique - Serving variations (sidespin, flick serve) - Deceptive spins and tactics - Advanced match play strategies

Throwball Jump shot and other variations - No-look passes and behind-the-back passes - Quick throws and fast breaks - Advanced dodging techniques and footwork - Zone defense and press defense strategies

Volleyball Offensive spiking mechanics (jumping and hitting the ball)

Course Outcomes: At the end of the course, the student will be able to

1. Demonstrate an understanding of the link between nutrition, performance, and healthy eating habits
2. Demonstrate improved self-awareness, stress management skills, and effective teamwork through participation in sportsmanship-focused activities.
3. Perform in the selected sports or athletic events

Textbooks:

1. Muller, J. P., "Health, Exercise and Fitness", 1st Edition, Sports Publication, 2018
2. Uppal, A.K., "Physical Fitness", Friends Publication New Delhi, 1992
3. Russell R.P., "Health & Fitness through Physical Education: Human Kinematics", Human Kinetics Publishers, 1994



MANGALORE INSTITUTE OF TECHNOLOGY & ENGINEERING

(A Unit of Rajalaxmi Education Trust[®], Mangalore)

Autonomous Institute affiliated to VTU, Belagavi, Approved by AICTE, New Delhi

Accredited by NAAC with A+ Grade & ISO 9001:2015 Certified Institution

Reference Books:

1. Anaika , “Play Field Manual”, Friends Publication New Delhi, 2005.
2. IAAF Manual
3. Pinto John & Roshan Kumar Shetty, “Introduction to Physical Education”

Web links:

1. <https://www.youtube.com/watch?v=wvlztaJYKYI>
2. <https://www.youtube.com/watch?v=d393LzvqG3E&list=PL94CA1fTzfEd8FkpCa0WNTF7y1pFWNFKc>
3. <https://www.youtube.com/watch?v=m7EhWv4wgP4>

Scheme & Assessment of students for auditing the course & Grades

Sl. No.	Activity	Marks
1.	Participation of students	20
2.	Quizzes-2, each of 15 marks	30
3.	Final presentation/Exhibition/Participation in Competitions (Certificate of participation in National/International)	50
	Total	100

National Service Scheme - IV

Semester	VI	CIE Marks	100
Course Code	23NMCC327	SEE Marks	-
Teaching Hours/Week (L:T: P)	0:0:1	Exam Hrs	-
Total Hours	13	Credits	-

Course Learning Objectives: This course is designed to

1. Develop discipline, character, brotherhood, the spirit of adventure and ideals of selfless service amongst young citizens
2. Develop youth leadership in the students.
3. Induce social consciousness among students through various societal activities.
4. Impart knowledge in finding practical solutions to individual and community problems

NSS -Contents

No. of Hrs: 13

Introduction:

- Basic first aid skills
- Disaster preparedness, emergency evacuation

Activities:

- Environment Awareness and Conservation
- Obstacle management Training, conflict management and negotiation skills

Note:

- Students in individual or in a group should select any one activity in the beginning of each semester till end of that respective semester for successful completion as per the instructions of NSS officer with the consent of HOD of the department.
- At the end of every semester, activity report should be submitted for evaluation.

Course outcomes: At the end of the course, the student will be able to

1. Understand the importance of nation building and individual contribution to the betterment of the society.
2. Discover grassroots challenges of community and solve them by technological intervention.
3. Create societal impact by upholding the value of one for all and all for one.
4. Maintain discipline and team spirit.

Textbooks:

1. Ministry of Youth Affairs & Sports, Government of India (2022) "National Service Scheme Manual"
2. Rajiv Gandhi National Institute of Youth Development, Ministry of Youth Affairs & Sports, Government of India, (2017) "Introduction Training Module for National Service Scheme (NSS) Program officers",
3. Gurmeet Hans (1996), "Case material as Training Aid for field workers" TISS

Reference Books:

1. Dr. G R Bannerjee, (2012), Social service opportunities in Hospitals, TISS
2. Ram Ahuja (Third Edition, 2014), Social Problems in India, Rawat publications

Web links:

1. History of NSS <https://thebetterindia.com/140/national-service-scheme-nss/>
2. NSS – an introduction <https://www.youtube.com/@nationalserviceschemeoffic4034/videos>

Scheme & Assessment of students for auditing the course & Grades

Sl. No.	Activity	Marks
1.	Participation of students	30
2.	Individual contribution to success of the program	40
3.	Report preparation	30
	Total	100

Arts - IV			
Semester	VI	CIE Marks	100
Course Code	23NMCC328	SEE Marks	-
Teaching Hours/Week (L: T: P)	0:0:1	Exam Hrs	-
Total Hours	13	Credits	-
<p>Course Learning Objectives: This course is designed to</p> <ol style="list-style-type: none"> To impart an understanding of the creative process from initial concept to final execution. Create and demonstrate proficiency in a chosen arts discipline through practical application. Analyze and appreciate diverse art forms and styles To participate in art competitions at regional, state, national, and international levels, as well as in cultural events 			
Contents			No. of Hrs.: 13
<p>Note: Student will continue the arts form selected in previous semester.</p> <p>Performing Arts (Dance) Orientation, Cinema Script Writing, Audition Techniques, Shooting Script, Basics Direction and Camera, Group Assignments, Group Presentation, Evaluation.</p> <p>Music Orientation, Western Songs, Voice Culture, Voice Modulation, Rap Singing, Folk Song Revision, Film Song Revision, Group Presentation Evaluation</p> <p>Arts & Crafts Orientation, Puppetry: Glow Puppetry- Head Puppets -Animal Puppetry -POP Puppetry- Group Presentation- Evaluation</p> <p>Theatre Orientation, Theatre Music, Theatre Choreography, Script Writing, Group Production, Grand Rehearsals, Group Show, Evaluation.</p>			
<p>Course Outcomes: At the end of the course, the student will be able to</p> <ol style="list-style-type: none"> To be capable of creating choreography and delivering live performances for an audience. Employ a range of acting techniques and use them to create a performance. Evolve into creative, effective, independent, and reflective individuals capable of making informed decisions in both process and performance. Acquire knowledge and comprehension of the roles and processes used in current theatre arts practice. 			
<p>Textbooks:</p> <ol style="list-style-type: none"> Music in Theory and Practice by Bruce Benward and Marilyn Sake, McGraw-Hill Education, 2014 Art Fundamentals: Theory and Practice by Otto G. Ocvirk, Robert E. Stinson, Philip R. Wigg, Robert Bone, and David L. Cayton, McGraw-Hill Education, 2012 The Viewpoints Book: A Practical Guide to Viewpoints and Composition by Anne Bogart and Tina Landau, Theatre Communications Group, 2004 			
<p>Reference Books:</p> <ol style="list-style-type: none"> Dance Composition: A practical guide to creative success in dance making, Jacqueline M. Smith The Artist's handbook of method and materials by Ralph Mayer Glimpses of Indian music and dance by Dr. Arun Bangre. 			
<p>Web links: https://certindia.gov.in/audio-visual-catalogue/</p>			
Scheme & Assessment of students for auditing the course & Grades			
Sl. No.	Activity	Marks	
1.	Students Participation	20	
2.	Quizzes-2 (each of 15 marks)	30	
3.	Final presentation/Exhibition/Participation in Competitions	50	
Total			100