Aeronautical Engineering

Sky & Beyond!

Fly, Inspire, Innovate across boundaries

Students Handbook
(SS 2022-23)
B. Tech. - Aeronautical Engineering

Department of Aeronautical Engineering, Vel Tech

Aeronautical Engineering

Document Details

Version	Revision History	Revised by
1/Aug 2022	Book Origin	Head / Aero
27/Oct 2022	Question paper pattern	Head / Aero

Contents

Welcome to the Sky and Beyond!

The Department of Aeronautical Engineering is one of the premier academic departments and research hubs at the Vel Tech TechnoSphere. Vel Tech Aero research and education aim to develop an inclusive environment for teachers and students towards the development of air transport, drone technology, computing, and new-age propulsion systems.

Flying is passionate; flying is magnificent; flying is an amazing element in human endeavors. Transport is key for national building and history taught us that the superpower of the world owns successful transportation in each era. Air Transport became the defining element of Superpower after WWII. Vel Tech Aero is one of the important establishments for self-reliance in Aero Tech of our nation and it established some of the unique R&D facilities which are serving important Aero Tech establishments in India.

Vel Tech Aero has a decade's history and tradition in Engineering education which was established in 2007 with the vision of “Excellence in education and research practices of Aeronautical Engineering” and offering cutting-edge degree programmes. The graduates of Vel Tech Aero serve across India and have a strong influence in the International Aeronautical Arena. As per Tamilnadu Defense Policy, Vel Tech Aero is one of the pioneering academic & research establishments. The Vel Tech Aeros B.Tech. Aeronautical Engineering is India's First NBA (Washington Accords Quality Framework of India) accredited programme.

Vel Tech Aero is the initiator; its Vision and mission hone its practices and embarked footprints and predicted future tech revolutions. For example, Vel Tech Aeros M.Tech. Aero with Specialization in UAV was started way back in 2014 and now Drones becomes inevitable technology in almost every important technological field which includes smart Agri, logistics, remote sensing, and defense.

You are one of the proud elements of the national building mission. Welcome to the Vel Tech Aero ecosystem. You will enjoy; practicing flying machines, admiring people and “Welcome to Sky and Beyond!”.

Regards

Dr. R. Jaganraj, *DGCA Certified Drone Pilot*
Head / Aeronautical Engineering

Our Vision

Excellence in educational and research practices of Aeronautical Engineering

Our Mission

- Nurture quality education ambience to students by employing modern education pedagogies
- Provide vital state of the art research facilities to students and faculty members with opportunities to create, interpret, apply and disseminate knowledge.
- Develop linkages with the world class research organizations and institutions for excellence in teaching and research.
- Promote Industry Institute linkages; Nurture entrepreneurship

“Our Vision and Mission hones our activities, developments and new establishments to achieve self reliance in aero”

Beginning of the New Destination

B. Tech. - Aeronautical Engineering

Programme Educational Objectives

- Solve real world problems and support needs in aeronautical and related areas community by pioneering in technical fundamentals
- Practice commitment in ethical and perceive entrepreneurship, societal contexts & play excellent role in multidisciplinary team with persisting growth in technical, professional and interpersonal skills; exhibit effective leadership, communication and collaboration
- Pilot innovative technologies, product & process development, and systems in aeronautical and related fields by practicing Conceive, Design, Implementation and Operate

Programme outcomes

Domain Specific Knowledge and Reasoning

1. Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
2. Problem analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
3. Design/development of solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

Professional and personal Skills

4. Conduct investigations of complex problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
5. Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.
6. The engineer and society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
7. Environment and sustainability: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
8. Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

Interpersonal Skills & Lifelong Learning

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

10. Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
11. Project management and finance: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
12. Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

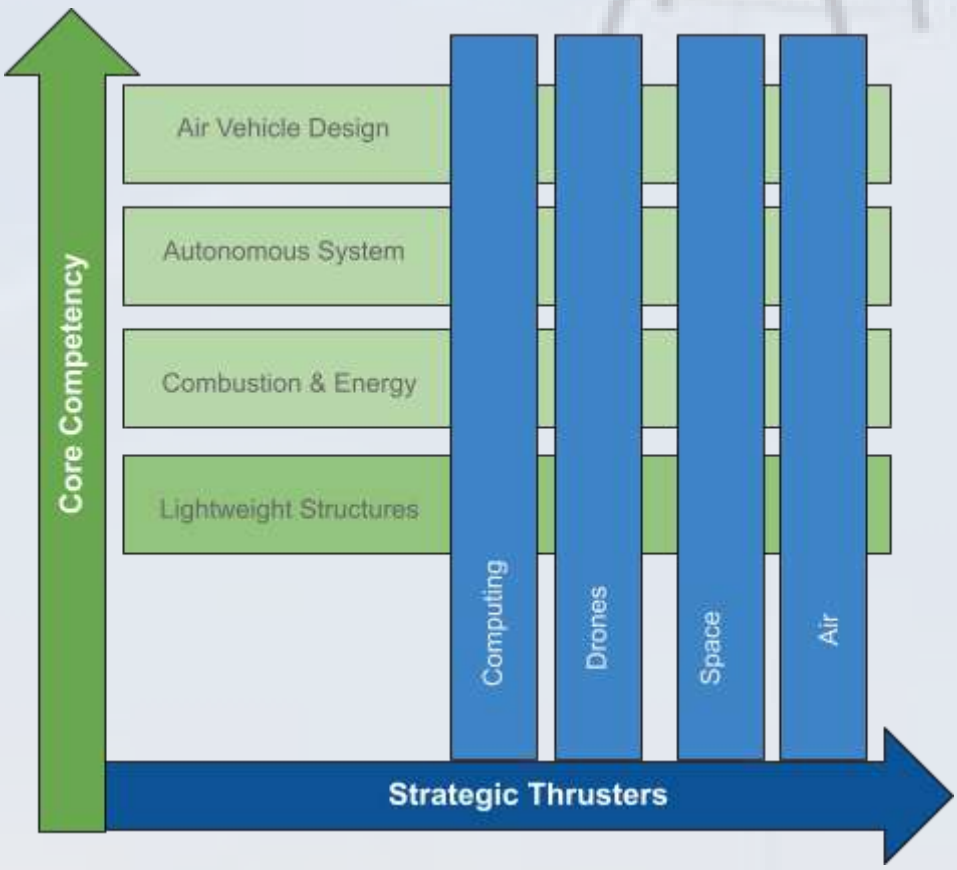
Programme Specific Outcomes

Aeronautical System Design & CDIO attributes

13. Practice design thinking and realize engineering solutions and its impact on business and societal
14. Conceive aeronautical and related engineering systems and practice designing of complex systems by understanding requirements, system modeling and business.
15. Implement best solutions by practicing hardware and software integration, sensing, and simulations; Operate complex engineering systems and understand mission requirements and operation environment.

Lab, Research Centers & People

Vel Tech Aero research capabilities are Air, Computing, Drones & Space.



Aerodynamics - Air Vehicle Design, Computational Engineering

Aerodynamics Lab Design Studio	Domain Coordinator Mr. A. Adaikalaraj
	Technical Staff Mr. Sathishkumar

Propulsion - Gas Turbine Design & Heat Transfer, Electric Propulsion

Propulsion Lab GTRE - High Speed Bearing Lab	Domain Coordinator Mr. Kirubadurai B
	Technical Staff Mr. Selvakumar

Flight Mechanics & Control - Autonomous systems, remote sensing, precision agriculture, water quality, hybrid systems, heavy lifting applications & AI & VR

Flight Mechanics & Control Lab Aero Hanger & Simulator Lab CASR	Domain Coordinator Dr. G. Surendar
	Technical Staff Mr. Jayaraj R

Aircraft Structures - Materials, Lightweight Structures & Composites

Aircraft Structure Lab DIO Lab Aircraft Structure Repair Lab	Domain Coordinator Mr. G. Boopathy
	Technical Staff Mr. Sathish

Gist of VTR UGE 21

Students joined after 2021 in B.Tech. Aeronautical Engineering shall follow the VTR UGE 21 regulations of Vel Tech. This regulation will help the student to understand rules and regulations, minimum degree requirements, grading and salient options for students. The below gist is extracted from VTR UGE 21 which will be helpful to the students for understanding overall regulations. However, students are advised to read the full regulation available at weblink: https://www.veltech.edu.in/academic-regulations/

Students are also advised to take a look at the degree chart of this handbook and discuss with mentor / Senior Teachers / Head to understand their pace of study and select proper courses to fit themselves in any one career option.

1. Course category & Minimum Credits Required for Regular Students

Minimum credits required for regular students in various course categories

Section Number	Course Category	Minimum Credits Required
7.2.1	Foundation Courses (FC)	56
7.2.2	Programme Core (PC)	58
7.2.3	Programme Elective (PE)	18
7.2.4	Open Elective (OE)	12
7.2.5	Independent Learning (IL)	14
7.2.6	Industry/Higher Institute Learning Interaction (IHL)	2
7.2.7	Professional Proficiency Courses (PPC)	4
Total		164

Minimum credits required for Lateral Entry students in various course categories. Exempted credits are available at the degree chart.

Section Number	Course Category	Minimum Credits Required
7.2.1	Foundation Courses (FC)	22
7.2.2	Programme Core (PC)	48
7.2.3	Programme Elective (PE)	18
7.2.4	Open Elective (OE)	12
7.2.5	Independent Learning (IL)	14
7.2.6	Industry/Higher Institute Learning Interaction (IHL)	2
7.2.7	Professional Proficiency Courses (PPC)	4
Total		120

Mandatory Courses

Foundation Mandatory Courses

10210ME105	Engineers and Society
10210BL101	Constitution of India

Complementary Skills Mandatory Courses

The students shall take at least one course each from Groups I and II as given in below Table. No credits shall be awarded for the courses under this category. The student shall fulfill the minimum requirements as prescribed in the evaluation guidelines for mere completion of the course which is mandatory for the award of the degree.

Group	Category
Group-I	Sports/Yoga
	National Cadet Corps
	National Service Scheme
	Extra-curricular Activities
	English Proficiency Certification
Group-II	Value Added Courses
	Globally accepted Certification Courses
	Co-curricular Activities
	Foreign Languages

2. Major / Minor / Honor / Specialization - Design your Degree

The student can register for several degree options available as per VTU UGE 21 Regulations. Students are advised to discuss with mentor & HoD before enrolling into degree options available. The broad options are given below.

Options **B.Tech. Aeronautical Engineering**	Credit Requirement	Eligibility Details
Specialization a) Computational Engineering b) Autonomous Drone Technology	Program Elective 18 credits and Independent Learning 13 Credits from Specialized area. **Starts from 3rd sem.**	Students with 6.0 CGPA as on III Semester / Qualifying exam (For LE)
Honors Aerial Robotics	The students enrolled for the program shall earn eighteen (18) extra credits in their Major degree programme in addition to the minimum credits required. **Starts from 4th sem.**	Students with 7.5 CGPA without any backlogs as on III Semester are eligible Students need to maintain the CGPA of minimum 7.5 and above including minor degree courses, without any backlogs
Minor Degree List attached below	The students enrolled for the program with minor degree shall earn eighteen (18) extra credits in any emerging area **in other programmes apart from the admitted major programme** **Starts from 4th sem.**	Students with 7.0 CGPA without any backlogs as on III Semester / Qualifying exam (For LE) Students need to maintain a CGPA of minimum 8.5 and above including the Honors courses without any backlogs.

List of Minor Degree Options Available for B. Tech - Aeronautical Engineering & B. Tech - Aerospace Engineering Students

Minor Degree	**Offering Department**	**Minor Degree**	**Offering Department**
Artificial Intelligence Data Science Cyber Security Artificial Intelligence & Machine Learning Artificial Intelligence & Data Science Artificial Intelligence & Robotics Financial Technology Gaming and Animation	**Computer Science & Engineering**	Smart Communication Technologies Smart Automation	**ECE**
Remote Sensing and GIS	**Civil Engineering**	Brain Computer Interface Bioprocess Controls & Devices	**Biomedical Engineering**
Electric Vehicle Technology Renewable Energy Sources	**EEE**	Human Computer Interaction	**Bio Tech**

3. Semester Registration & Course Registration

All students shall complete the semester registration link provided by the institute at each semester as per academic schedule. The semester registration will enable students to proceed with course registration. Before courses registration students shall discuss with mentors. After registration students shall ensure registry of courses in their mentor book which is maintained mentor.

The credit requirements for each semester are given below.

- student shall register in a semester minimum of 15 credits and maximum of 25 credits, out of which minimum 12 credits shall be from foundation and core
- If the student acquired 135 credits or 85 credits from foundation & core, with prior permission may register below 15 credits.

Expected credit earning & registration in each sem

Sem	Keep it up! Understand quad option well and proceed for 9 month internship	Discuss with a mentor. Need to plan to get 6 month internship	Meet the HoD and discuss how to get degree
1	22	22	15
2	44	44	30
3	69	66	45
4	94	88	60
5	119	110	75
6	144	132	90
7	155	155	105
8	164	164	120

4. How to identify course code

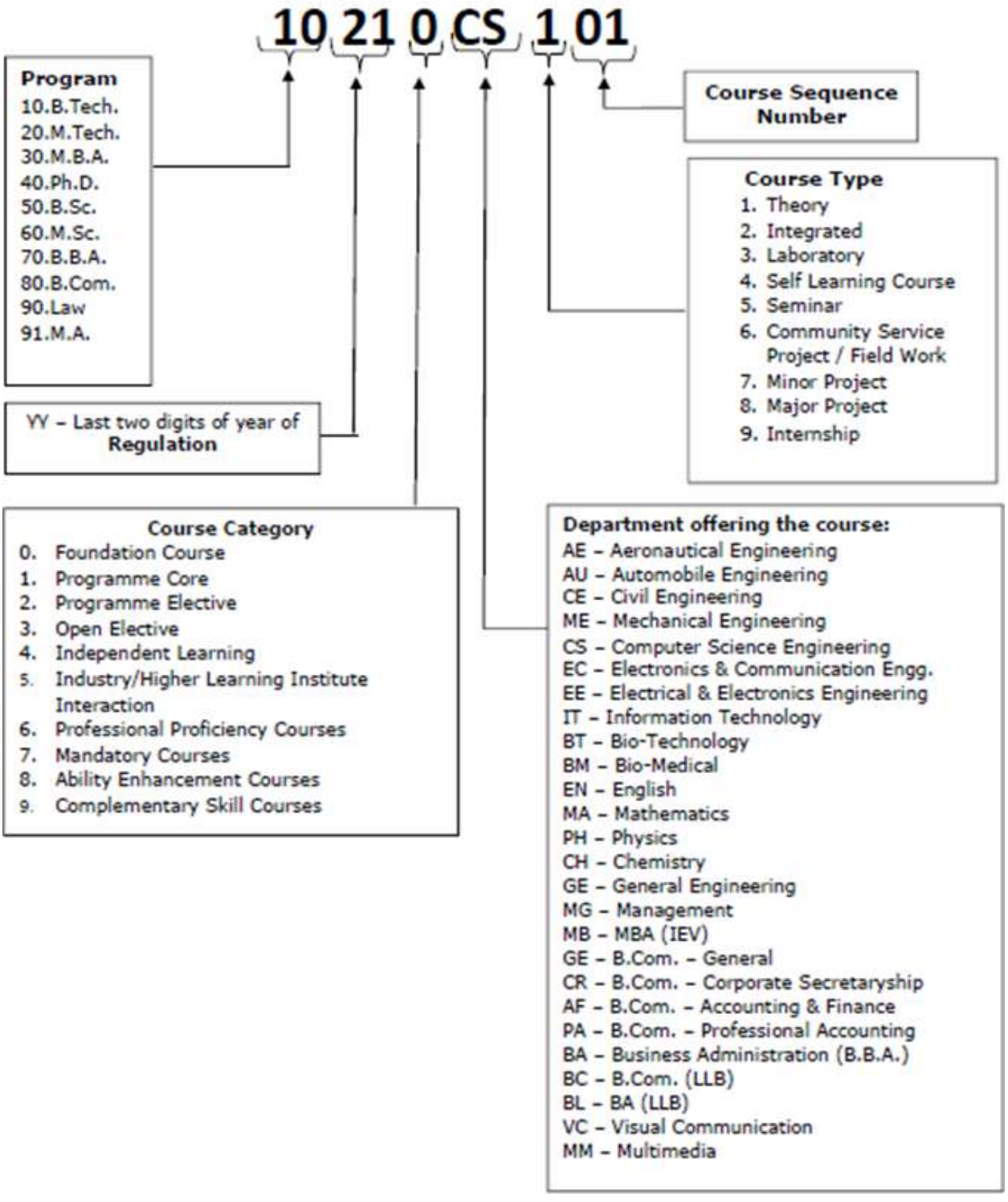
Course Category	Min Credit	Offering Dept	Course Code
Foundation Courses (FC)	56	Freshman Engineering	10210XXYYY
Programme Core (PC)	58	Aero	10211AEYYY
Programme Elective (PE)	18	Aero	10212AEYYY
Open Elective (OE)	12	SOC / SOE / SOL / SOM	10213XXYYY
Independent Learning (IL)	14	Aero	10214AEYYY
Industry/Higher Institute Learning Interaction (IHL)	2	Aero	10215AEYYY
Professional Proficiency Courses (PPC)	4	Training & Placement	10216XXYYY
Mandatory - Foundation	N/A	Freshman Engineering	10217XXYYY
Mandatory - Complementary	N/A	Aero	10219AEYYY

Complementary courses - How to earn it?

Group	Category	How to earn it?
Group-I (At Least 1 expected)	Sports/Yoga	Submit certification by participating in the recognized event on prior approval.
	National Cadet Corps	Submit C certificate

	National Service Scheme	Submit at least 1 camp certificate
	Extra-curricular Activities	Submit recognized event participation certificate on prior approval
	English Proficiency Certification	Approach English department to know about approved certification
Group-II (At Least 1 expected)	Value Added Courses	Dept will offer in each sem under 10219AEYYY series. Need to complete 4 courses.
	Globally accepted Certification Courses	Need to submit DGCA certified drone pilot course certificate
	Co-curricular Activities	Need to submit project expo / conference attended certificate
	Foreign Languages	Courses will be offered by international division

COURSE NUMBERING SCHEME



5. Types of courses & Grading

S No	Type of Course	Grading
1	Theory	Internal 40 Marks ● 30 - Average of 3 tests ● 5 - Assignment cum presentation ● 5 - Attendance External 60 Marks - Theory Exam
2	Lab	Internal 40 Marks ● 15 - Average of performance in each experiment ● 25 - Model Lab External 60 Marks - Lab exam
3	Integrated - Theory	Internal 40 Marks ● 20 - Average of 2 tests ● 20 - Model Lab External 60 Marks - Theory Exam
4	Integrated - Lab	Internal 40 Marks ● 15 - Average of performance in each experiment ● 25 - Model Lab External 60 Marks - Lab exam

***General distribution is given above. Refer PBL page for marks for PBL project.**

- For all courses 75% attendance is mandatory
- With permission of Head on some medical grounds, 65% will be permitted with fine.
- No on permission and medical leaves will be considered for 65% attendance. Students must secure a minimum 65% attendance by physical presence.

Curriculum & Degree Chart

Foundation

S.No	Course Code	Course Name	Credits
1	10210PH102	Physics of Materials	3
2	10210PH103	Applied Physics	2
3	10210PH302	Applied Physics Laboratory	1
4	10210CH101	Engineering Chemistry	3
5	10210CH301	Engineering Chemistry Laboratory	1
6	**10210CH103**	**Environmental Studies**	**2**
7	10210MA201	Matrices and Calculus	3
8	**10210MA109**	**Numerical Methods**	**3**
9	**10210MA105**	**Transforms & Fourier Series**	**3**
10	10210MA203	Vector Calculus and Complex Variables	3
11	10210EN201	Professional Communication-I	2
12	10210EN202	Professional Communication-II	2
13	10210BM101	Biology for Engineers	2
14	10210CS101	Problem Solving Using C	3
15	10210CS301	Problem Solving Using C Lab	1
16	10210CS201	Python Programming	2
17	10210CS303	IT Workshop	1
18	10210EE301	Engineering Products Lab	1
19	10210ME101	Design Thinking	2
20	10210ME201	Engineering Graphics	3
21	10210ME102	Universal Human Values	3
22	10210EE204	Introduction to Engineering	3
23	**10210ME103**	**Innovation & Entrepreneurship**	**2**
24	**10210ME104**	**Project Management & Finance**	**2**
25	10210EE201	Basic Electrical, Electronics and Measurement Engineering	3
26	**10210ME105**	**Engineers and Society**	**M**
27	**10210BL101**	**Constitution of India**	**M**

Programme Core

Concentration Area : Aerodynamics & CFD							
S. No.	**Course Code**	**Course Name**	**L**	**T**	**P**	**C**	**Type**
1	10211AE201	Fluid Mechanics	2	0	2	3	IT
2	10211AE202	Low Speed Aerodynamics	2	0	2	3	IT
3	10211AE203	High Speed Aerodynamics	2	0	2	3	IT
4	10211AE204	Aircraft Design Rules & Certification	0	0	2	1	IT
5	10211AE205	Computational Fluid Dynamics	2	0	2	3	IT
Concentration Area : Propulsion & Heat Transfer							
S. No.	**Course Code**	**Course Name**	**L**	**T**	**P**	**C**	
6	10211AE106	Thermodynamics & Heat Transfer	2	1	0	3	T
7	10211AE207	Propulsion Lab	0	0	2	1	L
8	10211AE108	Aircraft Propulsion	3	0	0	3	T
9	10211AE109	Rocket & Space Propulsion	3	0	0	3	T
10	10211AE210	Combustion & Gas Dynamics	2	0	2	3	IT
Concentration Area : Aircraft Structures & Materials							
S. No.	**Course Code**	**Course Name**	**L**	**T**	**P**	**C**	
11	10211AE211	Solid Mechanics	1	1	2	3	IT
12	10211AE312	DIO Lab	0	0	2	1	L
13	10211AE213	Aircraft Structural Mechanics	1	1	2	3	IT
14	10211AE214	Aircraft Structural Dynamics	1	1	2	3	IT
15	10211AE215	Finite Element Analysis	1	1	2	3	IT
Concentration Area : Flight Mechanics & Control							
S. No.	**Course Code**	**Course Name**	**L**	**T**	**P**	**C**	
16	10211AE116	Engineering Mechanics	1	1	0	2	T
17	10211AE217	Linear system Analysis & Control	1	0	2	2	IL
18	10211AE218	Aircraft Systems & Instruments	1	0	2	2	IL
19	10211AE219	Avionics	1	0	2	2	IL
20	10211AE120	Airplane Performance	1	1	0	2	T
21	10211AE221	Airplane Stability & Control	1	0	2	2	IL
Concentration Area : Aircraft Design & Real Time Operating Systems							
S. No.	**Course Code**	**Course Name**	**L**	**T**	**P**	**C**	
22	10211AE223	Introduction to Aerospace Engineering	1	0	2	2	IL
23	10211AE224	Robotics for Aeronautical Engineering	2	0	2	3	IT
24	10211AE225	Aircraft Design	1	0	2	2	IL
Total Credit Requirements						58	

LE Exempted: 10211AE201, 10211AE106, 10211AE211, 10211AE312 - 10 credits*
For circuit branch LE, these courses are mandated to complete. But, Exempted for CGPA/SGPA calculation

Programme Elective (18 Credits Required)

Specialization Electives for Computational Engineering

Concentration Area : Computational Engineering							
S. No.	**Course Code**	**Course Name**	**L**	**T**	**P**	**C**	**Type**
1	10212AE201	Electromechanical Systems	2	0	2	3	IT
2	10212AE202	Introduction to Computer Programming	2	0	2	3	IT
3	10212AE203	Engineering Computation	2	0	2	3	IT
4	10212AE204	Computational Thinking and Data Science	2	0	2	3	IT
5	10212AE205	Scientific Computation	2	0	2	3	IT
6	10212AE206	Software Engineering and Design	3	0	0	3	T

Specialization Electives for Autonomous Drone Technology

Concentration Area : Flight Mechanics & Control							
S. No.	**Course Code**	**Course Name**	**L**	**T**	**P**	**C**	
19	10212AE107	Lighter Than Air System	3	0	0	3	T
20	10212AE108	Flapping Wing Dynamics	3	0	0	3	T
21	10212AE209	Flight Testing	2	0	2	3	IT
Concentration Area : Aircraft Design & Real Time Operating Systems							
S. No.	**Course Code**	**Course Name**	**L**	**T**	**P**	**C**	
22	10212AE110	Unmanned Systems	3	0	0	3	T
23	10212AE211	UAV Mapping & Monitoring	2	0	2	3	IT
24	10212AE212	Data Analysis & System Identification	2	0	2	3	IT

Non Specialization Electives

Concentration Area : Aerodynamics & CFD							
S. No.	**Course Code**	**Course Name**	**L**	**T**	**P**	**C**	**Type**
1	10212AE219	Computational Vehicle Aerodynamics	2	0	2	3	IT
2	10212AE220	Computational UAV Aerodynamics	2	0	2	3	IT
3	10212AE221	Design & Analysis of Space Mission Vehicles	2	0	2	3	IT
4	10212AE222	High Speed Jet Flows & Simulation	2	0	2	3	IT
5	10212AE223	Aerodynamic Analysis of Turbo machines	2	0	2	3	IT
6	10212AE124	Rotary Wing Aerodynamics	3	0	0	3	T
Concentration Area : Propulsion & Heat Transfer							
S. No.	**Course Code**	**Course Name**	**L**	**T**	**P**	**C**	
7	10212AE125	Propellants & Fuel Technology	2	0	2	3	IT
8	10212AE126	Cryogenic Engineering	3	0	0	3	T
9	10212AE227	Electric Propulsion	2	0	2	3	IT

10	10212AE128	RAMJET & SCRAMJET Propulsion	3	0	0	3	T
11	10212AE129	Combustion in Rocket & Jet Engine	3	0	0	3	T
12	10212AE130	Acoustics instabilities	3	0	0	3	T
Concentration Area : Aircraft Structures & Materials							
S. No.	**Course Code**	**Course Name**	**L**	**T**	**P**	**C**	
13	10212AE131	Aircraft Materials	3	0	0	3	T
14	10212AE132	Composite Materials & Structures	3	0	0	3	T
15	10212AE133	Experimental Stress Analysis	3	0	0	3	T
16	10212AE134	High Temperature Materials	3	0	0	3	T
17	10212AE135	Vibrations & Aeroelasticity	3	0	0	3	T
18	10212AE236	Aircraft Component Design	2	0	2	3	IT
Concentration Area : Flight Mechanics & Control							
	10212AE137	Space Flight Mechanics	3	0	0	3	
Total Credit Requirements						18	

Independent Learning

S. No.	Course Code	Course Name	L	T	P	C	Type
1	10214AE601	Community Service Project	0	0	2	1	Project
2	10214AE701	Minor Project 1	0	0	4	2	Project
3	10214AE702	Minor Project 2	0	0	4	2	Project
4	10214AE801	Capstone Project	0	0	18	9	Project

Industry / Higher Institute Interaction

S. No.	Course Code	Course Name	L	T	P	C	Type
1	10215AE901	Industry Internship 1				1	Internship
2	10215AE902	Industry Internship 2				1	Internship
3	10215AE903	Industry Internship 3				2	Internship
4	10215AEXXX	Industry / Abroad Expert Course 1				1	T/IT/IL
5	10215AEXXX	Industry / Abroad Expert Course 2				2	T/IT/IL

Value Added Courses Courses

S. No.	Course Code	Course Name	L	T	P	C	Type
1	10219AE201	Design, Drafting, GD&T and 3D Printing	0	0	2	1	L
2	10219AE202	MATLAB & Python for Aerospace Engineers	0	0	2	1	L
3	10219AE203	Ansys CFD, COMSOL Multiphysics & Ansys FEM	0	0	2	1	L
4	10219AE204	Machine Learning for Aerospace Engineering	0	0	2	1	L

Open Elective
(For other department students)

Concentration Area : Aerodynamics & CFD							
S. No.	**Course Code**	**Course Name**	**L**	**T**	**P**	**C**	**Type**
1	**10213AE101**	Wind Engineering	3	0	0	3	T
2	10213AE102	Drones & its applications	3	0	0	3	T
Concentration Area : Propulsion & Heat Transfer							
S. No.	**Course Code**	**Course Name**	**L**	**T**	**P**	**C**	
6	**10213AE103**	Space Exploration	3	0	0	3	T
Concentration Area : Aircraft Structures & Materials							
S. No.	**Course Code**	**Course Name**	**L**	**T**	**P**	**C**	
11	**1021AE104**	Smart Structures	3	0	0	3	T
Total Credit Requirements						12	

General Degree Requirement - 164

Above 164 Credits requirement for Honor / Minor Degree

Honors in Aerial Robotics

Concentration Area : Flight Mechanics & Control							
S. No.	**Course Code**	**Course Name**	**L**	**T**	**P**	**C**	
16	**10212AE113**	Introduction to Aerial Robotics	3	0	0	3	T
17	**10212AE114**	Robotic Perception	3	0	0	3	T
18	**10212AE115**	Navigation, Guidance & Control	3	0	0	3	T
Concentration Area : Aircraft Design & Real Time Operating Systems							
S. No.	**Course Code**	**Course Name**	**L**	**T**	**P**	**C**	
22	**10212AE116**	Computational motion planning	3	0	0	3	T
23	**10212AE117**	State Estimation & learning	3	0	0	3	T
24	**10212AE218**	Experiential Learning on Aerial Robotics	1	0	4	3	IL
Total Credit Requirements						18	

Minor Degree in UAV Remote Sensing & Mapping
(Requirements for other department students)

Concentration Area : Aerodynamics & CFD							
S. No.	**Course Code**	**Course Name**	**L**	**T**	**P**	**C**	**Type**
1		UAV Aerodynamics	1	0	0	1	T
Concentration Area : Propulsion & Heat Transfer							
S. No.	**Course Code**	**Course Name**	**L**	**T**	**P**	**C**	
6		UAV Propulsion	1	0	0	1	T
Concentration Area : Aircraft Structures & Materials							
S. No.	**Course Code**	**Course Name**	**L**	**T**	**P**	**C**	
11		UAV Structures	1	0	0	1	T
Concentration Area : Flight Mechanics & Control							
S. No.	**Course Code**	**Course Name**	**L**	**T**	**P**	**C**	
16		UAV Systems	2	0	2	3	IT
17		UAV & Satellite Remote Sensing	3	0	0	3	T
18		UAV Survey Techniques	3	0	0	3	T
Concentration Area : Aircraft Design & Real Time Operating Systems							
S. No.	**Course Code**	**Course Name**	**L**	**T**	**P**	**C**	
22		Aerial Photography & Interpretation	2	0	2	3	IT
23		UAV Mapping	1	0	4	3	IL
Total Credit Requirements						18	

Aeronautical Engineering

Recommended Degree Chart

I & II Sem		III		IV		V		VI		VII - Intensive		VIII	
10210PH102 / Physics of Materials	3												
10210PH103 / Applied Physics	2	10211AE201 / Fluid Mechanics	3	10211AE202 / Low Speed Aerodynamics	3	10211AE203 / High Speed Aerodynamics	3	10211AE109 / Rocket & Space Propulsion	3				
10210PH302 / Applied Physics Laboratory	1	10211AE106 / Thermodynamics & Heat Transfer	3	10211AE207 / Propulsion Lab	1	10211AE205 / Computational Fluid Dynamics	3	10211AE210 / Combustion & Gas Dynamics	3				
10210CH101 / Engineering Chemistry	3	10211AE211 / Solid Mechanics	3	10211AE108 / Aircraft Propulsion	3	10211AE120 / Airplane Performance	2	10211AE215 / Finite Element Analysis	3				
10210CH301 / Engineering Chemistry Laboratory	1	10211AE312 / DIO Lab	1	10211AE213 / Aircraft Structural Mechanics	3	10211AE221 / Airplane Stability & Control	2	10211AE214 / Aircraft Structural Dynamics	3				
10210EN201 / Professional Communication-I	2	10211AE116 / Engineering Mechanics	2	10211AE217 / Linear system Analysis & Control	2	10211AE224 / Robotics for Aeronautical Engineering	3	10211AE225 / Aircraft Design	2				
10210EN202 / Professional Communication-II	2	10211AE223 / Introduction to Aerospace Engineering	2	10211AE218 / Aircraft Systems & Instruments	2	10211AE219 / Avionics	2	10211AE204 / Aircraft Design Rules & Certification	1				
10210BM101 / Biology for Engineers	2												
10210MA201 / Matrices and Calculus	3	**10210MA105 / Transforms & Fourier Series**	3	**10210MA109 / Numerical Methods**	3			**10210ME103 / Innovation & Entrepreneurship**	2	**10210ME104 / Project Management & Finance**	2		
10210MA203 / Vector Calculus and Complex Variables	3	**10210BL101 / Constitution of India**	0	**10210ME105 / Engineers and Society**	0			**10210CH103 / Environmental Studies**	2				
10210CS101 / Problem Solving Using C	3	PE1	3	PE2	3	PE3	3	PE4	3	PE5	3		
10210CS301 / Problem Solving Using C Lab	1									PE6	3		
10210CS201 / Python Programming	2	OE1	3	OE2	3	OE4	3			OE3	3		
10210CS303 / IT Workshop	1												
10210EE301 / Engineering Products Lab	1	PPC4	1	PPC1	1	PPC2	1	PPC3	1				
10210ME101 / Design Thinking	2												
10210ME201 / Engineering Graphics	3	IHL1	1			IHL1	1						
10210ME102 / Universal Human Values	3			Community Project	1	Mini Project 1	2	Mini Project 2	2			Capstone Project	9
10210EE204 / Introduction to Engineering	3												
10210EE201 / Basic Electrical, Electronics and Measurement Engineering	3												
I&II	**44**	**III**	**25**	**IV**	**25**	**V**	**25**	**VI**	**25**	**VII**	**11**	**VIII**	**9**

Class work schedules

Vel Tech
Rangarajan Dr. Sagunthala
R&D Institute of Science and Technology
(Deemed to be University Estd. u/s 3 of UGC Act, 1956)

Date: 19-05-2022

The Academic Calendar for the Academic Year 2022-23

ACADEMIC CALENDAR AY 2022-23		
B.Tech. – II YEAR	**SUMMER SEMESTER**	**WINTER SEMESTER (Tentatively)**
Commencement of Student Semester Registration	28-Jun-22	15-Dec-22
Commencement of Course Registration	18-Jul-22	26-Dec-22
Commencement of Class Work	25-Jul-22	02-Jan-23
Last Date for Semester Registration	01-Aug-22	09-Jan-23
Last Date for Semester Registration with late fee / Course Registration	08-Aug-22	19-Jan-23
Test - 1 (Theory Courses)	22-Aug-22	31-Jan-23
Mid Term Test - I (Integrated Courses)	19-Sep-22	25-Feb-23
Test -2 (Theory Courses)	17-Oct-22	24-Mar-23
Model-Practical Exam	02-Nov-22	11-Apr-23
Test-3 (Theory Courses) / Mid Term Test - 2 (Integrated Courses)	07-Nov-22	17-Apr-23
Last Instructional Day	12-Nov-22	25-Apr-23
EXAMINATIONS		
Semester End Exam Timetable notification	31-Oct-22	04-Apr-23
Commencement of Semester End Practical/Viva-voce Examination	14-Nov-22	27-Apr-23
Commencement of Semester End Theory Examination	24-Nov-22	10-May-23
Declaration of Semester End Examination Results	One week from the date of Last Examination	One week from the date of Last Examination
HOLIDAYS		
LIST OF PUBLIC HOLIDAYS	AS PER TAMIL NADU STATE GOVERNMENT PUBLIC HOLIDAYS	
DUSSEHRA HOLIDAYS	01-Oct-22 to 05-Oct-22	
INPLANT TRAINING	18 – Jul-22 to 25 – Jul-22	15-Dec-22 to 31-Dec-22
Commencement of the Next Academic Year (2023-24) is 26–JUNE-2023 (Tentatively)		

*First and Third Saturday – Non Instructional day

Dr. M. J. Carmel Mary Belinda
Dean - Academics
in-charge
Vel Tech
Rangarajan Dr. Sagunthala
R&D Institute of Science and Technology

Prof. S. Salivahanan
Vice Chancellor
Vel Tech
Rangarajan Dr. Sagunthala

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Quad Option Framework

The VTR UGE 21 regulations is a fully flexible choice based credit system. If the student completes credits as per degree chart provided in this document, they can choose Year long internship during their 7 & 8 sem to pursue their Capstone Project along with career option. The Year long internship options are given below.

Students Opportunities

Exploration Beyond Employment

Year Abroad Internship	Year Industry Internship	Incubation I-map	Placement TEEP

Scheme	Eligibility	Outcome
Industry Internship / + Capstone Project	144 Credit completed till 6 sem (No pending in core & foundation) and 155 credits after 7 (intensive).	Industry: One year industry project to provide industry practicing skills within a degree programme.
International Internship / 3+2 Programme + Capstone Project	144 Credit completed till 6 sem (No pending in core & foundation) and 155 credits after 7 (intensive).	Students will be sent to partner institutes abroad for about one year. They will be educated with funding options for projects as well as masters.
TBI (Company establishment) + Capstone	144 Credit completed till 6 sem (No pending in core & foundation) and 155 credits after 7 (intensive).	Students can start their own business and they will get guidance & technical assistance. The successful product development will be considered as a capstone project.
Placement Training + Capstone Project	144 Credit completed till 6 sem (No pending in core & foundation) and 155 credits after 7 (intensive).	Students can enroll themselves in placement cells to get company specific training and placement assistance. They will be allocated with inhouse projects.

PBL Projects - How to Pursue?

The PBL projects are developed for implementing project based learning. The PBL project is identified for each semester and a certain percentage of internal marks will be awarded based on performance of the PBL project. The following courses are selected for III sem.

	Course Code	Course Name	L	T	P	C	A	Hours	Marks for PBL
1	10211AE201	Fluid Mechanics	2	0	2	3	2	6	5
2	10211AE106	Thermodynamics & Heat Transfer	2	1	0	3	2	5	5
3	10211AE211	Solid Mechanics	1	1	2	3	2	6	5
4	10211AE116	Engineering Mechanics	1	1	0	2	2	4	5
5	10211AE223	Introduction to Aerospace Engineering	1	0	2	2	2	5	10

Project List

Computational Specialization	Drone Specialization
Design & Development of Wind Turbine	Development of Force Component Test Rig for Drone (Fixed Wing)
Development of IoT based BP measurement system	Development of Force Component Test Rig for Drone (Multicopter Wing)
Design of Wing & its characterization	Development of Drone Motor Test Rig
Development of Flow Control Techniques	Development of Simple Drone Control Systems
Development of simple heat engine	Design & development of drone electric motor & testing
Design of propellor	Design of flapping wing UAV

Students shall register as a group (maximum 3 members) in below form. Duplicate forms will not be considered. Only team leads need to be applied.

https://docs.google.com/forms/d/e/1FAIpQLScOlBRUSai5wUsFyPtBV1nEjjHvDgcaQ1gS-vSNWDtmNS1_Sw/viewform?usp=pp_url

Syllabus of the Courses - Summer 22-23

Course Code	Course Name	L	T	P	C
10211AE201	Fluid Mechanics	2	0	2	3

Category : Program Core

Type : Integrated Theory / PBL

Total Course Meeting Hours - 90

L	T	P	A	H/Week
2	0	2	2	6

Prerequisite	10210MA203/ Vector Calculus and Complex Variables	Linked Courses	Low Speed Aerodynamics

The course aims at providing the students with a broad understanding of fluid statics and dynamics. It deals with the dimensional analysis of models and introduces analysis of flow through pipes. It outlines the elementary concepts of boundary layer theory.

Course Outcomes

No	Statement	Learning Levels
1	Identify types of fluids and flow patterns	Remember
2	Estimate the properties of fluid using analytical and experimental methods	Understand
3	Apply the governing equations of fluid mechanics to identify the velocity & potential functions.	Apply
4	Estimate losses in pipe flow using analytical and experimental methods	Apply
5	Compute boundary layer thickness & aerodynamic forces for flat plates using analytical methods & Experimental methods	Analyze
6	Practice dimensional analysis, physical modeling and identify scale effects for fluid flow problems	Evaluate

Course Contents		Activity Set			CO	Contact Hours
		Problem	**Practice**	**Project**		
1	Properties of fluids	Determination of fluid properties			**2**	**5**
2	Fluid statics- Measurements of pressure by various manometers and pressure gauges	Determine the pressure by manometers	Measuring the pressure drop across a flow section or a flow device		**2**	**5+2**
3	Fluid models and types of flow	Calculation of Kinematic Properties	Measure the flow rate using venturi and orifice		**1**	**3+2**
4	Classification of flow lines	Determine the type of fluid motion.			**1**	**3**
5	Mass, Bernoulli and energy equations	Apply Bernoulli's equation to solve a variety of fluid flow problems.	Verification of Bernoulli’s theorem in practically		**3**	**3+2**
6	Laminar and Turbulent Flow in Pipes	Determine the flow rate of fluid through the pipe	Flow Rates in Horizontal Pipes		**4**	**4+ 2**
7	Expression for loss of head due to friction in pipes or Darcy – Weisbach Equation.	Determine the head loss and the pressure drop in pipe flow	Determine major and minor Losses in a Pipe		**4**	**4+2**

8	Introduction to Boundary layer theory	Estimate the boundary layer thickness			**5**	**3**
9	Laminar Fully Developed Pipe Flow	Determine the viscous flow parameters			**4**	**4+2**
10	Turbulent Pipe Flow and types	Compute the various pipe flow problems in turbulent flow			**4**	**4+2**
11	Dimensional analysis and methods	Determine the dimensions of Constants.			**6**	**4**
12	Model Analysis & Physical Modeling	Determine the Similarity between Model and Prototype.			**6**	**4**
Total Course Meeting Hours						**60**

Textbook & Other resources

1. Kumar, K.L., “Engineering Fluid Mechanics”, Eurasia Publishing House (P) Ltd., New Delhi (7th edition), 1995.
2. Bansal, R.K., “Fluid Mechanics and Hydraulics Machines”, (5th edition), Laxmi publications (P) Ltd., New Delhi, 1995
3. Philip J. Pritchard, “Fox and Mcdonald's Introduction to Fluid Mechanics”, John Wiley & Sons Inc, 8th edition, 2011
4. YunusCengel, John Cimbala, “Fluid Mechanics in SI Units”, McGraw Hill Education (India) Private Limited, 3rd edition, 2014
5. Frank White, “Fluid Mechanics”, McGraw-Hill Education, 8th edition, 2015

Grading

Performance will be evaluated on the basis of class participation, problem set performance, and the group design project. There will be three tests and one final theory exam. The final grade for the course will be calculated approximately as follows:

Continuous Evaluation (CE)			**Semester End Examination (SE)**	**Total Grading**
Average of Two Mid Term	**Model Lab**	**Total CE**	**Theory Exam**	**CE + SE**
20	**20**	**40**	**60**	**100**

Criteria	**Score**	**Course Outcomes for evaluation**
Mid Term Test 1	**20**	**1,2,3**
Mid Term Test 2	**20**	**4,5,6**
Model Lab (in which 5 marks for PBL Project)	**20**	**1,2,3,4,5,6**

Group Project

There shall be group projects based on the selected core courses. The CDIO based project / problem will be assigned to each student by the core courses offering committee (CCOC). The problem / Project shall consist of expected course outcomes from each core course and students are expected to deliver a solution in expected format. The evaluation shall be made by CCOC meeting during the prescribed time line and as per rubrics of the selected problem set. The problem sets will be given to the students during the first week of class participation.

Instructors:

Mr. A.Adaikalaraj **Assistant Professor / Aeronautical Engineering** **aadaikalaraj@veltech.edu.in** **2023, Faculty Cabin**	**Dr. R. Narenshankar** **Associate Professor /Aeronautical Engineering** **narensankar@veltech.edu.in** **Research Park,**

Activity Hours:

Each week two hours will be allocated for an activity hour in which course handling faculty members of SM, FM, TD, EM & IAE along with PBL coordinator will mentor the students to pursue group activity cum projects. Each student needs to join a three member student team and be assigned with one combined project. The PBL committee will monitor and mentor the student to pursue the activity. The scores will be computed based on the activity participation and final demo cum presentation & report.

Reg No:

B. TECH. DEGREE EXAMINATIONS, MAY/DEC 2022

AERONAUTICAL ENGINEERING

10211AE201 - Fluid Mechanics

Maximum : 60 Marks **Duration : Three Hours**

K1 – Remember, K2 – Understand, K3 – Apply, K4 – Analyze, K5 – Evaluate, K6 - Create

Part A (10 X 2 = 20 Marks) (K level shall not exceed K2)

Q. No.	CO Distribution	K Level	Special Instructions if any
1	CO1	K3	
2	CO4	K3	CO4 is to validate the experimental component of CO1 & 2. Appropriate question to test the experimental & Numerical procedure with respect to CO 1 & 2 is expected.
3	CO2	K3	
4	CO4	K4	CO4 is to validate the experimental component of CO1 & 2. Appropriate question to test the experimental & Numerical procedure with respect to CO 1 & 2 is expected.
5	CO3	K4	
6	CO3	K4	
7	CO5	K5	
8	CO5	K5	
9	CO6	K5	
10	CO6	K5	

Part – B (5 X 8 = 40 Marks) (K level shall not exceed the mentioned level)

Q. No.		CO Distribution	K Level	Special Instructions if any
11	(a)	CO1	K3	
	[OR]			
	(b)	CO1	K3	

12	(a)	CO2	K3	
	[OR]			
	(b)	CO2	K3	
13	(a)	CO3	K4	
	[OR]			
	(b)	CO3	K4	
14	(a)	CO5	K5	
	[OR]			
	(b)	CO5	K5	
15	(a)	CO6	K5	
	[OR]			
	(b)	CO6	K5	

Course Code	Course Name	L	T	P	C
10211AE106	Thermodynamics & Heat Transfer	2	1	0	3

Category: Program Core

Type: Theory / PBL

Total Course Meeting Hours - 75

L	T	P	A	H/Week
2	1	0	2	5

Prerequisite	Vector Calculus and Complex Variable	Linked Courses	Aircraft Propulsion

Course Description: This course supports understanding the First and Second laws of thermodynamics along with the concepts of temperature, internal energy, heat, work, entropy, Refrigeration, and Basics of heat transfer like conduction, convection, radiation. This course deals with the Modes of heat transfer Basic laws governing conduction, convection, and radiation heat transfer and its application.

Course Outcomes

No	Statement	Learning Levels	
		Cognitive	Affective
1	Apply the thermodynamic process to solve problems	**Apply**	**Responding**
2	Performance analyses of Otto Cycle, Diesel Cycle, and Brayton cycle	**Apply**	**Responding**
3	Explain the working principles of vapour compression a refrigeration systems	**Apply**	**Responding**
4	Apply heat conduction, convection and radiation concepts to solve the real time problems.	**Apply**	**Responding**
5	Apply LMTD and NTU methods to design heat exchangers	**Apply**	**Responding**

Course Contents		Activity Set			Contact Hours
Unit 1	Thermodynamics Laws and Air Standard Cycles (CO 1, 2)	Problem	Practice	Project	
	CO1				
1.1	Basic concepts of thermodynamics and steady flow energy equation	Steady Flow Energy Equation			10
1.2	Law of thermodynamic and thermodynamic process	Thermodynamic Process			5
	CO2				
1.3	Air standard cycles: Otto, Diesel and Brayton	Air Standard efficiency			10
Unit 2	**Refrigeration and Conductive Heat Transfer (CO 3, CO4)**				

	CO3				
2.1	Refrigeration: working principle of vapour compression refrigeration system - properties of refrigerants.		Determination of COP using Refrigeration Test Rig		3+2
	CO4				
2.2	Basic concept of heat transfer - general heat conduction equation in cartesian and cylindrical coordinates – composite plane wall and cylinder - critical radius of insulation	Composite Wall, Cylinder and Fin	Determine the Thermal Conductivity of Insulating Material using Composite Wall Apparatus		12+2
2.3	Fins: Rectangular fin Fin efficiency and fin effectiveness				6
Unit 3	**Convection, Radiation and Heat Exchanger.** **(CO 5)**	**Problem**	**Practice**	**Project**	**Contact Hours**

3.1	Free convection in external flows: vertical and horizontal bodies. Forced convection in internal and external flows	Flow over Plate and Cylinders. Flow in Tubes	Determine the Heat Transfer using forced convection apparatus		8+ 2
3.2	Basic concepts of radiation - radiation shields	Radiation Shield	Determine the Emissivity of Gray Surface		3+ 2
3.3	Introduction to heat exchanger - LMTD and NTU methods for parallel and counter flow heat exchangers	Heat Transfer and Effectiveness			10
Total Course Meeting Hours					75

Textbook & Other resources

1. Yunus A Cengel / Michael A Boles, “Thermodynamics - An Engineering Approach”, (SI Units), Tata Mc Graw Hill India, 7th edition, Special Indian Edition 2011.
2. P K Nag, “Engineering Thermodynamics”, Tata McGraw Hill, New Delhi, 6th Edition, 2008.
3. Rathakrishnan E., “Fundamentals of Engineering Thermodynamics”, Prentice-Hall India, 2005
4. Principals of heat transfer,FrankKreith, Raj M. Manglik, Mark S. Bohn, Seventh Edition, Cengage learning, 2011.
5. Yunus A. Cengel - Heat transfer, a practical approach, Fifth edition,Tata Mc Graw Hill.
6. J P Holman, Souvik Bhattacharyya, 10th Edition, McGraw Hill Education Private Ltd.

Grading
Performance will be evaluated on the basis of class participation, problem set performance, and the group design project. There will be three tests and one final theory exam. The final grade for the course will be calculated approximately as follows:

Continuous Evaluation (CE)				Semester End Examination (SE)	Total Grading
Average of Three Test	Assignment cum Presentation	Class Participation	Total CE	Theory Exam	CE + SE
30	5	5	40	60	100

Criteria	Score	Course Outcomes for evaluation
Test 1	30	1 & 2
Test 2	30	3 & 4
Test 3	30	5 & 6
Group Project	5	3 & 4
Class Participation	5	Nil

Group Project
There shall be group projects based on the selected core courses. The CDIO based project / problem will be assigned to each student by the core courses offering committee (CCOC). The problem / Project shall consist of expected course outcomes from each core course and students are expected to deliver a solution in expected format. The evaluation shall be made by CCOC meeting during the prescribed time line and as per rubrics of the selected problem set. The problem sets will be given to the students during the first week of class participation.

Instructors

Dr.S.Ganesan **Professor** drganasans@veltech.edu.in **2023,Head Office, Aeronautical Engineering**	**Mr. B.Kirubadurai** **Assistant Professor,** **kirubaduraib@veltech.edu.in** **2023,Head Office, Aeronautical Engineering**

Reg No:

B. TECH. DEGREE EXAMINATIONS, MAY/DEC 2022
AERONAUTICAL ENGINEERING

10211AE106 Thermodynamics & Heat Transfer

Maximum : 60 Marks **Duration : Three Hours**

K1 – Remember, K2 – Understand, K3 – Apply, K4 – Analyze, K5 – Evaluate, K6 - Create

Part A (10 X 2 = 20 Marks) (K level shall not exceed K2)

Q. No.	CO Distribution	K Level	Special Instructions if any
1	CO1	K2	
2	CO1	K2	
3	CO2	K2	
4	CO2	K2	
5	CO3	K3	
6	CO3	K3	
7	CO4	K3	
8	CO4	K3	
9	CO5	K3	
10	CO5	K3	

Part – B (5 X 8 = 40 Marks) (K level shall not exceed the mentioned level)

Q. No.		CO Distribution	K Level	Special Instructions if any
11	(a)	CO1	K2	
	[OR]			
	(b)	CO1	K2	
12	(a)	CO2	K2	
	[OR]			

	(b)	**CO2**	**K2**	
13	**(a)**	**CO3**	**K2**	
	[OR]			
	(b)	**CO3**	**K2**	
14	**(a)**	**CO4**	**K2**	
	[OR]			
	(b)	**CO4**	**K2**	
15	**(a)**	**CO5**	**K2**	
	[OR]			
	(b)	**CO5**	**K2**	

Course Code	Course Name	L	T	P	C
10211AE223	Introduction to Aerospace Engineering	1	0	2	2

Category: Program Core

Type : Integrated Lab/ PBL

Total Course Meeting Hours - 60

L	T	P	A	H/Week
1	0	2	1	4

Prerequisite	Nil	Linked Courses	1. Aircraft systems and Instruments 2. Airplane Performance

Course Description:

Course Outcomes

No	Statement	Learning Levels	
		Cognitive	Affective
1	Collet the history and evolution of aircraft	Knowledge	Receiving
2	Classify the flying vehicles & map its applications	Understand	Receiving
3	Understand the anatomy of flying vehicles and observe its functions	Apply	Responsing
4	Correlate Thrust & Power with altitude	Apply	Valuing
5	Compute aerodynamic forces of aerofoil & wing	Analysis	Organizing
6	Prototype simple aircraft & its components	Design	Characterizing

Course Contents		Activity Set			Contact Hours
CO	**CO-1 Collet the history and evolution of aircraft**	**Problem**	**Practice**	**Project**	
1	History and Introduction of Aeronautical Engineering National and International development strategy			Chronological order of aircraft evaluation in history	1
	Evolution of Air Transportation: Urban Air Mobility				1
2	**CO-2-Classify the flying vehicles & map its applications**	**Problem**	**Practice**	**Project**	**Contact Hours**
	Classification of Aircrafts: Exploring HTA and LTA				1
3	**CO-3 Understand the anatomy of flying vehicles and observe its functions**	**Problem**	**Practice**	**Project**	**Contact Hours**
	Aircraft Anatomy: Parts and functions of different aircrafts			Draw the free-hand sketch of Different types aircraft wings	1
	Exploring Wings: Different types and its significance				2
	Exploring Tail: Different types and its significance				1

	Aircraft Structures: Anatomy of fuselage and wings, introduction to aircraft materials			Draw the free-hand sketch of Different types aircraft fuselage	2
	Aircraft classification: Power and speed				1
4	**CO-4 Correlate Thrust & Power with altitude**	**Problem**	**Practice**	**Project**	**Contact Hours**
	Power plant: Introduction to IC engines, propellers and thrust				2
	Rockets: Types and principles				1
5	**CO-5 Compute aerodynamic forces of aerofoil & wing**	**Problem**	**Practice**	**Project**	**Contact Hours**
	The Atmosphere: Altitude and its effects on pressure, temperature and density				2
	Four forces: Evaluation Lift and Drag				1
	Drag and its components				1
	Aerofoil: Angle of attack and pressure distribution				1
	Aerofoil: Characteristics (Ar, W/S, CoP, Aerodynamic center)				1
	Aircraft: Introduction to maneuvers, mathematical model				1

6	CO-6 Prototype simple aircraft & its components (Any 3 by faculty)	Problem	Practice	Project	Contact Hours
	Exp 1: Prototyping of various types of aircraft wings		CNC & 3D Printer		25 Hrs
	Exp 2: Prototyping of various types of aircraft tails		Sheet metals		
	Exp 3: Prototyping of various types of aircraft fuselage		Sheet metals & wood		
	Exp 4: Prototyping of flight control surfaces		Drone Manufacturing		
	Exp 5: Assembling of aircraft components		Basic assembly tools		
	Exp 6: Demonstration of LTA / Flapping Wing / Gliding			Wind Tunnel Testing	
	Exp 7: Effects of Aspect Ratio		Wind Tunnel Testing		
	Exp 8: Effects of Forward Velocity		Wind Tunnel Testing		
	Exp 9: Propeller Characterization		Wind Tunnel Testing		
Total Course Meeting Hours: 60 Hrs					

Text Books:

1. Anderson, J.D., "Introduction to Flight", 6th edition, McGraw-Hill Higher Education,2015
2. Steven Brandt, "Introduction to Aeronautics: A Design Perspective" 3rd edition, AIAA Education series, 2015

ii. References:

1. David J.Newman, "Interactive Aerospace Engineering and Design," International student edition Edition, McGraw-Hill Higher Education.
2. Gregg Angles, "Introduction to Aeronautics", Random Exports, 2013
3. A.C. Kermode, "Flight without Formulae", 5th edition, Pearson Education, 2008
4. A.C. Kermode, R.H.Barnard, D.R. Philpott, "Mechanics of Flight", 12th Edition, Pearson,2012
5. LalitGupta, O P Sharma, "Fundamentals of Flight Basic Aerodynamics, Aircraft Structures, Aircraft Propulsion, Aircraft Systems (Vol 1 to 4), 1st edition, 2006
6. John Cutler, "Understanding Aircraft Structures", 4th Edition, Wiley, 2014
7. Dorothy Kent, "Aircraft Materials & Processes", 5th Edition,1998
8. A. Kanni Raj, "Materials: Aircraft & Aerospace", Create Space Independent Publishing Platform, 2015
9. S.K. Ojha," Flight performance of aircraft", AIAA Education Series,1995

Grading

Students' Performance will be evaluated based on lab participation, conducting an experiment, Results and analysis, Viva-Voce and Record. There will be a model lab and one final exam. The final grade for the course will be calculated as follows:

Continuous Evaluation (CE)		**Semester End Examination (SE)**		**Total Grading**
Experiments	Model Lab	Theory	Lab	**CE + SE**
15	25 (15 ML + 10 PBL)	20	40	**100**

Instructor

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2023, Faculty Cabin

Reg No:

B. TECH. DEGREE EXAMINATIONS, MAY/DEC 2022
AERONAUTICAL ENGINEERING

10211AE223 Introduction to Aerospace Engineering

Maximum : 60 Marks **Duration : Three Hours**

K1 – Remember, K2 – Understand, K3 – Apply, K4 – Analyze, K5 – Evaluate, K6 - Create

Part A (10 X 2 = 20 Marks) (K level shall not exceed K2)

Q. No.	CO Distribution	K Level	Special Instructions if any
1	CO1	K2	
2	CO1	K2	
3	CO2	K2	
4	CO2	K2	
5	CO3	K3	
6	CO3	K3	
7	CO4	K3	
8	CO4	K3	
9	CO5	K3	
10	CO5	K3	

Part – B (5 X 8 = 40 Marks) (K level shall not exceed the mentioned level)

Q. No.		CO Distribution	K Level	Special Instructions if any
11	(a)	CO1	K2	
	[OR]			
	(b)	CO1	K2	
12	(a)	CO2	K2	
	[OR]			

	(b)	**CO2**	**K2**	
13	**(a)**	**CO3**	**K2**	
	[OR]			
	(b)	**CO3**	**K2**	
14	**(a)**	**CO4**	**K2**	
	[OR]			
	(b)	**CO4**	**K2**	
15	**(a)**	**CO5**	**K2**	
	[OR]			
	(b)	**CO6**	**K2**	**Expected questions from process of practicing experiments / data sets to result estimation**

Course Code	Course Name	L	T	P	C
10211AE211	Solid Mechanics	1	1	2	3

Category : Program Core

Type : Integrated Theory / PBL

Total Course Meeting Hours - 90

L	T	P	A	H/Week
1	1	2	2	6

Prerequisite	10210MA203/ Vector Calculus and Complex Variables	Linked Courses	Aircraft Structural Mechanics

Course Description: Solid mechanics is a branch of mechanics that studies the behavior of solid matter under external forces, particularly deformation. This is the most fundamental course that an Aeronautical Engineer should take. High school mechanics is mostly focused on stiff bodies. The mechanics of deformable bodies are studied in this course. The concepts of stress, strain, axial force, shear force, bending moment, bending, and torsion for elastic bodies are covered in this course. In a nutshell, the course seeks to improve students' ability to solve engineering problems involving material strength.

Course Outcomes

No	Statement	Learning Levels	
		Cognitive	Affective
CO1	Apply material science fundamentals to solve determinate structures problems	Apply	Valuing
CO2	Identify structural concepts using shear force and bending moment diagrams	Apply	Valuing
CO3	Interpret the technique to evaluate deflection of beams	Analysis	Valuing
CO4	Apply structural analysis to validate the experimental results of determinate structural problems	Analysis	Valuing
CO5	Evaluate torsional strength and stiffness of given material	Evaluate	Organizing
CO6	Analysis of failure in thin walled cylinder and spherical structures due to internal fluid pressure	Evaluate	Characterizing

Course Contents			Activity Set			Contact Hours
Unit 1	**Deformation of Solids**	**CO No**	**Problem**	**Practice**	**Project**	
1.1	Material Properties-Hooke's Law- Elastic constants and their relationship- Statically determinate and indeterminate cases	1	Elastic Constants	Determine the Hardness, Impact and tensile strength of a given Material.	Validate experimental results with numerical analysis using Ansys.	10
1.2	Deformation of simple and compound bars- stresses due to freely falling weight.	1	Find strain energy with the given condition			10
1.3	principal stresses and principal planes – Mohr's circle of stress.	1	Mohr's Circle			5
Unit 2	**Transverse Loading on Beams and its Deflection**		**Problem**	**Practice**	**Project**	**Contact Hours**
2.1	Types of transverse loading on beams – Shear force and bending moment diagrams in beams – Cantilevers – Simply supported beams and overhanging beams.	2&4	Draw SFD and BMD	Determine the deflection of beams with given loading conditions.	Validate experimental results with numerical analysis using Ansys.	15
2.2	Theory of simple bending-Deflection of beams-Double Integration method – Macaulay's method – Area moment method	3&4	Find the slope and deflection of beam with the given load conditions			10
Unit 3	**Torsion, Springs and Thin Vessels**		**Problem**	**Practice**	**Project**	**Contact Hours**
3.1	Torsion of a (circular) shaft- Design of Springs	5	Calculate the power	Find the torsional strength of a given rod; Find the stiffness of the	Assignment	15

			transmission of the shaft; Design a spring with given Conditions	Spring		
3.2	Stresses in thin cylinders and spherical shells due to internal fluid pressure	6		Find stresses induced in the given thin-walled cylinder and spherical shell		10
Total Course Meeting Hours						**60+15=75**

Textbook & Other resources

i. Text Books:

1. Timoshenko, S., "Strength of Materials", Vol. I and II, Princeton D. von Nostrand Co, 1990.
2. E. P. Popov, Introduction to Mechanics of Solids, Prentice Hall, 1973.
3. L. S. Srinath, Advanced Solid Mechanics, Second Edition, Tata McGraw Hill, 2003.

ii. References:

1. S. Ramamrutham, R. Narayanan., "Strength of Materials", 18th Edition.,2014
2. C S Reddy., "Basic Structural Analysis", 3rd Edition., 2010
3. James M. Gere, Timoshenko, "Mechanics of Materials" 2nd edition, CBS Publisher,2006.

Grading

Performance will be evaluated on the basis of class participation, problem set performance, and the group design project. There will be three tests and one final theory exam. The final grade for the course will be calculated approximately as follows:

Continuous Evaluation (CE)			**Semester End Examination (SE)**	**Total Grading**
Average of Two Test	**Model Lab**	**Total CE**	**Theory Exam**	**CE + SE**
20	**20 (15 ML + 5PBL)**	**40**	**60**	**100**

Criteria	**Score**	**Course Outcomes for evaluation**
Test 1	**20**	**1,2& 3**
Test 2	**20**	**4,5&6**
Model Lab	**20**	**1 to 6**

Group Project

There shall be group projects based on the selected core courses. The CDIO based project / problem will be assigned to each student by the core courses offering committee (CCOC). The problem / Project shall consist of expected course outcomes from each core course and students are expected to deliver a solution in expected format. The evaluation shall be made by CCOC meeting during the prescribed time line and as per rubrics of the selected problem set. The problem sets will be given to the students during the first week of class participation.

Instructors

Dr. Joseph J Kakkassery **Assistant Professor** **drjosephjkakkassery@veltech.edu.in** **Aeronautical Engineering**	**Mr. G.Bhoopathi** **Associate Professor** **bhoopathig@veltech.edu.in** **Aeronautical Engineering**

Reg No:

B. TECH. DEGREE EXAMINATIONS, MAY/DEC 2022

AERONAUTICAL ENGINEERING

10211AE211 - Solid Mechanics

Maximum : 60 Marks **Duration : Three Hours**

K1 – Remember, K2 – Understand, K3 – Apply, K4 – Analyze, K5 – Evaluate, K6 - Create

Part A (10 X 2 = 20 Marks) (K level shall not exceed K2)

Q. No.	CO Distribution	K Level	Special Instructions if any
1	CO1	K3	
2	CO1	K3	
3	CO2	K3	
4	CO4	K4	CO4 is to validate the experimental component of CO2. Appropriate question to test the experimental & Numerical procedure with respect to CO2 is expected.
5	CO3	K4	
6	CO4	K4	CO4 is to validate the experimental component of CO3. Appropriate question to test the experimental & Numerical procedure with respect to CO23 is expected.
7	CO5	K5	
8	CO5	K5	
9	CO6	K5	
10	CO6	K5	

Part – B (5 X 8 = 40 Marks) (K level shall not exceed the mentioned level)

Q. No.		CO Distribution	K Level	Special Instructions if any
11	(a)	CO1	K3	

	[OR]			
	(b)	CO1	K3	
12	(a)	CO2	K3	
	[OR]			
	(b)	CO2	K3	
13	(a)	CO3	K4	
	[OR]			
	(b)	CO3	K4	
14	(a)	CO5	K5	
	[OR]			
	(b)	CO5	K5	
15	(a)	CO6	K5	
	[OR]			
	(b)	CO6	K5	

Course Code	Course Name	L	T	P	C
10211AE312	DIO Lab	0	0	2	1

Category : Program Core

Type : Lab

Total Course Meeting Hours - 30

L	T	P	A	H/Week
0	0	2	0	2

Prerequisite	Introduction to Engineering	Linked Courses	Nil

This course aims to inculcate basic manufacturing skills to students through structured practice of using machines.

Course Outcomes

No	Statement	Learning Levels	
		Cognitive	Affective
CO1	Understand different manufacturing techniques	Understand	Receiving
CO2	Identify suitable manufacturing technique for given material	Apply	Receiving
CO3	Practice various metal joining process	Apply	Responsing
CO4	Practice various NDT testing	Apply	Valuing
CO5	Practice basic composite manufacturing process	Create	Organizing
CO6	Practice basic safety at lab	Apply	Valuing

Course Contents

1. Study various manufacturing techniques & its industry specifications
2. Study about different materials and its manufacturing process
3. Practice basic lathe machine operations
4. Practice basic CNC machine operations
5. Study various metal joining process & its industry specifications
6. Study selection of suitable metal joining process for the given metal / alloy type
7. Practice basic welding, riveting & drilling operations
8. Study composite manufacturing process
9. Practice basic composite manufacturing techniques
10. Practice NDT technique

Grading

Performance will be evaluated on the basis of class participation, problem set performance, and the group design project. There will be three tests and one final theory exam. The final grade for the course will be calculated approximately as follows:

Continuous Evaluation (CE)			**Semester End Examination (SE)**	**Total Grading**
Performance in each experiment during lab class work session	**Model Lab**	**Total CE**	**Lab Exam**	**CE + SE**
15	**25**	**40**	**60**	**100**

Instructors

Dr. JV Sai Prasanna Kumar **Professor** **drjvsaiprasannakumar@veltech.edu.in** **Aeronautical Engineering**	**Mr. G.Bhoopathi** **Associate Professor** **bhoopathig@veltech.edu.in** **Aeronautical Engineering**

Course Code	Course Name	L	T	P	C
10211AE116	Engineering Mechanics	1	1	0	2

Category: Program Core

Type : Theory Course / PBL

Total Course Meeting Hours - 60

L	T	P	A	H/Week
1	1	0	2	4

Prerequisite	Matrices and Calculus	Linked Courses	Linear System Analysis & Control

Course Description:

Course Outcomes

No	Statement	Learning Levels	
		Cognitive	Affective
1	Understand the fundamentals of dimensions and the principles of statics of particles	Understand	Responding
2	Apply Free body diagram concepts to find the Moment for the given engineering structure	Apply	Valuing
3	Apply laws of motion to identify motion characteristics of moving objects	Apply	Valuing
4	Apply kinetic energy and Velocity and acceleration concepts to solve impact among multiple bodies	Apply	Characterization
5	Analyze the concepts of momentum and elastic behavior on a body	Analyze	Valuing
6	Apply the principles and types of friction on bodies	Apply	Valuing

Course Contents	Activity Set			Contact Hours
Understand the fundamentals of dimensions and the principles of statics of particles (CO 1)	**Problem**	**Practice**	**Project**	
Units and Dimensions	Fundamental derived units			2
Lami's theorem, Parallelogram and Triangular Law of forces	Determine Vector's magnitude and direction	Analysis of the forces and vectors using trigonometry concepts.	Magnitude and direction of resultant force in load carrying structure.	3
Vectors	Magnitude of the resultant forces			2
Vectorial representation of forces and couples ,Vector operations:				
Equilibrium of a particle	Equilibrium of bodies (Magnitude of components)			3
Equilibrium of a particle in space, Principle of transmissibility	Equilibrium conditions for the particle subjected to the force.	Magnitudes of the forces in real time examples	Project based on the cables and attachment of a structures.	
Apply Free body diagram concepts to find the Moment of Inertia for the given engineering structure (CO 2)	**Problem**	**Practice**	**Project**	
Free body diagram	Determine the moment of force about a particular point	Creating a free-body diagram for real time problems		3

Varignon's theorem,Equilibrium of Rigid bodies in two dimensions and three dimensions	Determine the moment of the force, acting on a structure.	Concept of a moment by example	Estimation of the moments on rigid bodies	4
Moments and Couples	Calculate the reaction at support for a given structure			3
Apply laws of motion to identify motion characteristics of moving objects (CO 3)	**Problem**	**Practice**	**Project**	
First moment of area and the Centroid	Determine the coordinates of centroid of engineering shapes	Moments of Inertia for various shapes		3
Parallel axis theorem and perpendicular axis theorem	Moment of inertia of aircraft structure	Determine the second moment of area or the mass moment of inertia of a rigid body about any axis		3
Principal moments of inertia of plane areas, Moment of inertia	Moment of inertia of aircraft structure		Moments of inertia Ixx and Iyy for a different Aircraft component sections	4
Apply kinetic energy and Velocity and acceleration concepts to solve impact among multiple bodies (CO 4)	**Problem**	**Practice**	**Project**	
Work-Energy Equation of particles	Determine potential energy and kinetic energy of a moving body			5

Displacement, Velocity and Acceleration, their relationship	Based on velocity and acceleration of a body		Estimate the velocity and acceleration of a body	5
Analyze the concepts of momentum and elastic behavior on a body (CO 5)	**Problem**	**Practice**	**Project**	
Curvilinear motion	Determine the angular velocity			3
Impulse and Momentum	Calculate the momentum of the moving bodies.		Kinetics problems in dynamics	3
Impact of elastic bodies.	Determine the elastic behavior of the structure.			4
Apply the principles and types of friction on bodies (CO 6)	**Problem**	**Practice**	**Project**	
Friction, Types of Friction	Calculate various type of friction			5
Translation and Rotation of Rigid Bodies		Friction on a Moving bodies	Estimation of coefficient of the friction	5
Total Course Meeting Hours				**60**

i. Text Books:

1. Hibbeller, R.C., Engineering Mechanics, Vol. 1 Statics, Vol. 2 Dynamics, Pearson Education Asia Pvt. Ltd., 2015.
2. S. Timoshenko, D.H. Young, J.V. Rao, SukumarPati, Engineering Mechanics, McGraw Hill Education (India) Private Limited., 2013.

ii. References:

1. Palanichamy, M. S., and Nagan, S., Engineering Mechanics (Statics and Dynamics), Tata McGraw Hill, New Delhi 2012.
2. Kumar, K. L., Engineering Mechanics, Tata McGraw- Hill, New Delhi, 2011.
3. Shames, I. H., and Krishna Mohana Rao, G., Engineering Mechanics (Statics and Dynamics), Dorling Kindersley India) Pvt. Ltd. (Pearson Education), 2011.
4. Beer, F. P., and Johnston, E. R., Vector Mechanics for Engineers – Dynamics and Statics, Tata McGraw-Hill, New Delhi, 2011.
5. Natarajan, K.V., Engineering Mechanics, Dhanalakshmi Publishers, 2011.
6. Rajasekaran, S. and Sankarasubramanian, G., Engineering Mechanics, Vikas Publishing House Pvt Ltd, 2011.

Grading

Performance will be evaluated on the basis of class participation, problem set performance, and the group design project. There will be three tests and one final theory exam. The final grade for the course will be calculated approximately as follows:

Continuous Evaluation (CE)				**Semester End Examination (SE)**	**Total Grading**
Average of Three Test	**Assignment cum Project**	**Class Participation**	**Total CE**	**Theory Exam**	**CE + SE**
30	**5**	**5**	**40**	**60**	**100**

Criteria	**Score**	**Course Outcomes for evaluation**
Test 1	**30**	**Co1 & Co2**
Test 2	**30**	**Co3 & Co4**
Test 3	**30**	**Co5 & Co6**
Group Project	**5**	**CO1 to CO6**
Class Participation	**5**	**N/A**

Group Project

There shall be group projects based on the selected core courses. The CDIO based project / problem will be assigned to each student by the core courses offering committee (CCOC). The problem / Project shall

consist of expected course outcomes from each core course and students are expected to deliver a solution in expected format. The evaluation shall be made by CCOC meeting during the prescribed time line and as per rubrics of the selected problem set. The problem sets will be given to the students during the first week of class participation.

Instructors

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2024, FMC Lab

Reg No:

B. TECH. DEGREE EXAMINATIONS, MAY/DEC 2022
AERONAUTICAL ENGINEERING

10211AE116 Engineering Mechanics

Maximum : 60 Marks **Duration : Three Hours**

K1 – Remember, K2 – Understand, K3 – Apply, K4 – Analyze, K5 – Evaluate, K6 - Create

Part A (10 X 2 = 20 Marks) (K level shall not exceed K2)

Q. No.	CO Distribution	K Level	Special Instructions if any
1	CO1	K2	
2	CO1	K2	
3	CO2	K2	
4	CO2	K2	
5	CO3	K3	
6	CO3	K3	
7	CO4	K3	
8	CO4	K3	
9	CO5	K3	

10	CO6	K3	

Part – B (5 X 8 = 40 Marks) (K level shall not exceed the mentioned level)

Q. No.		CO Distribution	K Level	Special Instructions if any
11	(a)	CO1	K2	
	[OR]			
	(b)	CO1	K2	
12	(a)	CO2	K2	
	[OR]			
	(b)	CO2	K2	
13	(a)	CO3	K2	
	[OR]			
	(b)	CO3	K2	
14	(a)	CO4	K2	
	[OR]			
	(b)	CO4	K2	
15	(a)	CO5	K2	
	[OR]			
	(b)	CO6	K2	

Course Code	Course Name	L	T	P	C
10211AE218	Aircraft systems and Instruments	1	0	2	2

Category: Program Core

Type: Integrated Lab

Total Course Meeting Hours - 45

L	T	P	A	H/Week
1	0	2	0	3

Prerequisite	Nil	Linked Courses	Avionics

Course Description: The course deals with aircraft sub-systems and instruments' basic principles and working. The course aims to enhance students' knowledge of aircraft system handling procedures, maintenance practices and technical aspects of various sub-systems.

Course Outcomes

No	Statement	Learning Levels	
		Cognitive	Affective
1	Recognize the differences among the types of systems	Understand	Receiving
2	Understand the primary and secondary systems of an aircraft	Understand	Responding
3	Distinguishes the differences between Navigation, Guidance, and Control Systems	Understand	Responding
4	Realize the importance of environmental systems of aircraft	Understand	Responding
5	Interpret the uses of sensors in aircraft instruments	Apply	Valuing
6	Conduct functional tests on aircraft ground handling & servicing	Analyze	Valuing

Course Contents			Activity Set		
CO	**Contact Hours**	**CO 1 - Recognize the differences among the types of systems**	**Problem**	**Practice**	**Project**
1	3 Hrs	System - Types of the system: Open-loop system Closed-loop system			
		Mechanical System, Hydro-mechanical system, Electrical, and Electronics system			
CO	**Contact Hours**	**CO 2 - Understand the primary and secondary systems of an aircraft**	**Problem**	**Practice**	**Project**
2	1 Hrs	Aircraft primary systems and secondary systems			
CO	**Contact Hours**	**CO 3 - Distinguishes the differences between Navigation, Guidance, and Control Systems**	**Problem**	**Practice**	**Project**
3	4 Hrs	Aircraft Seeking System			
		Communication System			
		Navigation and guidance system			
		Flight control system			
		Propulsion system			
CO	**Contact Hours**	**CO 4 - Realize the importance of environmental systems of aircraft**	**Problem**	**Practice**	**Project**
4	3 Hrs	Oxygen system			
		Air conditioning and pressurization system			
		Oil and lubrication system			
		Fire protection system			
		Environmental protection system: Anti icing, De-icing system, rain removal system			
CO	**Contact Hours**	**CO 5 - Interpret the uses of sensors in aircraft instruments**	**Problem**	**Practice**	**Project**
5	4 Hrs	Aircraft sensors - Types of sensors: Air data sensor, accelerometer, gyroscopes, temperature sensors			

		Flight instruments			
		Navigation instruments			
		Engine instruments			
CO	**Contact Hours**	**CO 6 - Conduct functional tests on aircraft ground handling & servicing**	**Problem**	**Practice**	**Project**
6	30 Hrs	Exp 1: Aircraft Jacking and Levelling			
		Exp 2: Aircraft Rigging Checks			
		Exp 3: Servicing of landing gear hydraulic system			
		Exp 4: Servicing of aircraft fuel system			
		Exp 5: Study of aircraft braking system			
	Total Course Meeting Hours: 45 Hrs				

Textbook & Other resources

1. McKinley, J.L., and Bent, R.D., "Aircraft Maintenance & Repair", McGraw-Hill, 2013.
2. "General Hand Books of Airframe and Power Plant Mechanics", U.S. Dept. of Transportation, Federal Aviation Administration, The English Book Store, New Delhi 1995.
3. "Airframe and Power Plant Mechanics: Power plant Handbook" by Federal Aviation Administration, Aircraft Technical Book Company, 2012.
4. Mekinley, J.L. and Bent, R.D., "Aircraft Power Plants", McGraw-Hill, 1993.
5. Pallet, E.H.J., "Aircraft Instruments & Principles", Pitman & Co., 1993.
6. Treager, S., "Gas Turbine Technology", McGraw-Hill, 1997

Grading

Students' Performance will be evaluated based on lab participation, conducting an experiment, Results and analysis, Viva-Voce and Record. There will be a model lab and one final exam. The final grade for the course will be calculated as follows:

Continuous Evaluation (CE)		**Semester End Examination (SE)**		**Total Grading**
Experiments	Model Lab	Theory	Lab	**CE + SE**
15	25	20	40	**100**

Instructor

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Vel Tech Rangarajan Dr. Sagunthala R&D Institute of Science and Technology,
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Location

The classes will be conducted at 2123 and Aero Hangar.

Course Code	Course Name	L	T	P	C
10212AE110	Unmanned Systems	3	0	0	3

Category: Program Elective

Type: Theory Course

Total Course Meeting Hours - 45

L	T	P	A	H/Week
3	0	0	0	3

Prerequisite	Nil	**Linked Courses**	Lighter Than Air System

Course Description: This course provides exposure to the design & development of unmanned systems (UGV, UWV, UAVs). Students will get a skill set in classifying the sub-systems of unmanned vehicles.

Course Outcomes

No	Statement	Learning Levels	
		Cognitive	Affective
1	Recognize the differences among the types of Unmanned Systems	Understand	Receiving
2	Classify the autonomous levels of unmanned systems	Understand	Receiving
3	Distinguishes the various sub-systems for unmanned vehicles	Understand	Responding
4	Understand the various applications of unmanned systems	Understand	Responding
5	Realize the use of navigation and autopilot for unmanned systems	Understand	Responding
6	Interpret design features of unmanned vehicle	Understand	Responding

Course Contents			Activity Set		
CO	**Contact Hours**	**CO 1 - Recognize the differences among the types of Unmanned Systems**	**Problem**	**Practice**	**Project**
1	5	Historical developments of UAS			
		Introduction of UGV, UWV, UAVs			
		Payloads and its uses			
CO	**Contact Hours**	**CO 2 - Classify the autonomous levels of unmanned systems**	**Problem**	**Practice**	**Project**
2	4	Classification of unmanned systems, sea planes, hovercraft			
		Autonomous vehicles			
CO	**Contact Hours**	**CO 3 - Distinguishes the various sub-systems for unmanned vehicles**	**Problem**	**Practice**	**Project**
3	9	Primary systems and secondary systems of unmanned vehicles			
		Launching and recovery of the systems of unmanned vehicles			
		Propulsion system of unmanned vehicles			
		Communication system of unmanned vehicles			
CO	**Contact Hours**	**CO 4 - Understand the various applications of unmanned systems**	**Problem**	**Practice**	**Project**
4	9	Application of UGV			
		Application of UWV			
		Application of UAVs			
CO	**Contact Hours**	**CO 5 - Realize the use of navigation and autopilot for unmanned systems**	**Problem**	**Practice**	**Project**
5	9	Ground control station			
		Onboard controls of unmanned vehicles			
		Navigation systems of unmanned vehicles			

		Autopilot systems			
CO	**Contact Hours**	**CO 6 - Interpret design features of unmanned vehicle**	**Problem**	**Practice**	**Project**
6	9	Design concepts and Design process			
		Design alternatives and variables			
		Design attributes and performance characteristics			
		Case study of UGV, UWV and UAS			
	Total Course Meeting Hours: 45				

Textbook & Other resources

1. Lennon, A. (1996). Basics of R/C model aircraft design: Practical techniques for building better models. Motorbooks International.
2. Austin, R. (2011). Unmanned aircraft systems: UAVs design, development and deployment. John Wiley & Sons.

Grading

Students' Performance will be evaluated based on cycle tests, class attendance, and assignment submission. There will be one end-semester theory exam. The final grade for the course will be calculated as follows:

Continuous Evaluation (CE)			**Semester End Examination (SE)**	**Total Grading**
Average of Three Test	Assignment	Attendance	Theory Exam	**CE + SE**
30	5	5	60	**100**

Instructor

Dr. G. SURENDAR, Ph.D (Aero), M.Tech (Avionics), B.E (Aero)
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Reg No:

B. TECH. DEGREE EXAMINATIONS, MAY/DEC 2022
AERONAUTICAL ENGINEERING

10212AE110 – Unmanned Systems

Maximum: 60 Marks **Duration: Three Hours**

K1 – Remember, K2 – Understand, K3 – Apply, K4 – Analyze, K5 – Evaluate, K6 - Create

Part A (10 X 2 = 20 Marks) (K level shall not exceed K2)

Q. No.	CO Distribution	K Level	Special Instructions if any
1	CO1	K2	
2	CO1	K2	
3	CO2	K2	
4	CO2	K2	
5	CO3	K2	
6	CO3	K2	
7	CO4	K2	
8	CO5	K2	
9	CO6	K2	
10	CO6	K2	

Part – B (5 X 8 = 40 Marks) (K level shall not exceed the mentioned level)

Q. No.		CO Distribution	K Level	Special Instructions if any
11	(a)	CO1	K2	
	[OR]			
	(b)	CO1	K2	
12	(a)	CO2	K2	

	[OR]			
	(b)	CO2	K2	
13	(a)	CO3	K2	
	[OR]			
	(b)	CO3	K2	
14	(a)	CO4	K2	
	[OR]			
	(b)	CO4	K2	
15	(a)	CO5	K2	
	[OR]			
	(b)	CO5	K2	

Course Code	Course Name	L	T	P	C
10212AE201	Electromechanical Systems	2	0	2	3

Category: Program Elective

Type: Integrated Theory

Total Course Meeting Hours - 60

L	T	P	A	H/Week
2	0	2	0	4

Prerequisite	Nil	Linked Courses	Introduction to Computer Programming

Course Description: This course provides exposure to understand basic instrumentation & data gathering from mechanical systems.The computing requires fundamental understanding of I/O of the system, the process and data gathering. This course will give basic understanding of data required from mechanical systems for system modeling and computing. Students will do design of experiments at the end of the course.

Course Outcomes

No	Statement	Learning Levels	
		Cognitive	Affective
1	Explain fundamental data acquisition systems & system modeling	Understand	Receiving
2	Understand instrumentation & measurements for aerospace vehicles	Understand	Receiving
3	Select sensors for given physical quantity and calibrate it	Understand	Responding
4	Practice strain measurement & its applications	Understand	Responding
5	Practice IMU measurements & its applications	Understand	Responding
6	Practice pressure measurements & its applications	Understand	Responding

Course Contents		Activity Set		
Contact Hours	**CO 1 -** Explain fundamental data acquisition systems & system modeling	**Problem**	**Practice**	**Project**
3	Basics of data acquisition systems			
	Introduction to system modeling			
	Mathematical modeling of electromechanical and electro hydraulic actuation systems			
	control system specifications and compensator design approaches			
Contact Hours	**CO 2 -** Understand instrumentation & measurements for aerospace vehicles	**Problem**	**Practice**	**Project**
9	Basics of instrumentation systems and transducers			
	classification of transducers and static characteristics			
	instrumentation amplifiers and filtering circuits			
	components of measurement systems,,			
	measurement accuracy and uncertainty & quantification of error			
	statistical spread of data			
	Theory of rap test, impulse response, impulse hammer and accelerometers.			
	Electromagnetic shakers, frequency domain measurements, triggering, acquisition of transient data.			
	Introduction to digital image correlation			
Contact Hours	**CO 3 -**Select sensors for given physical quantity and calibrate it	**Problem**	**Practice**	**Project**
6	temperature measurement, dial gauge, LVDT, laser displacement sensor.			
	Principle of Wheatstone bridge, strain gages for strain			

	pressure measurement.			
	IMU measurements			
Contact Hours	**CO 4 -** Practice strain measurement & its applications	**Problem**	**Practice**	**Project**
6	Perform metal deformation measurements			
	Perform load cell design			
	Perform force measurement			
Contact Hours	**CO 5 -** Practice IMU measurements & its applications	**Problem**	**Practice**	**Project**
6	I/O measurements from typical IMU sensor			
	Vibration measurements of simple beams			
	RPM measurement techniques			
	Object velocity estimation from IMU sensor			
Contact Hours	**CO 6 -** Practice pressure measurements & its applications	**Problem**	**Practice**	**Project**
6	Simple baro sensor I/O measurement			
	Measurement of Total, static & dynamic pressure			
	Measurement of fluid velocity			
				Total Course Meeting Hours: 60

Textbook & Other resources

James W. Dally , William F. Riley , Kenneth G. McConnell, Instrumentation for Engineering Measurements, John Wiley & Sons; 2nd edition

Lyshevski, Electromechanical Systems, Electric Machines, and Applied Mechatronics, CRC Press; 1st edition

Grading

Students' Performance will be evaluated based on cycle tests, class attendance, and assignment submission. There will be one end-semester theory exam. The final grade for the course will be calculated as follows:

Continuous Evaluation (CE)			Semester End Examination (SE)	Total Grading
Average of Two Test	Model Lab	Attendance	Theory Exam	**CE + SE**
20	20	40	60	**100**

Criteria	Score	Course Outcomes for evaluation
Mid Term Test 1	**20**	**1,2,3**
Mid Term Test 2	**20**	**4,5,6**
Model Lab	**20**	**4,5,6**

Instructors:

Mr. A.Aaikalaraj **Assistant Professor / Aeronautical Engineering** **aadaikalaraj@veltech.edu.in** **2023, Faculty Cabin**	**Dr. R. Narenshankar** **Associate Professor /Aeronautical Engineering** **narensankar@veltech.edu.in** **Research Park,**

Reg No:

B. TECH. DEGREE EXAMINATIONS, MAY/DEC 2022
AERONAUTICAL ENGINEERING

10212AE201 – Electromechanical Systems

Maximum: 60 Marks **Duration: Three Hours**

K1 – Remember, K2 – Understand, K3 – Apply, K4 – Analyze, K5 – Evaluate, K6 - Create

Part A (10 X 2 = 20 Marks) (K level shall not exceed K2)

Q. No.	CO Distribution	K Level	Special Instructions if any
1	CO1	K2	
2	CO1	K2	
3	CO2	K2	
4	CO2	K2	
5	CO3	K2	
6	CO3	K2	
7	CO4	K2	
8	CO5	K2	
9	CO6	K2	
10	CO6	K2	

Part – B (5 X 8 = 40 Marks) (K level shall not exceed the mentioned level)

Q. No.		CO Distribution	K Level	Special Instructions if any
11	(a)	CO1	K2	

	[OR]			
	(b)	CO1	K2	
12	(a)	CO2	K2	
	[OR]			
	(b)	CO2	K2	
13	(a)	CO3	K2	
	[OR]			
	(b)	CO3	K2	
14	(a)	CO4	K2	
	[OR]			
	(b)	CO4	K2	
15	(a)	CO5	K2	
	[OR]			
	(b)	CO5	K2	

Course Code	Course Name	L	T	P	C
10219AE201	Design, Drafting, GD&T and 3D Printing	0	0	2	M

Category : Complementary Skills - Group II

Type : Integrated Lab

Total Course Meeting Hours - 30

L	T	P	A	H/Week
0	0	2	0	2

Prerequisite	Engineering Graphics	Linked Courses	Ansys CFD, COMSOL Multiphysics & Ansys FEM

This course imparts the knowledge to understand fundamental concepts of surface modeling and its tools in a generic framework and provides a clear understanding of CAD systems for 3D modeling and assembly.

Course Outcomes

No	Statement	Learning Levels	
		Cognitive	Affective
CO1	Describe the basics of Sketching & Parametric Modeling	Understand	Receiving
CO2	Describe the tools to create and edit the 3D Models	Apply	Receiving
CO3	Generating draft sheet for manufacturing	Apply	Responsing
CO4	Paraphrase GD&T principles and apply GD&T in draft sheet	Apply	Valuing
CO5	Develop 3D models using additive manufacturing techniques	Create	Organizing

Course Contents

UNIT I Introduction to CAD Design **6**

Product cycle Management, Parametric Technology, Introduction to CAD Environment & Menu bar and Mouse Navigation.

Sketcher: creating 2D Geometry, Working on Profile Toolbar Dimensioning the Sketches, Modifying and Constructing using Operation & Transformation Toolbar.

Experiments: Applying Constraints & Constraint Definition, Animating constraint &Checking Various Mechanisms.

UNIT II 3D Modeling **6**

Understanding Part Design Environment, Creating Solid Models using Sketch-Based Features,Working with Dress-Up Features, View Toolbar, Creating & Working efficiently on ReferenceElements Planes and lines & points.

Editing: Updating Features, Transformation Features e.g. Patterning, Rotating, Advanced ModelingTechniques, Boolean Operations, Annotations, Assigning Materials & Measuring Properties.

Experiments:Wing spar – Rib – stringers, Turbine Blades

UNIT III Drafting **6**

Generating Drawing View with 1st angle or 3rd angle, Using Wizard, Generating Projected, Auxiliary, Section, Detailed views, etc. Using Control knob, Editing Views.

Experiments: Connecting rod –Piston and crank shaft-– Screw jack—Machine Vice

UNIT IV Geometric Dimensioning & Tolerance **6**

Generating Dimensions, InsertingSheets, Adding Datum, Geometric Tolerances & symbols and Generating BOM table.

Experiments: Shaft couplings– Screw jack—Machine Vice.

UNITV Additive Manufacturing **6**

Introduction to Solid & Liquid based system – Fused Deposition Modeling (FDM) & Stereolithography Apparatus (SLA) – Principle, Process, Advantages, Disadvantages and Application, Direct and indirect tooling, FabricationProcess.

Experiments:3D printing of Connecting rod, Piston and crankshaft.

TOTAL:30 PERIODS

Grading

This course has no credits. However, students need to secure 50% marks in lab experiments and model lab exams to get certification. This certification will be used to satisfy the partial fulfillment requirements of the complementary course category.

Instructors

Mr Kolappan S
Assistant Professor
kolappan@veltech.edu.in
Aeronautical Engineering

Mentoring

Mentor Allocation BATCH 2020-24			
S.No	Vtu No	Name	Mentor
1	VTU21465	ELENI HAILU ABETU	Mr.KUMARAN.T TTS 2936 9095688835
2	VTU19071	SAMUEL J G	
3	VTU19244	MOHAMMED SHAJAN S	
4	VTU19310	PRASHANT GAUR	
5	VTU19366	M VIJAY VENKAT RAMAN	
6	VTU19385	LEELA PRASAD D	
7	VTU19440	MAROTHU LEELARAVIVARMAPRASAD	
8	VTU19544	NIVED SUNIL P	
9	VTU19581	M S AKHIL	
10	VTU19596	KACHANI MAHENDRA REDDY	
11	VTU19633	CHAMIDISETTY PRABHU KUMAR	
12	VTU19641	J JEBIN	
13	VTU19726	GADUPUDI UMASANKER	
14	VTU19999	MOHAMMED ANSAF	
15	VTU20034	MOLLETI HARI	Mr.B.KIRUBADURAI TTS 2875 9677437890
16	VTU20319	MUHAMMED SHAMMAS P	
17	VTU20434	K UDAY KUMAR	
18	VTU20612	PRAHALAD T	
19	VTU20627	P KARAN	
20	VTU20679	SARFAZ ANFAL A	

21	VTU20725	RAFIQ MOHAMED.S	
22	VTU20803	NUSUM SAI RAM	
23	VTU20887	SAYOOJ K	
24	VTU21028	KHUSHI SHARMA	
25	VTU21081	GANGA THILAK	
26	VTU21309	MYTHISH G	
27	VTU21311	ROHAN BASTOLA	
28	VTU21175	JAHNAVI D	Ms.S.NITHYA TTS2960 9677420955
29	VTU21214	UPPADA HARSHITHA	
30	VTU21222	KRISHNA PRIYA A	
31	VTU21302	TANUKU MAITHREYEE	
32	VTU20449	KEERTHI MISHRA	
33	VTU20944	PALLEMDEVI SRI	

Join Aviator Club

Drone Technology Lab, Aeronautical Engineering is organizing a student forum “Aviator”. This club will disseminate knowledge and skill on drones. Interested Students may join using the link below.

https://docs.google.com/forms/d/e/1FAIpQLSfG5bFh-b99ldTNIDr4nKC3d1_6hhk0zlV4Q0v15rUfUgyORA/viewform?usp=pp_url

This club will help students to

- Become a drone pilot
- Design and test flying machines
- Participating international & national project competitions
- Organizing Events at Department
- Represent Department in Events

Students need to purchase T-Shirts & Basic Drone Kit for participating in training & events. These club activities will be considered under complementary skills degree requirements. For more information, contact Mr. Gowtham G, Assistant Professor, Aero.

Disclaimer

“Students are advised to check the latest version of this book, syllabus & latest Regulation of VTR UGE 21 available at www.veltech.edu.in for updated & correct information. This book is for basic information about Regulations, Syllabus & features of curriculum. Students shall not decide anything based on this book without verifying it with VTR UGE 21 Regulation available at www.veltech.edu.in ”

Pioneering Air & Space Transport