MATS UNIVERSITY

MATS School of Engineering & I.T

Department of Aeronautical Engineering (B.Tech Scheme)

Semester - 1

S.No.	Code	Subject	Total Credit	Periods per week			Scheme of	
				L	T	P	ESE	IM
1	BT100	Engineering Mathematics – I	4	3	1	-	70	30
2	BT101	Engineering Physics	4	3	1	-	70	30
3	BT102	Programming for Logic Building	3	3	0	-	70	30
4	BT103	Engineering Graphics & Design	2	2	0	-	70	30
5	BT104	Environmental Sciences	1	1	0	-	70	30
6	BT105	Technical English	2	2	0	-	70	30
7	BT106	Engineering Physics Laboratory	1	-	-	2	30	20
8	BT107	Programming and Soft Skill Laboratory	1	-	-	2	30	20
9	BT108	Engineering Graphics & Design Laboratory	2	-	-	4	30	20
10	BT109	Communication Skills Laboratory	1	-	-	2	30	20
11	BT 110	Manufacturing Practices – I Laboratory	2	-	-	4	30	20
Total			**23**	**14**	**2**	**14**	**570**	**280**

Semester - 2

S.No.	Code	Subject	Total Credit	Periods per week			Scheme of	
				L	T	P	ESE	IM
1	BT200	Engineering Mathematics - II	4	3	1	-	70	30
2	BT201	Engineering Chemistry	3	3	0	-	70	30
3	BT202	Basic Electrical & Electronics Engineering	3	3	0	-	70	30
4	BT203	Object Oriented Programming	3	3	0	-	70	30
5	BT204	Constitution of India, Professional Ethics and	1	1	0	-	70	30
6	BT2051	Fundamental of Mechanical Engg.	3	3	0	-	70	30
7	BT206	Engineering Chemistry Laboratory	1	-	-	2	30	20
8	BT207	Basic Electrical & Electronics Engg Laboratory	1	-	-	2	30	20
9	BT208	Advance ProgrammingLaboratory	1	-	-	2	30	20
10	BT2091	Fundamental of Mechanical Engg. Laboratory	1	-	-	2	30	20
11	BT210	Manufacturing Practices – II Laboratory	2	-	-	4	30	20
Total			**23**	**16**	**1**	**12**	**570**	**280**

Semester - 3

S.No.	Code	Subject	Total Credit	Periods per week			Scheme of	
				L	T	P	ESE	IM
1	BT300	Engineering Mathematics-III	3	3	0	-	70	30
2	BT351	Elements of Aeronautics	3	3	0	-	70	30
3	BT352	Mechanics of Solids	4	3	1	-	70	30
4	BT353	Fluid Mechanics & Machinery	4	3	1	-	70	30
5	BT354	Aero Engineering Thermodynics	3	3	0	-	70	30
6	BT305	Universal Human Values	1	1	0	-	70	30
7	BT356	Mechanics of Solids Lab	1	-	-	2	30	20
8	BT357	Fluid Mechanics & Machinery Lab	1	-	-	2	30	20
9	BT358	Aero Engineering Thermodynics Lab	1	-	-	2	30	20
10	BT359	Advanced Manufacturing Practices Lab	1	-	-	2	30	20
Total			**22**	**16**	**2**	**8**	**540**	**260**

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Department of Aeronautical Engineering (B.Tech Scheme)

Semester - 4

S.No.	Code	Subject	Total Credit	Periods per week			Scheme of	
				L	T	P	ESE	IM
1	BT450	Aircraft Structure-I	3	3	0	-	70	30
2	BT451	Mechanics of Machines	3	3	0	-	70	30
3	BT452	Aerodynamics-I	3	3	0	-	70	30
4	BT453	Aircraft System & Instrumentation	3	3	0	-	70	30
5	BT454	Design & Drafting Laboratory	1	-	-	2	30	20
6	BT455	Aircraft System & Instrumentation Laboratory	1	-	-	2	30	20
7	BT456	Aerodynamics Laboratory	1	-	-	2	30	20
8	BT457	Mechanics of Machines Laboratory	1	-	-	2	30	20
9	BTPXX	Professional Elective-I	3	3	0	-	70	30
10	BTOXX	Open Elective-I	3	3	0	-	70	30
Total			**22**	**18**	**0**	**8**	**540**	**260**

Semester - 5

S.No.	Code	Subject	Total Credit	Periods per week			Scheme of	
				L	T	P	ESE	IM
1	BT550	Aircraft Propulsion	3	3	0	-	70	30
2	BT551	Aerodynamics-II	3	3	0	-	70	30
3	BT552	Aircraft Structure-II	3	3	0	-	70	30
4	BT553	Flight Dynamics	4	3	1	-	70	30
5	BT554	Aircraft Structure Laboratory	1	-	-	2	30	20
6	BT555	Computer Aided Simulation Laboratory-I	1	-	-	2	30	20
7	BT556	Propulsion Laboratory-I	1	-	-	2	30	20
8	BT557	Vocational Training/ Internship- 1	3	-	-	-	-	50
9	BTPXX	Professional Elective-II	3	3	-	-	70	30
Total			**22**	**15**	**1**	**6**	**440**	**260**

Semester - 6

S.No.	Code	Subject	Total Credit	Periods per week			Scheme of	
				L	T	P	ESE	IM
1	BT650	Composite Materials & Structures	4	3	1	-	70	30
2	BT651	Rocket Propulsion	4	3	1	-	70	30
3	BT652	Aircraft Design	3	3	0	-	70	30
4	BT653	Aircraft Structure Repair Laboratory	1	-		2	30	20
5	BT654	Propulsion Lab-II	1	-		2	30	20
6	BT655	Aero Engine Repair & Maintenance Laboratory	1	-		2	30	20
7	BT656	Project-I	2	-	-	4	70	30
8	BTPXX	Professional Elective-III	3	3	0	-	70	30
9	BTOXX	Open Elective-II	3	3	0	-	70	30
Total			**22**	**15**	**2**	**10**	**510**	**240**

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Semester - 7

S.No.	Code	Subject	Total Credit	Periods per week			Scheme of	
				L	T	P	ESE	IM
1	BT750	Avionics	3	3	0	-	70	30
2	BT751	Finite Elements Methods	3	3	0	-	70	30
3	BT752	Introduction to Space Technology	3	3	0	-	70	30
4	BT753	Avionics Laboratory	1	-	-	2	30	20
5	BT754	Computer Aided Simulation Laboratory-II	1	-	-	2	30	20
6	BT755	Internship-II	3	-	-	-	0	50
7	BT756	Project-II	2	-	-	4	70	30
8	BTPXX	Professional Elective-IV	3	3	0	-	70	30
9	BTOXX	Open Elective -III	3	3	0	-	70	30
Total			**22**	**15**	**0**	**8**	**480**	**270**

Semester - 8

S.No.	Code	Subject	Total Credit	Periods per week			Scheme of	
				L	T	P	ESE	IM
1	BT850	Internship/ Training-3	6				70	30
2	BT851	Project-III	6				120	80
3	BTPXX	Professional Elective-5-Online Mode/ MOOCs	3				70	30
4	BTOXX	MOOCs	3				70	30
Total			**18**	**0**	**0**	**0**	**330**	**170**
		Total Credit =	**174**				**6000**	

Additional Subjects & Scheme for Honours Group

S.No.	Code	Subject	Total Credit	Periods per week			Scheme of	
				L	T	P	ESE	IM
Semester - 5								
1	BTHXXX	Honours Core I	3	3	0	-	70	30
2	BTHXXX	Honours Laboratory I	1	-	-	2	30	20
Total			**4**	**3**	**0**	**2**	**100**	**50**
Semester - 6								
1	BTHXXX	Honours Core II	3	3	0	-	70	30
2	BTHXXX	Honours Laboratory II	1	-	-	2	30	20
Total			**4**	**3**	**0**	**2**	**100**	**50**
Semester - 7								
1	BTHXXX	Honours Core III	3	3	0	-	70	30
2	BTHXXX	Honours Laboratory III	1	-	-	2	30	20
Total			**4**	**3**	**0**	**2**	**100**	**50**
Semester - 8								
1	BTHXXX	Honours Core IV (Online Mode/ MOOCs)	4				70	30
2	BTHXXX	Honours Core V (Online Mode/ MOOCs)	4				70	30
Total			**8**	**0**	**0**	**0**	**140**	**60**
		Total Credit =	**194**				**6650**	

Program Outcomes (POs)		
Engineering Graduates will be able to:		
PO1	**Engineering knowledge**	Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
PO2	**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, data and synthesis of the information to provide valid conclusions
PO3	**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
PO4	**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
PO5	**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.
PO6	**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.
PO7	**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
PO8	**Ethics**	Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
PO9	**Individual and team work**	Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings
PO10	**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.
PO11	**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.
PO12	**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

Program Specific Outcomes (PSOs)	
Engineering graduates will be able to:	
PSO1	To mould students to become a professional with all necessary skills, personality and sound knowledge in basic and advance technological areas.
PSO2	Develop and use modern engineering tools to Design and analyze the complex problems in Aeronautical Engineering
PSO3	To develop leadership skills in our students necessary to shape the social, intellectual, business and technical worlds.

Program Educational Objectives (PEOs)	
Engineering Graduates will be able to:	
PEO1	Excel in professional career and higher education by acquiring knowledge in engineering principles through analytical, computational and experimental methods
PEO2	Design and analysis of components, systems appropriate to Aeronautical engineering and solutions that are technically sound, economically feasible and socially acceptable, including real life problems
PEO3	Exhibit professionalism, ethical attitude, communication skills, team work in their professional carrier and adapt to state of art through continuous improvement

PEO/PO Mapping

PEO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
PEO1	√	√	√	√	√		√					
PEO2			√	√	√	√	√	√	√	√	√	√
PEO3				√		√	√		√		√	√

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Department of Aeronautical Engineering

Semester-III — CO-PO and CO-PSO Mapping

Elements of Aeronautics	(BT351)

Course Objective:

1. To introduce the concepts of flying machine, International standard atmosphere, structural aspects of airplanes, brief description of systems, instruments and power plants used in airplanes.

Course Outcome:

1. This is first exposure of Airplane as a whole to the students.
2. Identify the component of Flight
3. Identify suitable materials for Aircraft structure
4. Perform basic calculation on Mechanics using Newton law for lift, drag and moment

COs	Programme Outcomes(POs)												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	3	2	1	1	1	-	-	-	-	1	3	3	1
CO2	3	3	2	1	0	1	0	-	-	-	-	1	2	1	1
CO3	3	3	3	1	0	1	1	-	-	-	-	1	2	1	1
CO4	3	3	3	2	1	1	0	-	-	-	-	1	3	2	1

Mechanics of Solids	(BT352)

Course Objective:

1. To introduce various behavior of structural components under various loading conditions.
2. To know the phenomenon of bending of different sections and its analysis and recognize principle stresses.
3. Concepts of strain energy, torsion and numerical analysis

Course Outcome:

1. Solve the problems related to the structural components under various loading conditions.
2. Explain the meaning of stress, strain, establish relationship between them and apply concepts of stress, strain to solve numerical problems.
3. Compute Shear Force and Bending Moment for determinate beams and draw Shear Force and draw Bending Moment Diagrams for various loading conditions.
4. To apply the knowledge of bending and shear concept to determine various stresses and draw stress diagrams.
5. Apply knowledge of strain energy, torsion and thin cylinders and spherical shells to solve Numerical problems

COs	Programme Outcomes(POs)												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	2	3	2	1	1	-	-	-	-	-	1	2	2	1
CO2	2	3	2	1	0	1	-	-	-	-	-	1	2	1	1
CO3	2	3	3	1	0	1	-	-	-	-	-	1	2	1	1
CO4	2	3	3	2	1	1	-	-	-	-	-	1	2	2	1
CO5	3	3	3	3	2	1	-	-	-	-	-	1	2	2	1

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Semester-III — CO-PO and CO-PSO Mapping

Fluid Mechanics & Machinery	(BT353)

Course Objective:

1. The applications of the conservation laws to flow through pipes and hydraulic machines are studied.
2. To understand the importance of dimensional analysis.
3. To understand the importance of various types of flow in pumps and turbines.

Course Outcome:

1. Upon completion of this course, the students can able to apply mathematical knowledge to predict the properties and characteristics of a fluid.
2. Critical analyses and the performance of pumps and turbines

COs	Programme Outcomes(POs)												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	2	1	0	1	0	-	-	-	-	1	2	1	1
CO2	3	3	3	1	0	1	1	-	-	-	-	1	2	1	1

Aero Engineering Thermodynamics	(BT354)

Course Objective:

1. Understand laws of thermodynamics and its applications to Aerospace Engineering.
2. Comprehend the concept and applications of energy, entropy and exergy.
3. Understand various gas and vapor power cycles with applications.
4. Understand the gas mixture behavior and chemical reactions.
5. Apply the Thermodynamic Principles to Aerospace Engineering Applications.

Course Outcome:

1. Effectively use the basic concepts of thermodynamics and its Ist law of Thermodynamics.
2. Effectively use the laws of thermodynamics for basic calculations.
3. Able to analyse various gas power cycles.
4. Able to calculate the power developed from steam as the working medium

COs	Programme Outcomes(POs)												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	2	1	0	1	0	-	-	-	-	1	2	1	1
CO2	3	3	3	1	0	1	1	-	-	-	-	1	2	1	1
CO3	3	3	2	1	0	1	0	-	-	-	-	1	2	1	1
CO4	3	3	3	1	0	1	1	-	-	-	-	1	2	1	1

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Department of Aeronautical Engineering

Semester-III — CO-PO and CO-PSO Mapping

Universal Human Values	(BT305)

Course Objective:

1. Development of a holistic perspective based on self- exploration about themselves (human being), family, society and nature/existence.
2. Understanding (or developing clarity) of the harmony in the human being, family, society and nature/existence
3. Strengthening of self-reflection.
4. Development of commitment and courage to act.

Course Outcome:

1. By the end of the course, students are expected to become more aware of themselves, and their surroundings (family, society, nature); they would become more responsible in life, and in handling problems with sustainable solutions, while keeping human relationships and human nature in mind.
2. They would have better critical ability. They would also become sensitive to their commitment towards what they have understood (human values, human relationship and human society). It is hoped that they would be able to apply what they have learnt to their own self in different day-to- day settings in real life, at least a beginning would be made in this direction.
3.

COs	Programme Outcomes(POs)												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	-	-	-	-	-	2	3	1	2	2	1	1	1	1	2
CO2	-	-	-	-	-	2	3	1	2	2	1	1	1	2	2

Mechanics of Solids Laboratory	(BT355)

Course Objective:

1. To supplement the theoretical knowledge gained in Mechanics of Solids with practical testing for determining the strength of materials under externally applied loads.
2. This would enable the student to have a clear understanding of the design for strength and stiffness.

Course Outcome:

1. Ability to perform different material testing.
2. Ability to characteristic materials.
3.

COs	Programme Outcomes(POs)												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	2	1	1	1	-	-	-	-	-	1	1	1	0
CO2	3	3	3	1	1	1	-	-	-	-	-	1	1	1	0

Department of Aeronautical Engineering

Semester-III CO-PO and CO-PSO Mapping

Fluid Mechanics and Machinery Laboratory	(BT356)

Course Objective:

1. Upon Completion of this subject, the students can able to have hands on experience in flow measurements using different devices and also perform calculation related to losses in pipes and also perform characteristic study of pumps, turbines etc.

Course Outcome:

1. Ability to use the measurement equipments for flow measurement.
2. Ability to do performance trust on different fluid machinery.

COs	Programme Outcomes(POs)												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	2	1	1	1	-	-	-	-	-	1	1	1	0
CO2	3	3	3	1	1	1	-	-	-	-	-	1	1	1	0

Aero Engineering Thermodynamics Lab	(BT357)

Course Objective:

1. Can clearly understand the performance of a Gas Turbine Engine
2. Clearly understand the port timing mechanism and valve timing mechanism of stroke engine.

Course Outcome:

1. Get a clear idea about effectiveness of a parallel flow heat exchanger.
2. Get a clear idea about effectiveness of a counter flow heat exchanger
3.

COs	Programme Outcomes(POs)												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	2	1	1	1	-	-	-	-	-	1	1	1	0
CO2	3	3	3	1	1	1	-	-	-	-	-	1	1	1	0

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Department of Aeronautical Engineering

Semester-III — CO-PO and CO-PSO Mapping

Advance Manufacturing Practices Lab	(BT358)

Course Objective:

1. To strengthen the students ability to measure and inspect to precise tolerances.
2. To read working drawings, understand operational symbols and execute machining operations.

Course Outcome:

1. Prepare fitting models according to drawings using hand tools- V-block, marking gauge, files, hack saw, drills etc.
2. Understand integral parts of lathe, shaping and milling machines and various accessories and attachments used.
3. Select cutting parameters like cutting speed, feed, depth of cut, and tooling for various machining operations.
4. Perform cylindrical turning operations such as plain turning, taper turning, step turning, thread Cutting, facing, knurling, internal thread cutting, eccentric turning and estimate cutting time.
5. Perform machining operations such as plain shaping, inclined shaping, keyway cutting, Indexing and Gear cutting and estimate cutting time.

COs	Programme Outcomes(POs)												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	2	2	1	1	1	-	-	-	-	-	-	1	1	0
CO2	2	2	2	1	1	1	-	-	-	-	-	-	1	1	0
CO3	2	2	2	1	1	1	-	-	-	-	-	-	1	1	0
CO4	2	1	1	1	1	1	-	-	-	-	-	-	1	1	0
CO5	2	1	2	1	1	1	-	-	-	-	-	-	1	1	0

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Semester-IV CO-PO and CO-PSO Mapping

Aircraft Structure-I	(BT450)

Course Objective:

1. To provide the students an understanding on the linear static analysis of determinate and indeterminate aircraft structural components.
2. To make the students understand the various energy methods to compute the strain energy in axial, bending, torsion and shear loadings.
3. To impart the knowledge on column structural member
4. To interpret the failure behaviour of materials using failure theories.
5. To make the students understand the various induced stresses.

Course Outcome:

1. Analyse the statically determinate and indeterminate using the principle of iterative methods and theorem of three moments.
2. Make use of classical methods determine the deflections of beams, frames and arches
3. Understand the stability, Euler buckling load and problems in column design.
4. Analyse the failure of the brittle and ductile materials in comparison with simple mechanical tests.
5. Interpret and Predict material failure for the induced stresses caused due to the dynamic and other environmental effects.

COs	Programme Outcomes(POs)												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	2	2	1	1	0	-	-	-	-	1	2	1	1
CO2	3	3	3	2	2	1	1	-	-	-	-	1	2	1	1
CO3	3	3	2	2	2	1	0	-	-	-	-	1	2	1	1
CO4	3	3	3	2	2	1	1	-	-	-	-	1	2	1	1
CO5	3	3	3	1	1	1	1	-	-	-	-	1	2	1	1

Mechanics of Machines	(BT451)

Course Objective:

1. The knowledge of this subject is very essential for an engineer in designing the various parts of a machine
2. To understand the dynamics of mechanism
3. To develop the understanding of friction force, gear and cam mechanisms.
4. To understand the balancing and vibration in heavy machines.

Course Outcome:

1. Understand the basic law of equilibrium and application of the on a mechanism
2. Knew about the Design and working principles of gear and cam.
3. Knew the effects of vibration in heavy machines.

COs	Programme Outcomes(POs)												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	2	1	0	1	0	-	-	-	-	1	2	1	1
CO2	3	3	3	1	0	1	1	-	-	-	-	1	2	1	1
CO3	3	3	2	1	0	1	0	-	-	-	-	1	2	1	1

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Semester-IV CO-PO and CO-PSO Mapping

Aerodynamics-I	(BT452)

Course Objective:

1. To introduce fundamental aerodynamic theories and aerodynamic characteristics of airfoils and wings
2. To familiarize students with viscous flows

Course Outcome:

1. classify airfoils and label their nomenclature; apply governing equations to formulate necessary
2. subsidiary equation in order to determine the aerodynamic force
3. Explain potential flow theories and solve their combinations.
4. estimate the aerodynamic characteristics of airfoils
5. estimate the aerodynamic characteristics of wings
6. formulate and solve boundary layer problems

COs	Programme Outcomes(POs)												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	2	2	1	1	0	-	-	-	-	1	2	1	1
CO2	3	3	3	2	2	1	1	-	-	-	-	1	2	1	1
CO3	3	3	2	2	2	1	0	-	-	-	-	1	2	1	1
CO4	3	3	3	2	2	1	1	-	-	-	-	1	2	1	1
CO5	3	3	3	1	1	1	1	-	-	-	-	1	2	1	1
CO6	3	3	3	1	1	1	1	-	-	-	-	1	2	1	1

Aircraft System and Instrumentation	(BT453)

Course Objective:

1. To impart knowledge of the aircraft control systems
2. To gain knowledge on hydraulic and pneumatic systems of aircraft
3. Basic knowledge of piston and jet engine fuel and lubrication systems
4. To impart knowledge on aircraft environment systems
5. To gain knowledge on flight and engine instruments.

Course Outcome:

1. Understands the aircraft control systems
2. Acquires knowledge on hydraulic and pneumatic systems of aircraft
3. Understands piston and jet engine fuel and lubrication systems
4. Understands the aircraft environment systems
5. Identify flight and engine instruments

COs	Programme Outcomes(POs)												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	2	2	1	1	0	-	-	-	-	1	2	1	1
CO2	3	3	3	2	2	1	0	-	-	-	-	1	2	1	1
CO3	3	3	2	2	2	0	0	-	-	-	-	1	2	1	1
CO4	3	3	3	2	2	0	0	-	-	-	-	1	2	1	1
CO5	3	3	3	1	1	0	0	-	-	-	-	1	2	1	1

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Semester-IV — CO-PO and CO-PSO Mapping

Experimental Stress Analysis(PE-I)	(BTP502)

Course Objective:

1. To study the various experimental techniques involved for measuring displacements, stresses and strains in structural components.
2. To study Photo-elasticity and its effects in materials
3. To Study various coating techniques
4. Study and Introduction to non-destructive testing

Course Outcome:

1. Able to distinguish various types of principles in strain and stress measurement
2. Able to analyze various electrical resistance strain gauges and its applications
3. Able to acquire knowledge on photo elastic techniques
4. Able to use brittle coating and moire fringe methods
5. Familiarized to various techniques on non-destructive testing

COs	Programme Outcomes(POs)												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	2	2	1	1	0	-	-	-	-	1	2	1	1
CO2	3	3	3	2	2	1	1	-	-	-	-	1	2	1	1
CO3	3	3	2	2	2	1	0	-	-	-	-	1	2	1	1
CO4	3	3	3	2	2	1	1	-	-	-	-	1	2	1	1
CO5	3	3	3	1	1	1	1	-	-	-	-	1	2	1	1

Design & Drafting Lab	(BT454)

Course Objective:

1. Ability to gain practical experience in handling 2D drafting and 3D drafting
2. Ability to perform surface modelling on a/c and its parts
3. To develop in students' graphic skills for communication of concepts, ideas of engineering products
4. To familiarize with technical drawings

Course Outcome:

1. Explain graphic skills for communication of concepts, ideas of engineering products.
2. Design surface modelling using modelling software.
3. Create surface modelling in a/c and its parts
4. Create drafting on 3D models
5. Get job opportunities on design-based industries

COs	Programme Outcomes(POs)												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	2	2	1	1	0	-	-	-	-	1	2	1	1
CO2	3	3	3	2	2	1	0	-	-	-	-	1	2	1	1
CO3	3	3	2	2	2	0	0	-	-	-	-	1	2	1	1
CO4	3	3	3	2	2	0	0	-	-	-	-	1	2	1	1
CO5	3	3	3	1	1	0	0	-	-	-	-	1	2	1	1

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Semester-IV — CO-PO and CO-PSO Mapping

Aircraft system and Instrumentation Lab	(BT455)

Course Objective:

1. To impart knowledge of the aircraft system and instruments
2. To Examination and testing of element of flight director and various systems
3. Basic knowledge of Wiring and cabling demonstration
4. To know about Safety precaution associated with radio equipment
5. To gain knowledge on flight instruments

Course Outcome:

1. Know about of the aircraft system and instruments
2. Examine and testing of element of flight director and various systems
3. Implement basic knowledge of Wiring and cabling
4. Understand Safety precaution associated with radio equipment
5. Understand the working of flight instruments

COs	Programme Outcomes(POs)												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	2	2	1	-	-	-	-	-	-	1	2	1	1
CO2	3	2	2	2	2	-	-	-	-	-	-	1	2	1	1
CO3	3	2	2	2	2	-	-	-	-	-	-	1	2	1	1
CO4	3	2	2	2	2	-	-	-	-	-	-	1	2	1	1
CO5	3	2	2	1	1	-	-	-	-	-	-	1	2	1	1

Aerodynamics Lab	(BT456)

Course Objective:

1. To visualize and understand the low speed flows
2. To practice techniques which predict/measure aerodynamics forces
3. To understand the interactions of flow fields

Course Outcome:

1. Ability to use the fundamental aerodynamic principles for aircraft testing applications
2. Deep understanding of flow visualization
3. Understanding about instruments and their function

COs	Programme Outcomes(POs)												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	2	2	1	-	-	-	-	-	-	1	2	1	1
CO2	3	2	2	2	2	-	-	-	-	-	-	1	2	1	1
CO3	3	2	2	2	2	-	-	-	-	-	-	1	2	1	1

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Semester-IV **CO-PO and CO-PSO Mapping**

Mechanics of Machines Lab	(BT457)

Course Objective:

1. To develope the understanding of operation of a Porter Governor, Proell Governor and Hartnell Governor
2. To investigate the behavior of a Worm wheel
3. To measure the coefficient of static and kinetic friction
4. To develop understanding about balancing of rod in the rotating and reciprocating system

Course Outcome:

1. Understand the operation of a Porter Governor, Proell Governor and Hartnell Governor
2. investigate the behavior of a Worm wheel
3. measure the coefficient of static and kinetic friction
4. understand about balancing of rod in the rotating and reciprocating system

COs	Programme Outcomes(POs)												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	2	2	1	-	-	-	-	-	-	1	2	1	1
CO2	3	2	2	2	2	-	-	-	-	-	-	1	2	1	1
CO3	3	2	2	2	2	-	-	-	-	-	-	1	2	1	1
CO4	3	2	2	2	2	-	-	-	-	-	-	1	2	1	1

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Semester-V — CO-PO and CO-PSO Mapping

Aircraft Propulsion	(BT550)

Course Objective:

1. To understand the fundamental and principles of jet propulsion
2. To understand about the types and operation of various parts of the jet Engines
3. To understand about the performance parameter of aircraft

Course Outcome:

1. To understand the working of various air breathing engines and combustors
2. To understand the design features of inlets and perform necessary calculations
3. To understand the design features of compressors and perform necessary calculations
4. To understand the design features of turbines and perform necessary calculations

COs	Programme Outcomes(POs)												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	3	2	1	1	1	-	-	-	-	1	3	3	1
CO2	3	3	2	1	0	1	0	-	-	-	-	1	2	1	1
CO3	3	3	3	1	0	1	1	-	-	-	-	1	2	1	1
CO4	3	3	3	2	1	1	0	-	-	-	-	1	3	2	1
CO5	3	3	3	2	1	1	0	-	-	-	-	1	3	2	1

Aerodynamics-II	(BT551)

Course Objective:

1. To make the student understand the concepts of compressible aerodynamics.
2. To develop understanding of isentropic and non-isentropic flow.
3. Also to introduce the design concepts of transonic and supersonic wing sections.

Course Outcome:

1. Apply the fundamental flow equations and basic solution techniques in solving compressible quasi-one-dimensional flows – Nozzle flows
2. Apply the fundamental flow equations and basic solution techniques in solving compressible one dimensional flow – normal shock waves, Rayleigh and Fanno flows.
3. Analyze one-dimensional flows with shock waves, expansion waves.
4. Calculate the aerodynamic characteristics of airfoils and wings of use in compressible subsonic, transonic flight conditions.
5. Perform calculations associated with supersonic airfoils.

COs	Programme Outcomes(POs)												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	3	2	1	1	1	-	-	-	-	1	3	3	1
CO2	3	3	2	1	0	1	0	-	-	-	-	1	2	1	1
CO3	3	3	3	1	0	1	1	-	-	-	-	1	2	1	1
CO4	3	3	3	2	1	1	0	-	-	-	-	1	3	2	1
CO5	3	3	3	2	1	1	0	-	-	-	-	1	3	2	1

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Semester-V CO-PO and CO-PSO Mapping

Aircraft Structures-II	(BT552)

Course Objective:

1. To provide the students various methods for analysis of aircraft wings and fuselage.
2. To provide understanding about the behavior of major aircraft structural components.

Course Outcome:

1. To perform calculations on unsymmetrical bending
2. To perform shear flow calculations in open sections and closed sections
3. To perform buckling calculations in plates
4. To perform stress analysis calculations on wing and fuselage structures

COs	Programme Outcomes(POs)												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	3	2	1	1	1	-	-	-	-	1	3	3	1
CO2	3	3	2	1	0	1	0	-	-	-	-	1	2	1	1
CO3	3	3	3	1	0	1	1	-	-	-	-	1	2	1	1
CO4	3	3	3	2	1	1	0	-	-	-	-	1	3	2	1

Flight Dynamics	(BT553)

Course Objective:

1. To make the student understand the performance of airplanes under various flight conditions like take off, cruise, landing, climbing, gliding, turning and other maneuvers.
2. To make the student understand the concepts of stable and unstable configuration of airplanes.

Course Outcome:

1. Understand concepts of straight and level flight and Range and Endurance
2. Understand performance of climb and descent take-off, landing and turning performance.
3. An understanding of the contribution to static longitudinal stability, directional stability from various components of the airplane
4. To get familiarized with the longitudinal, directional and lateral dynamics of the airplane

COs	Programme Outcomes(POs)												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	3	2	1	1	1	-	-	-	-	1	3	3	1
CO2	3	3	2	1	0	1	0	-	-	-	-	1	2	1	1
CO3	3	3	3	1	0	1	1	-	-	-	-	1	2	1	1
CO4	3	3	3	2	1	1	0	-	-	-	-	1	3	2	1
CO5	3	3	3	2	1	1	0	-	-	-	-	1	3	2	1

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Semester-V **CO-PO and CO-PSO Mapping**

Aircraft Structures Lab	BT554

Course Objective:

1. To enable the students, understand the behavior of aircraft structural components under different loading conditions.
2. To study the failure of different component under different loading condition

Course Outcome:

1. Be able to understand the importance of aircraft structures which are the load carrying members
2. The analytical ability of calculating the bending stresses in beams of un-symmetrical sections
3. To perform buckling load calculations on columns
4. To understand vibration character of cantilever beam
5. To gain experimental understanding of photo elastic models

COs	Programme Outcomes(POs)												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	3	2	1	0	0	-	-	-	-	1	2	1	1
CO2	3	2	2	1	1	0	0	-	-	-	-	1	2	1	1
CO3	3	2	3	1	1	0	0	-	-	-	-	1	2	1	1
CO4	3	2	3	2	1	0	0	-	-	-	-	1	2	1	1
CO5	3	2	3	2	1	0	0	-	-	-	-	1	2	1	1

Computer Aided Simulation Lab-I	BT 555

Course Objective:

1. To develop understanding of 2-Dim and 3-Dim drawing using software
2. To develop coding skill to operate the CNC machines
3. To develop interest about CAD designing/solid modeling

Course Outcome:

1. Design and analysis in 2-Dim and 3-Dim modeling using software
2. Deal with advance engineering problems based on their Coding skills
3. Improves design and drafting skills using Auto-CAD/SOLIDWORKS

COs	Programme Outcomes(POs)												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	2	3	2	1	0	0	-	-	-	-	1	2	1	1
CO2	2	2	2	1	1	0	0	-	-	-	-	1	2	1	1
CO3	2	2	3	1	1	0	0	-	-	-	-	1	2	1	1
CO4	2	2	3	2	1	0	0	-	-	-	-	1	2	1	1
CO5	2	2	3	2	1	0	0	-	-	-	-	1	2	1	1

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Semester-V **CO-PO and CO-PSO Mapping**

Propulsion-I Lab	BT 556

Course Objective:

1. To enable the students, understand the behavior of CD-nozzle
2. To enable the students, understand the behavior of choked and un-choked flow
3. To enable the students, understand the behavior of subsonic speed jet engine
4. To enable the students, understand the behavior supersonic speed jet engine
5. To enable the students, understand the behavior of combustion chamber

Course Outcome:

1. Perform experiments to observe the behavior of CD-nozzle
2. Perform experiments to analyze choked and un-choked flow
3. Perform experiments on operation of Turbojet Engine and Turbofan Engine
4. Perform experiments on supersonic speed that is about ramjet engine
5. Perform experiments on can type and annular type of combustion cambers

COs	Programme Outcomes(POs)												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	3	2	1	0	0	-	-	-	-	1	2	1	1
CO2	3	2	2	1	1	0	0	-	-	-	-	1	2	1	1
CO3	3	2	3	1	1	0	0	-	-	-	-	1	2	1	1
CO4	3	2	3	2	1	0	0	-	-	-	-	1	2	1	1
CO5	3	2	3	2	1	0	0	-	-	-	-	1	2	1	1

Vocational Training/ Internship- 1	(BT557)

Course Objective:

1. The training helps the students gain a much deeper knowledge and interest about the stream of engineering so opted for.
2. The training readily enhances the technical skills of the individuals in a practical environment.
3. Learning the basics about working individually as well as in a team
4. The training helps in the improvement of the awareness of the overall environment of the industry and the work culture at the same time

Course Outcome:

1. Understand the working procedures in industry
2. Gain knowledge about contemporary technologies
3. Gain hand on experience on various processes
4. Apply new methods to investigate complex engineering problems
5. Gain motivation towards lifelong learning

COs	Programme Outcomes(POs)												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	1	1	2	1	1	1	1	1	1	1	3	3	3	1
CO2	2	1	1	1	1	1	1	1	1	1	1	3	3	3	1
CO3	2	1	1	1	1	1	1	1	1	1	1	3	3	2	1
CO4	2	1	1	2	1	1	1	1	1	1	1	3	3	2	1
CO5	2	1	1	2	1	1	1	1	1	1	1	3	3	2	1

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Semester-VI — CO-PO and CO-PSO Mapping

Composite Material & structures	(BT650)

Course Objective:

1. To make the student understand the analysis of composite laminates under different loading conditions and different environmental conditions.
2. To understand failure types in composite materials
3. Use of composite in aircraft industry

Course Outcome:

1. Understanding the mechanics of composite materials
2. Ability to analyse the laminated composites for various loading eases
3. Knowledge gained in manufacture of composites.

COs	Programme Outcomes(POs)												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	3	2	1	1	1	-	-	-	-	1	3	3	1
CO2	3	3	2	1	0	1	0	-	-	-	-	1	2	1	1
CO3	3	3	3	1	0	1	1	-	-	-	-	1	2	1	1

Rocket Propulsion	(BT651)

Course Objective:

1. To impart knowledge in non air-breathing and hypersonic propulsion methods to students so that they are familiar with various propulsion technologies associated with space launch vehicles, missiles and space probes.
2. To understand the principles of operation of rocket propulsion.
3. To understand about the types, operation and performance of the rocket engines.

Course Outcome:

1. Understanding various propulsion systems
2. Differentiate various rocket propulsion systems
3. Knowledge about the applications and principles of liquid and solid-liquid propulsion systems
4. Develop hybrid propulsion and cryogenic in rocketry

COs	Programme Outcomes(POs)												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	3	2	1	1	1	-	-	-	-	1	3	3	1
CO2	3	3	2	1	0	1	0	-	-	-	-	1	2	1	1
CO3	3	3	3	1	0	1	1	-	-	-	-	1	2	1	1
CO4	3	3	3	2	1	1	0	-	-	-	-	1	3	2	1

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Semester-VI **CO-PO and CO-PSO Mapping**

Aircraft Design	(BT652)

Course Objective:

1. To introduce application of fundamental aerodynamic theories in aircraft design
2. Proper use of weight estimation calculations for designing an aircraft
3. Make use of historical data in new design
4. Load estimation and component selection according to load on structure

Course Outcome:

1. Be able to perform weight estimation calculations
2. Be able perform design calculations pertaining to configuration layout and flight envelope
3. Be able perform design calculations for engine selection
4. Be able perform design calculations for control surface selection

COs	Programme Outcomes(POs)												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	3	2	1	1	1	-	-	-	-	1	3	3	1
CO2	3	3	2	1	0	1	0	-	-	-	-	1	2	1	1
CO3	3	3	3	1	0	1	1	-	-	-	-	1	2	1	1
CO4	3	3	3	2	1	1	0	-	-	-	-	1	3	2	1

Aircraft Structure Repair Lab	BT653

Course Objective:

1. To build skills of riveting and sheel metal work
2. To build skills of patch work and metal forming
3. To build skills of various types of welding

Course Outcome:

1. Ability to join the different types of aircraft wood
2. Develop skills on riveting, mooring and patch work
3. Differentiate the welding process and weld the materials
4. Able to perform the checks for aircraft symmetry, levelling and jacking

COs	Programme Outcomes(POs)												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	3	2	1	0	0	-	-	-	-	1	2	1	1
CO2	3	2	2	1	1	0	0	-	-	-	-	1	2	1	1
CO3	3	2	3	1	1	0	0	-	-	-	-	1	2	1	1
CO4	3	2	3	2	1	0	0	-	-	-	-	1	2	1	1

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Semester-VI **CO-PO and CO-PSO Mapping**

PROPULSION LAB-II	(BT654)

Course Objective:

1. To enable the students, understand the behavior supersonic flows
2. To study the different expansion levels of jets
3. To estimate engine noice level and correction technique

Course Outcome:

1. Be able to perform experiments using supersonic free jet facility
2. Be able to identify the flow features of jets at different expansion levels
3. Be able to perform experiments to estimate jet decay and spread character
4. Be able to visualize various flow features of jets using optical techniques
5. Be able to perform preliminary aero-acoustic experiments

COs	Programme Outcomes(POs)												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	3	2	1	0	0	-	-	-	-	1	2	1	1
CO2	3	2	2	1	1	0	0	-	-	-	-	1	2	1	1
CO3	3	2	3	1	1	0	0	-	-	-	-	1	2	1	1
CO4	3	2	3	2	1	0	0	-	-	-	-	1	2	1	1
CO5	3	2	3	2	1	0	0	-	-	-	-	1	2	1	1

AERO ENGINE REPAIR AND MAINTENANCE LAB	(BT655)

Course Objective:

1. To apply maintenance procedure to piston engines
2. To understand the propeller theory
3. To identify the jet engine and helicopter engine components and faults
4. To apply non destructive testing procedures
5. To apply overhauling procedure to engines

Course Outcome:

1. Apply maintenance procedure to piston engines
2. Understand the propeller theory
3. Identify the jet engine and helicopter engine components and faults
4. Apply non-destructive testing procedures
5. Apply overhauling procedure to engines

COs	Programme Outcomes(POs)												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	3	2	1	0	0	-	-	-	-	1	2	1	1
CO2	3	2	2	1	1	0	0	-	-	-	-	1	2	1	1
CO3	3	2	3	1	1	0	0	-	-	-	-	1	2	1	1
CO4	3	2	3	2	1	0	0	-	-	-	-	1	2	1	1
CO5	3	2	3	2	1	0	0	-	-	-	-	1	2	1	1

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Department of Aeronautical Engineering

Semester-VI CO-PO and CO-PSO Mapping

Project-I	(BT656)

Course Objective:

1. To develop the ability to solve a specific problem right from its identification and literature review
2. To train the students in preparing project reports and to face reviews and viva voce examination

Course Outcome:

1. On Completion of the project work-1, students will be in a position to conduct experimental or Computational investigations relevant to practical problems by formulating proper methodology.

COs	Programme Outcomes(POs)												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	3	2	1	0	0	1	-	-	-	1	2	2	1

School of Engg. & I.T.

MATS UNIVERSITY
GULLU, ARANG, RAIPUR [C.G.]

Department of Aeronautical Engineering

Semester-VII — CO-PO and CO-PSO Mapping

Avionics	(BT750)

Course Objective:

1. To introduce the basic of avionics and its need for civil and military aircrafts
2. To impart knowledge about the avionic architecture and various avionics data buses
3. To gain more knowledge on various avionics subsystems

Course Outcome:

1. Students will be able to understand the concept of designing avionics systems
2. Be able to understand the principle of digital avionics systems
3. Able to know the practical and working of flight deck equipment
4. Students understand the principle and working of navigation system
5. Be able to understand the air data systems and auto pilot.

COs	Programme Outcomes(POs)												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	3	2	1	1	-	-	-	-	-	1	2	2	1
CO2	3	3	2	1	0	1	-	-	-	-	-	1	2	1	1
CO3	3	3	3	1	0	1	-	-	-	-	-	1	2	1	1
CO4	3	3	3	2	1	1	-	-	-	-	-	1	2	2	1
CO5	3	3	3	3	2	1	-	-	-	-	-	1	2	2	1

FINITE ELEMENT METHODS	(BT751)

Course Objective:

1. To give exposure various methods of solution and in particular the finite element method
2. It gives exposure to the formulation and the procedure of the finite element method and its application to varieties of problems

Course Outcome:

1. Will obtain an overall understanding of Finite Element analysis
2. Will be able to perform discrete element analysis
3. Will be able to perform continuum element analysis
4. Will be able to perform isoparametric element analysis
5. Will be able to apply FEM methods to typical engineering situations

COs	Programme Outcomes(POs)												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	3	2	1	1	-	-	-	-	-	1	2	2	1
CO2	3	3	2	1	0	1	-	-	-	-	-	1	2	1	1
CO3	3	3	3	1	0	1	-	-	-	-	-	1	2	1	1
CO4	3	3	3	2	1	1	-	-	-	-	-	1	2	2	1
CO5	3	3	3	3	2	1	-	-	-	-	-	1	2	2	1

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Department of Aeronautical Engineering

Semester-VII CO-PO and CO-PSO Mapping

INTRODUCTION TO SPACE TECHNOLOGY	(BT752)

Course Objective:

1. To introduce fundamental concepts of orbital mechanics
2. To introduce concepts of satellite injection and satellite perturbations, trajectory computation for interplanetary travel and flight of ballistic missiles based on the fundamental concepts of orbital mechanics.

Course Outcome:

1. Ability to perform satellite injection, satellite perturbations and trajectory control
2. Apply orbital mechanics to control ballistic missile

COs	Programme Outcomes(POs)												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	3	2	1	1	-	-	-	-	-	1	2	2	1
CO2	3	3	2	1	0	1	-	-	-	-	-	1	2	1	1
CO3	3	3	3	1	0	1	-	-	-	-	-	1	2	1	1
CO4	3	3	3	2	1	1	-	-	-	-	-	1	2	2	1
CO5	3	3	3	3	2	1	-	-	-	-	-	1	2	2	1

AVIONICS LAB	BT753

Course Objective:

1. To gain the knowledge about Addition/Subtraction of 8 bit and 16-bit data for control surface deflection.
2. Learning about Sorting of Data in Ascending & Descending order for voting mechanism.
3. To know about adder/ Subtractor and Multiplexer/Demultiplexer Circuits
4. Function of Encoder and Decoder circuits.
5. Leaning about data Buses Configuration

Course Outcome:

1. Know about Addition/Subtraction of 8 bit and 16-bit data for control surface deflection.
2. Know about Sorting of Data in Ascending & Descending order for voting mechanism.
3. Know about adder/ Subtractor and Multiplexer/Demultiplexer Circuits
4. Detail Functioning of Encoder and Decoder circuits.
5. Detail Leaning about data Buses Configuration

COs	Programme Outcomes(POs)												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	2	3	2	1	1	-	-	-	-	-	1	2	2	1
CO2	2	2	2	1	0	1	-	-	-	-	-	1	2	1	1
CO3	2	2	3	1	0	1	-	-	-	-	-	1	2	1	1
CO4	2	2	3	2	1	1	-	-	-	-	-	1	2	2	1
CO5	2	2	3	3	2	1	-	-	-	-	-	1	2	2	1

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GULLU, ARANG, RAIPUR [C.G.]

Department of Aeronautical Engineering

Semester-VII **CO-PO and CO-PSO Mapping**

COMPUTER AIDED SIMULATION LAB-II	(BT754)

Course Objective:

1. Ability to gain practical experience in handling 2D drafting and 3D drafting
2. Ability to perform surface modelling on a/c and its parts
3. To develop in students' graphic skills for communication of concepts, ideas of engineering products
4. To familiarize with technical drawings

Course Outcome:

1. Explain graphic skills for communication of concepts, ideas of engineering products.
2. Design surface modelling using modelling software.
3. Create surface modelling in a/c and its parts
4. Create drafting on 3D models
5. Get job opportunities on design-based industries

COs	Programme Outcomes(POs)												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	2	3	2	1	1	-	-	-	-	-	1	2	2	1
CO2	2	2	2	1	0	1	-	-	-	-	-	1	2	1	1
CO3	2	2	3	1	0	1	-	-	-	-	-	1	2	1	1
CO4	2	2	3	2	1	1	-	-	-	-	-	1	2	2	1
CO5	2	2	3	3	2	1	-	-	-	-	-	1	2	2	1

INTERNSHIP-II	(BT755)

Course Objective:

1. The Internship-II helps the students gain a much deeper knowledge and interest obout there learning in Internship-I
2. The training readily enhances the technical skills of the individuals in a practical environment.
3. The training helps in the improvement of the awareness of the overall environment of the industry and the work culture at the same time

Course Outcome:

1. Understand the working procedures in industry with more interest as in phase-I
2. Gain knowledge about modern technologies adopted in engineering works
3. Apply new methods to investigate complex engineering problems
4. Gain motivation towards lifelong learning

COs	Programme Outcomes(POs)												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	2	3	2	1	1	1	2	1	1	1	2	2	2	1
CO2	2	2	2	1	0	1	1	1	1	1	1	2	2	1	1
CO3	2	2	3	1	0	1	1	1	1	1	1	2	2	1	1
CO4	2	2	3	2	1	1	1	2	1	1	1	2	2	2	1
CO5	2	2	3	3	2	1	1	3	1	1	1	2	2	2	1

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Department of Aeronautical Engineering

Semester-VII CO-PO and CO-PSO Mapping

PROJECT-II	(BT756)

Course Objective:

1. To utilize the knowledge gained from literature survey and continue to solve the chosen problem (in Project-I) till the successful solution of the same.
2. To train the students in preparing project reports and to face reviews and viva voce examination
3. Successs /failure in project work built confidence in students

Course Outcome:

1. On Completion of the project-II work students will be in a position to take up any challenging practical problems and find solution by formulating proper methodology.
2. Gain confidence to deal real life problems

COs	Programme Outcomes(POs)												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	2	3	2	1	1	1	2	1	1	1	2	2	2	1
CO2	2	2	2	1	0	1	1	1	1	1	1	2	2	1	1

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Department of Aeronautical Engineering

Semester-VIII — CO-PO and CO-PSO Mapping

INTERNSHIP/TRAINING-III	(BT850)

Course Objective:

1. It gives career alternatives prior to graduation
2. Provides a platform to Integrate theory and practice
3. Assess interests and abilities in their field of study
4. Develop communication, interpersonal and other critical skills in the job interview process
5. Acquire employment contacts leading directly to a full-time job following graduation from college

Course Outcome:

1. Develop work habits and attitudes necessary for job success
2. Identify, write down, and carry out performance objectives (mutually agreed upon by the employer and the student) related to their job assignment.
3. Application of theory into practice develop confidence and improve understanding
4. Job/work environment help student for interview and job opportunity

COs	Programme Outcomes(POs)												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	3	2	1	1	1	2	1	1	1	2	2	2	1
CO2	3	2	2	1	0	1	1	1	1	1	1	2	2	1	1
CO3	3	3	3	1	0	1	1	1	1	1	1	2	2	1	1
CO4	3	2	3	2	1	1	1	2	1	1	1	2	2	2	1

Project-III	(BT851)

Course Objective:

1. Final Year Projects offer the opportunity to apply and extend material learned throughout the engineering
2. Assessment is by means of a seminar presentation, submission of a thesis, and a public demonstration of work undertaken.
3. In contrast to the majority of courses studied elsewhere in the program, projects are undertaken individually or in small groups.
4. The projects undertaken span a diverse range of topics, including theoretical, simulation and experimental studies, and vary from year to year.
5. The emphasis is necessarily on facilitating student learning in technical, project management and presentation spheres.

Course Outcome:

1. Demonstrate a sound technical knowledge of their selected project topic
2. Undertake problem identification, formulation and solution
3. Design engineering solutions to complex problems utilising a systems approach
4. Communicate with engineers and the community at large in written an oral forms
5. Demonstrate the knowledge, skills and attitudes of a professional engineer

COs	Programme Outcomes(POs)												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	2	3	2	1	1	1	2	1	1	1	2	2	2	1
CO2	2	2	2	1	0	1	1	1	1	1	1	2	2	1	1
CO3	2	2	3	1	0	1	1	1	1	1	1	2	2	1	1
CO4	2	2	3	2	1	1	1	2	1	1	1	2	2	2	1
CO5	2	2	3	3	2	1	1	3	1	1	1	2	2	2	1

MATS UNIVERSITY

ARANG, RAIPUR (C.G.)

Scheme & Syllabus

(Ist & IInd Semester)

Bachelor of Technology

Aeronautical Engineering

MATS School of Engineering &I.T

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ARANG, RAIPUR (C.G.)

Scheme of Teaching & Examination

B. TECH. I SEMESTER

S. No.	Code	Subject	Periods per week			Scheme of marks		Total Credit
			L	T	P	ESE	IM	
1.	BT100	Engineering Mathematics – I	3	1	-	70	30	4
2.	BT101	Engineering Physics	3	1	-	70	30	4
3.	BT102	Programming for Logic Building	3	0	-	70	30	3
4.	BT103	Engineering Graphics & Design	2	0	-	70	30	2
5.	BT104	Environmental Sciences	1	0	-	70	30	1
6.	BT105	Technical English	2	0	-	70	30	2
7.	BT106	Engineering Physics Laboratory	-	-	2	30	20	1
8.	BT107	Programming & Soft Skills Laboratory	-	-	2	30	20	1
9.	BT108	Engineering Graphics & Design Laboratory	-	-	4	30	20	2
10.	BT109	Communication Skills laboratory	-	-	2	30	20	1
11	BT 110	Manufacturing Practices – I Lab	-	-	4	30	20	2
Total			**14**	**2**	**14**	**570**	**280**	**23**

L – Lecture, T – Tutorial, ESE – End Semester Examination,
P – Practical, IM – Internal Marks (Include Class Test & Teacher's Assessments)

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MATS UNIVERSITY, RAIPUR (C.G.)
SCHOOL OF ENGINEERING & I.T.

Semester: I B.Tech | **Branch: All Streams of Engineering**
Subject: Engineering Mathematics-I | **Code: BT 100**
Total Lecture + Tutorial Periods: 60 | **Total Tutorial Periods: 01/week**
Total Credits: 04

OBJECTIVES:

- To develop the use of matrix algebra techniques this is needed by engineers for practical applications.
- To make the student knowledgeable in the area of infinite series and their convergence so that he/ she will be familiar with limitations of using infinite series approximations for solutions arising in mathematical modeling.
- To familiarize the student with functions of several variables. This is needed in many branches of engineering.
- To introduce the concepts of improper integrals, Gamma, Beta and Error functions which are needed in engineering applications.
- To acquaint the student with mathematical tools needed in evaluating multiple integrals and their usage.

UNIT-I

MATRICES

Real vector space, Subspace, Linear span, Linear dependence and linear independence of vectors, Basis, Dimension, Linear transformation, Matrix associated with a linear transformation, Rank and inverse by elementary transformation (Gauss Jordan method), System of linear equations, Eigenvalues and eigenvectors, Cayley-Hamilton theorem, Diagonalization of matrices.

UNIT- II

DIFFERENTIAL CALCULUS

Successive differentiation, Lebnitz theorem, Rolle's Theorem, Taylor's theorem with Lagrange's form of remainder, Expansions of functions in Taylor's and McLaurin's series

UNIT-III

PARTIAL DIFFERENTIATION

Functions of two variables: Limit, continuity and partial derivatives, derivatives of higher order, Euler's theorem on homogeneous functions, Total derivative, Change of variables, Jacobians, Maxima, minima and saddle points of functions of two variables

UNIT-IV

ORDINARY DIFFERENTIAL EQUATION

First order ordinary differential equations: Exact, linear and Bernoulli's equations, Euler's equations, Equations of first order and higher degree: equations solvable for p, equations solvable for y, equations solvable for x and Clairaut's type.

Ordinary differential equations of higher order linear differential equations with constant coefficients & variable coefficients, method of variation of parameters, Cauchy-Euler equation, Legendre polynomials and their properties

UNIT-V

MULTIPLE INTEGRAL

Beta and Gamma functions – elementary properties, Double and triple integrals, change of order of integration, Application to area and volume.

OUTCOMES:

- This course equips students to have basic knowledge and understanding in one fields of materials, integral and differential calculus.

NAME OF TEXT BOOKS:

1. Higher Engineering Mathematics by B.S.Grewal (42th edition)-Khanna Publisher.
2. Advanced Engineering Mathematics by Erwin Kreyszig (8th edition)-John Wiley & Sons.

NAME OF REFERENCE BOOKS:

1. Differential Calculus by Gorakh Prasad-Pothisala Private Limited.
2.Advanced Engineering Mathematics by R.K.Jain and S.R.K. Iyengar-Narosa Publishing House.
3.Applied Mathematics by P.N.Wartikar&J.N.Wartikar Vol-ll –Pune VidyarthiGrihaPrakasan, Pune.
4. Integral Calculus by Gorakh Prasad-Pothisala Private Limited.

MATS UNIVERSITY, RAIPUR (C.G.)

SCHOOL OF ENGINEERING & I.T.

Semester: I B.Tech **Branch: All Streams of Engineering**
Subject: Engineering Physics **Code: BT101**
Total Lecture + Tutorial Periods: 60 **Total Tutorial Periods: 01/Week**
Total Credits: 04

OBJECTIVES:

- To enhance the fundamental knowledge in Physics and its applications relevant to various streams of Engineering and Technology.

Unit -I

THEORY OF RELATIVITY SPACE

Time and motion, frame of reference, Galilean Transformation Outline of relativity, Michelson-Morley experiment, Special theory of Relativity, transformation of space and time, Time dilation, Doppler effect ,length contraction, addition of velocities, Relativistic mass: variation of mass with velocity, kinetic energy, equivalence of mass and energy, Relation between energy and momentum.

Unit- II

(a) LASERS

Temporal and spatial coherence of light wave Principle of laser, Laser characteristics, components of laser, Principle of Ruby, He-Ne &Nd -YAG lasers, application, basic concepts of Holography (only introductory part, No detail derivation)

(b) FIBRES OPTICS:

Optical fibers: Introduction & advantages, structure & classification, Option of propagation in fiber, attenuation & distortion, acceptance angle and cone, numerical aperture (only introductory part, No detail derivation).

Unit -III

NUCLEAR PHYSICS

Controlled and uncontrolled chain reaction, criteria of critical mass, nuclear reactor and its site selection & numerical ,nuclear forces, Nuclear fusion in stars . Introduction of

elementary particles. Electron ballistic: Motion of charged particles in electric and magnetic field. Aston and Bainbridge mass spectrograph.

Unit -IV

WAVE OPTICS

Wedge shaped films, Interferences by division of amplitude: Newton's rings and its applications Interference by division of wave front: Fresnel's bi prism, fringe width, diffraction grating, resolving power of grating,

Unit- V

SOLID STATE DEVICES:

Transistor: Input and Output characteristics in CE mode, Transistor as an amplifier, Hartley Oscillator. FET: Input and output characteristics of J-FETs & MOSFETs, Operational amplifiers (Op-Amp).

OUTCOMES:

The students will have knowledge on the basics of physics related to properties of matter, optics, acoustics etc., and they will apply these fundamental principles to solve practical problems related to materials used for engineering applications.

TEXT BOOKS:

1. Gaur and Gupta “Engineering Physics”
2. Avadhanulu and Kshirsagar “Engineering Physics”.
3. Verma H.C.: Concepts of Physics, Part-1 & Part-2, BharatiBhawan (P&D)
4. A.K. Tayal: Engineering Mechanics (Statics and Dynamics)

REFERENCE BOOKS:

• Jenkins and White: “Optics”, MeGrew-Hill Book Company.
• Singh R.B.: “Physics of Oscillations and Waves”
• Ghatak A.K.: “Optics”
• Mani and Mehta: “Modern Physics”, Affiliated East-West Press Pvt. Ltd, 1998.
• Sanjeev Puri: Modern Physics, narosa Pub. Co.2004.
• Azroff: Solid State Physics, Tata McGraw-Hill, 2004.
• Theraja: B.L., Basic Electronics, S.Chand, 2002.
• Puri: Digital Electronics, Tata McGraw-Hill, 2002.
• Millman, J and Halkias: integrated Electronics, Tata MeGraw-Hill, 2004.
• Tyagrajan and Ghatak: Lasers, Macmillan, 2001. •

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SCHOOL OF ENGINEERING & I.T.

Semester: I B.Tech | **Branch: All Streams of Engineering**
Subject: Programming For Logic Building | **Subject Code: BT 102**
Total Theory Periods: 48 | **Total Tutorial Periods: 00**
Total Credits: 03

COURSE OBJECTIVE:

- To distinguish and recognize low-level and high-level programming languages
- To know fundamental concepts of structured programming
- To understand logic development
- To design pseudo logic for various programming problems.
- To understand the basic structure of a program including sequence, decisions and looping.
- To design solutions to real world problems using C language.
- To use C language for problem solving and numerical computations.
- To apply computer-programming concepts to new problems or situations.

UNIT – I
ELEMENTS OF C LANGUAGE

Tools for Problem Solving: Problem Analysis, Flowchart, Algorithm Development. Top-Down Program Design, Structured Design Approach, Origin of C, Features & Characteristic of C, C Compiler, Character Set, Keywords, Identifiers, Constants, Variables, Input/ Output Statements, Basic Data Types, Operators and Expressions, Basic structure of C programs, A simple C Program.

UNIT – II
CONTROL FLOW CONSTRUCTION

Decision making and branching: Simple if statement, if else statement, Nesting of if-else statement, else - if Ladder, Switch statement, Operator, goto statement, Decision making and looping, While statement, Do-While statement, For statement, Jumps in loops, Break and Continue statement.

UNIT – III
DEFINING AND MANIPULATING ARRAYS

One Dimensional Arrays: Declaration of Arrays, Initialization of Arrays, Reading and Writing of integer, real and Character arrays, sorting and Searching in Arrays, Multi-Dimensional Arrays, Handling of Character Strings.

UNIT – IV

USER DEFINED FUNCTIONS

Syntax of Function, Calling functions, Actual & Formal Arguments, Categories of Functions, Function prototype, Scope Rules: Local & Global variables, Recursion, Recursion vs. iteration, Passing Arguments: call by values & call by reference, passing array to function.

Structures: Declaration and initialization of Structure, Array of structures, Array within structure, structure within structure, Structures and functions, Introduction to unions.

UNIT – V

POINTER DATA TYPE AND ITS APPLICATION

Pointer Operator, Pointer Expression, Initialization of pointers, Pointer Arithmetic, Pointer and Function Arguments, Pointer to function, Pointer and Arrays, Pointers and String, Arrays of Pointers, Pointers to Pointers, Dynamic memory allocation.

Files in C: Defining and Opening a file, closing a file, Input/ Output operations on files, Error handling during I/O operations, Random access to files.

COURSE OUTCOME:

After completion of the course study, students are going to be in a position to

- Analyze issues and style algorithms in pseudo code.
- Able to implement the algorithms and draw flowcharts for solving Mathematical and Engineering problems
- Read, perceive and trace the execution of programs written in C language.
- Develop confidence for self-education and ability for life-long learning needed for Computer language.
- Write down C program for a given algorithm by means of modular approach.

TEXT BOOKS:

1. The C programming Language, Dennis M Ritchie and Kernighan, PHI.
2. Let us C, Yashwant Kanetkar, BPB Publication.
3. Programming in C, E. Balaguruswamy, TMH.

REFERENCE BOOKS:

1. Programming in C, Byron Gottfried, Schaum's series outline TMH.
2. Programming in C, Ghosh, PHI.
3. Computer Programming in C, V. Raja Raman, PHI.

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SCHOOL OF ENGINEERING & I.T.

Semester: I B.Tech **Branch: All Streams of Engineering**

Subject: Engineering Graphics and Design **Code: BT 103**

Total Theory Periods: 28 **Total Tutorial Periods: 00**

Total Credits: 02

OBJECTIVES:

- To develop in students, graphic skills for communication of concepts, ideas and design of engineering products.
- To expose them to existing national standards related to technical drawings.

UNIT – I

a) IMPORTANCE OF ENGINEERING DRAWING: Scales: Representative Fraction, Type of Scale, Plain and Diagonal Scale.

b) **ENGINEERING CURVES:** Conic section, Ellipse, parabola, hyperbola, Cycloidal Curves: Cycloid, Epicycloids, Hypocycloid and Involutes.

UNIT – II

a) **PROJECTION:** Introduction, Principle of Projection, method of projection, planes of projection, four quadrants, first and third angle projection and reference line symbols for methods of projection, Orthographic projection.

b) **PROJECTION OF POINTS:** Introduction point situated in first, second, third & fourth quadrant. Projection of lines: Introduction, line parallel to one or both the planes, line contained by one or both the planes, line perpendicular to one of the planes, line inclined to one plane and parallel to other. Line inclined to both the planes. [Simple problems only]

UNIT – III

a) PROJECTIONS OF PLANES: Introduction, types of planes, projection of planes, projection of planes perpendicular to both the reference planes, perpendicular to one plane and parallel to the other plane, perpendicular to one plane and inclined to the other plane.

b) **PROJECTIONS OF SOLIDS:** Introduction, types of solids, projections of solids in simple position, projections of solids with axes inclined to one of the reference planes and parallel to the other, projections of solids with axes inclined to both H.P. and the V.P., section planes, types of sections, true shape of section, section of solids.

UNIT – IV

a) DEVELOPMENT OF SURFACES: Introduction, methods of development, development of lateral surfaces of right solids, cube, prisms, cylinders, pyramids & cone.

b) ISOMETRIC PROJECTION: Introduction, Isometric axes, lines & planes, Isometric scale, Isometric projection and Isometric view of simple objects.

UNIT – V

COMPUTER AIDED DRAWING: Introduction to CAD, benefits and limitation of CAD, CAD Software's, AutoCAD introduction, Basic Commands of AutoCAD, Concept of Layers, Dimensioning and text, Creation of two dimensional drawing.

OUTCOMES:

On Completion of the course the student will be able to

- Perform free hand sketching of basic geometrical constructions and multiple views of objects.
- Do orthographic projection of lines and plane surfaces.
- Draw projections and solids and development of surfaces.
- Prepare isometric and perspective sections of simple solids.
- Demonstrate computer aided drafting.

TEXT BOOKS:

(i) Bhatt, N.D., "Elementary Engineering Drawing", Charotar Book Stall, Anand

(ii) George Omura, "Mastering AutoCAD" B.P.B. Publication, New Delhi

REFERENCE BOOKS:

(i) Engineering Graphics – Laxminarayanan V. and VaishWanar, R.S. Jain Brothers, New Delhi

(ii) Engineering Graphics – Chandra, AM & Chandra Satish 1998.

(iii) Engineering Graphics – K.L. Narayan and P. Kannaih, Tata McGraw Hill

(iv) A Text book of Engineering Drawing (Plane & Solid Geometry) – N.D. Bhatt & V.M. Panchal, Charotar Publishing House

(v) The Fundamental of Engineering Drawing and Graphics Technology – French and Vireck, McGraw Hill.

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SCHOOL OF ENGINEERING & I.T.

Semester: I B. Tech **Branch: All Streams of Engineering**
Subject: Environmental Sciences **Code: BT 104**
Total Theory Periods: 15 **Total Tutorial Periods: 00**
Total Credits: 01

OBJECTIVES

- To create and disseminate knowledge to the students about environmental problems at local, regional and global scale.
- To provide practical training on modern instrumentation and analytical techniques for environmental analyses.
- To sensitize students towards environmental concerns, issues, and impacts of climate change and related mitigation strategies.
- To make the students to apply their knowledge for efficient environmental decision-making, management and sustainable development.
- To prepare students for successful career in environmental departments, research institutes, industries, consultancy and NGOs, etc.

UNIT-I:

CONCEPTS OF ENVIRONMENTAL SCIENCES AND NATURAL RESOURCES

Environment, Levels of organizations in environment, Structure and functions in an ecosystem; Biosphere, its Origin and distribution on land, in water and in air, Broad nature of chemical composition of plants and animals. Renewable and Non-renewable Resources, Forests, water, minerals, Food and land (with example of one case study); Energy, Growing energy needs, energy sources (conventional and alternative).

UNIT-II:

BIODIVERSITY AND ITS CONSERVATION

Biodiversity at global, national and local levels: India as a mega-diversity nation; Threats to biodiversity (biotic, abiotic stresses), and strategies for conservation.

UNIT-III:

ENVIRONMENTAL POLLUTION

Types of pollution- Air, water (including urban, rural, marine), soil, noise, thermal, nuclear; Pollution prevention; Management of pollution- Rural/Urban/Industrial waste management [with

case study of any one type, e.g., power (thermal/nuclear), fertilizer, tannin, leather, chemical, sugar], Solid/Liquid waste management, disaster management.

UNIT-IV:

ENVIRONMENTAL BIOTECHNOLOGY AND ENVIRONMENTAL MONITORING
Biotechnology for environmental protection- Biological indicators, bio-sensors; Remedial measures- Bio-remediation, phyto-remediation, bio-pesticides, bio-fertilizers; Bio-reactors- Design and application. Monitoring- Identification of environmental problem, tools for monitoring (remote sensing, GIS); Sampling strategies- Air, water, soil sampling techniques.

UNIT-V:

SOCIAL ISSUES AND ENVIRONMENT

Problems relating to urban environment- Population pressure, water scarcity, industrialization; remedial measures; Climate change- Reasons, effects (global warming, ozone layer depletion, acid rain) with one case study; Legal issues- Environmental legislation (Acts and issues involved), Environmental ethics.

OUTCOMES

- After completion of the course, the students have: Acquired fundamental knowledge of different aspects of environment and local, regional and global environmental problems.
- Developed environmental monitoring skills, including conduct of experiments and data analysis.
- Obtained exposure to the environmental pollution control technologies. Acquired the knowledge and skills needed for the environmental design and management.
- Acquired skills in the preparation, planning and implementation of environmental projects.

TEXTBOOKS:

1. Gilbert M. Masters, “Introduction to Environmental Engineering and Science”, 2nd Edition, Pearson Education, 2004.

2. Benny Joseph, “Environmental Science and Engineering”, Tata McGraw-Hill, New Delhi, 2006.

REFERENCE BOOKS:

1. A. K. Chatterji, “Introduction to Environmental Biotechnology”, Prentice Hall of India, New Delhi, 2006.

2. R.K. Trivedi,“Handbook of Environmental Laws, Rules, Guidelines, Compliances and Standards”, Vol. I and II, Enviro Media.

3. Nebel B. J., “Environmental Science”, Prentice Hall of India, New Delhi, 1987.

MATS UNIVERSITY, RAIPUR (C.G.)

SCHOOL OF ENGINEERING & I.T.

Semester: I B.Tech **Branch: All Streams of Engineering**
Subject: Technical English **Code: BT 105**
Total Theory Periods: 28 **Total Tutorial Periods: 00**
Total Credits: 02

OBJECTIVES:

- To enable learners of Engineering and Technology develop their basic communication skills in English.
- To emphasize specially the development of speaking skills amongst learners of Engineering and Technology.
- To ensure that learners use the electronic media such as internet and supplement the learning materials used in the classroom.
- To inculcate the habit of reading and writing leading to effective and efficient communication.

UNIT-I

Technical vocabulary-meaning in context, sequencing words, articles, prepositions, intensive reading and predicting content-reading and interpretation- process description.

UNIT-II

Phrases/structures indicating use/purpose- nonverbal communication- listening- corelating verbal and nonverbal communication-speaking in group discussion- formal letter writing- writing analytical paragraphs.

UNIT III

Cause and effect expressions- different grammatical forms of the same word- speaking stress and intonation- writing using connectives- report writing- types, structures, data collection, content form recommendation.

UNIT –IV

Numerical adjectives- oral instructions- descriptive writings, letter of application-content, format (c.v./biodata)-imperative forms –checklists, yes/no question forms- e mail communication.

UNIT-V

Speaking – discussion of problems and solutions- creative and critical thinking, writing a proposal.

OUTCOMES:

Learners should be able to

- Speak clearly, confidently, comprehensibly, and communicate with one or many listeners using appropriate communicative strategies.
- Write cohesively and coherently and flawlessly avoiding grammatical errors, using a wide vocabulary range, organizing their ideas logically on a topic.
- Read different genres of texts adopting various reading strategies.

Listen/view and comprehend different spoken discourses/excerpts in different accents.

BOOKS AND REFERENCES:

1. P.k. dutta, g. Rajeevan and c.l.n.prakash, ‘a course in communication skills,. Cambridge university press, india2007

2. Krishna mohan and meerabanerjee, ‘developing communication skills’ Macmillan india limited

3. Edger thrope, showickthrope, ‘objective english’ second edition,pearson education,2007

MATS UNIVERSITY

ARANG, RAIPUR (C.G.)

MATS UNIVERSITY, RAIPUR (C.G.)

SCHOOL OF ENGINEERING & I.T.

Semester: I B.Tech. | **Branch: All Streams of Engineering**
Lab: Engineering Physics Laboratory | **Code: BT 106**
Total Practical Periods: 28 | **Total Credit: 01**

OBJECTIVES:

- To introduce different experiments to test basic understanding of physics concepts applied in optics, thermal physics and properties of matter.

OUTCOMES:

- The hands on exercises undergone by the students will help them to apply physics principles of optics and thermal physics to evaluate engineering properties of materials.

LIST OF EXPERIMENTS (Any ten experiments can be performed)

1. To determine the surface tension by Capillary/Jager's method.
2. To determine the wave length of light by Newton's rings method.
3. To determine the wave length of light by Fresnel's Biprism.
4. To determine the focal length of combination of two thin lenses by nodal slide assembly and its verification.
5. To determine specific resistance of a wire by Carry Foster's Bridge.
6. To determine the Hall coefficient of semiconductor.
7. To determine e/m by Thomson's method.
8. Study of Photo – Cell and determination of Planck's constant.
9. Determination of wavelength of a spectral line using diffraction grating.
10. Determination of divergence of LASER beam.
11. Determination of grating element of a diffraction grating using LASER beam.
12. To determine the coefficients of viscosity of a liquid by capillary flow/Stoke's method.
13. To determine the frequency of A.C. mains using sonometer.
14. To determine the moment of inertia of flywheel.
15 To determine the forbidden energy gap of semiconductor diode.
16. To determine the mechanical equivalent of heat (J) by Calender&Barne's method.
17. To determine the numerical aperture (NA) of the given fiber cables.
18. To study the characteristics of LDR.

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MATS UNIVERSITY, RAIPUR (C.G.)
SCHOOL OF ENGINEERING & I.T.

Semester: I B.Tech. **Branch: All Streams of Engineering**
Lab: Programming & Soft Skills laboratory **Code: BT 107**
Total Practical Periods: 28 **Total Credits: 01**

List of Programs:

1. Write a program to take the radius of a sphere as input and print the volume and surface area of that sphere.
2. Write a program to take a 5-digit number as input and calculate the sum of its digits.
3. Write a program to take three sides of a triangle as input and verify whether the triangle is an isosceles, scalene Oran equilateral triangle.
4. Write a program that will take 3 positive integers as input and verify whether or not they form a Pythagorean triplet or not.
5. Write a program to print all the Prime numbers between a given ranges.
6. Write a program to define a function that will take an integer as argument and return the sum of digits of that integer**.**
7. Write a program to define a macro that can calculate the greater of two of its arguments. Use this macro to calculate the greatest of 4 integers.
8. Write a program to define a recursive function that will print the reverse of its integer argument.
9. Write a program to print the sum of first N even numbers using recursive function.
10. Write a program to sort an array using Bubble sort technique.
11. Write a program that will take the elements of two integer arrays of 5 element each, and insert the common elements of both the array into a third array (Set intersection)
12. Write a program to take 5 names as input and print the longest name.
13. Write a program to check whether two given strings are palindrome or not using user defined function.
14. Write a program to find sum of all array elements by passing array as an argument using user define functions.
15. Write a program to convert decimal number to binary number using the function.

16 Write a program to get the largest and smallest element of an array using the function.

17 Write a program to define a structure Student that will contain the roll number, name and total marks of a student. The program will ask the user to input the details of 5 students and print the details of all the students whose total marks is greater than a given value.

18 Write a program to define a union Contact that will contain the members Mobile no and E-mail id. Now define structure Employee that will contain name, roll number, mode of contact (mob/e-mail) and a variable of type Contact as members. The program will ask the user to give the details of two Employees including mode of contact and the contact num/ E-mail. Print the details of both the Employees.

19 Write a program to count vowels and consonants in a string using pointer.

20 Write a program to swap two numbers using pointers.

21 Write a program to find sum of array elements using Dynamic Memory Allocation.

22 Write a program that will ask the user to input a file name and copy the contents of that file into another file.

23 Write a program that will take any number of integers from the command line as argument and print the sum of all those integers.

24 Write a program to process sequential file for payroll data.

25 Write a program to process random file of library data.

Smart Working with MS-Office

MS-Word

a) Creating, editing, saving and printing text documents
b) Font and paragraph formatting
c) Simple character formatting
d) Inserting tables, smart art, page breaks
e) Using lists and styles
f) Working with images
g) Using Spelling and Grammar check
h) Understanding document properties
i) Mail Merge

MS-Excel

a) Spreadsheet basics
b) Creating, editing, saving and printing spreadsheets
c) Working with functions & formulas
d) Modifying worksheets with color &auto formats
e) Graphically representing data : Charts & Graphs
f) Speeding data entry : Using Data Forms
g) Analyzing data : Data Menu, Subtotal, Filtering Data
h) Formatting worksheets
i) Securing & Protecting spreadsheets

MS-PowerPoint

a) Opening, viewing, creating, and printing slides
b) Applying auto layouts
c) Adding custom animation
d) Using slide transitions
e) Graphically representing data : Charts & Graphs
f) Creating Professional Slide for Presentation.

LIST OF EQUIPMENT'S / MACHINE REQUIRED:

PCs, C-Compiler, C Online Compiler, Microsoft Office (version 2007 or above)

REFERENCES:

1. Programming in ANSI C – E. Balaguruswamy Tata Mc-Gcraw Hill.
2. Let us C, YashwantKanetkar, BPB Publication
3. C: The Complete Reference, Herbert Schildt, McGraw Hill.
4. Office 2007 for Dummies, Wallace Wang, Wiley Publishing
5. MS-Office 2010 Training Guide, Satish Jain/M.Geeta/Kratika, BPB Publications

MATS UNIVERSITY, RAIPUR (C.G.)

SCHOOL OF ENGINEERING & I.T.

Semester: I B.Tech **Branch: All Streams of Engineering**
Lab: Engineering Graphics and Design Laboratory **Code: BT 108**
Total Practical Periods: 60 **Total Credits: 02**

LIST OF EXPERIMENTS

Component-1

Sheet-1: Projection of Solids (4 problems) + Section and Development of solid surfaces (4 problems) Sheet -2: Orthographic projection without section (4 problems).
Sheet -3: Orthographic projection with section (4 problems). Sheet- 4: Isometric Projections (6 problems).

Component -2

One A-3 size sketch book consisting of:-
1) 6 problems each from Projection of Curves, Lines, Planes and Solids.
2) 6 problems from Section and Development of Solids.
3) 4 problems each from the Orthographic Projections (with Section), Reading of orthographic projections and Isometric projections.

Component - 3

1. An introduction of cad software and its utilities in the engineering software.
2. Study of the basic initial setting and viewing of drafting software interface.
3. Study of various tool bar options and exercises to familiarize all the drawing tools.
4. Use of various modify commands of drafting software.
5. Dimensioning in 2d and 3d entities.
6. Draw different types of 3d modeling entities using viewing commands, to view them (isometric projection).
7. Sectioning of solid primitives and rendering in 3d.
8. Intersection of solid primitives.

MATS UNIVERSITY

ARANG, RAIPUR (C.G.)

MATS UNIVERSITY, RAIPUR (C.G.)

SCHOOL OF ENGINEERING & I.T.

Semester: I B.Tech **Branch: All Streams of Engineering**
Lab: Communication & Soft Skills Laboratory **Code: BT 109**
Total Practical Periods: 28 **Total Credits: 01**

LIST OF TASKS:

1. Listening comprehension – Achieving ability to comprehend material delivered at relatively fast speed; comprehending spoken material in Standard Indian English, British English, and American English; intelligent listening in situations such as interview in which one is a candidate.

2. Vocabulary building, Creativity, using Advertisements, Case Studies etc.

3. Personality Development: Decision-Making, Problem Solving, Goal Setting, Time Management & Positive Thinking

4. Cross-Cultural Communication: Role-Play/ Non-Verbal Communication.

5. Meetings- making meeting effective, chairing a meeting, decision making, seeking opinions , interrupting and handling interruptions, clarifications, closure- Agenda, Minute writing.

6. Group Discussion – dynamics of group discussion, Lateral thinking, Brainstorming and Negotiation skills

7. Resume writing – CV – structural differences, structure and presentation, planning, defining the career objective

8. Interview Skills – formal & informal interviews, concept and process, pre-interview planning, opening strategies, answering strategies, interview through tele and video-conferencing 9. Writing Skills - Business Communication, Essays for competitive examinations.

10. Technical Report Writing/ Project Proposals – Types of formats and styles, subject matter – organization, clarity, coherence and style, planning, data-collection, tools, analysis.- Feasibility, Progress and Project Reports.

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SCHOOL OF ENGINEERING & I.T.

Semester: I B.Tech **Branch: All Streams of Engineering**
Lab:Manufacturing Practices -I Laboratory **Code: BT 110**
Total Practical Periods: 45+ (15 Instructional Periods) **Total Credits: 02**

INSTRUCTIONAL SYLLABUS

Carpentry:
Timber, definition, engineering applications, seasoning and preservation, plywood and ply boards.
Foundry:
Moulding sands, constituents and characteristics. Pattern, definition, materials, types, core prints. Role of gate, runner, riser, core and chaplets. Causes and remedies of some common casting defects like blow holes, cavities, inclusions.
Welding:
Definitions of welding, brazing and soldering processes, and their applications, Oxyacetylene gas welding process, equipment and techniques, type of flames and their applications. Manual met an arc Welding technique and equipment, AC and DC welding, electrodes, constituents and functions of electrode coating, Welding positions. Type of weld joint. Common welding defects such ascracks, undercutting slag inclusion, porosity.

LIST OF EXPERIMENTS

1. T-Lap joint and Bridle joint (Carpentry shop)
2. Mould of any pattern (foundry shop)
3. Casting of any simple pattern (foundry shop)
4. (a) Gas welding practice by students on mild steel flat

(b) Lap joint by Gas welding

5. (a) MMA Welding practice by students

(b) Square butt joint by MMA Welding

6. (a) Lap joint by MMA Welding

(b) Demonstration of brazing

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MATS UNIVERSITY
SCHOOL OF ENGINEERING & I.T.
SCHEME OF TEACHING AND EXAMINATION SESSION 2022-23
B. TECH.II – SEMESTER

S. No.	Code	Subject	Periods per week			Scheme of marks		Total Credit
			L	T	P	ESE	IM	
1.	BT200	Engineering Mathematics –II	3	1	-	70	30	4
2.	BT201	Engineering Chemistry	3	-	-	70	30	3
3.	BT202	Basic Electrical & Electronics Engineering	3	-	-	70	30	3
4.	BT203	Object Oriented Programming	3	-	-	70	30	3
5.	BT204	Constitution of India, Professional Ethics and Human Rights	1	-	-	70	30	1
6.	BT205	Professional Elective	3	-	-	70	30	3
	BT2051	Fundamental of Mechanical Engineering (For Aero/Mech/Mining/Civil)						
	BT2052	Introduction to Scripting (For CSE/Elex/Electrical)						
7.	BT206	Engineering Chemistry Laboratory	-	-	2	30	20	1
8.	BT207	Basic Electrical & Electronics Engineering Laboratory	-	-	2	30	20	1
9.	BT208	Advance Programming Laboratory	-	-	2	30	20	1
10.	BT209	Professional Elective Laboratory	-	-	2	30	20	1
	BT2091	Fundamental of Mechanical Engineering Laboratory (For Aero/Mech/Mining/Civil)						
	BT2092	Java Script Laboratory (For CSE/Elex/Electrical)						
11.	BT210	Manufacturing Practices – II Laboratory	-	-	4	30	20	2
Total			**16**	**1**	**12**	**570**	**280**	**23**

L – Lecture, T – Tutorial, ESE – End Semester Examination,
P – Practical, IM – Internal Marks (Include Class Test & Teacher's Assessment

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MATS UNIVERSITY, RAIPUR (C.G.)
SCHOOL OF ENGINEERING & I.T.

Semester: II B.Tech **Branch: All Streams of Engineering**

Subject: Engineering Mathematics-II **Subject Code: BT 200**

Total Lecture + Tutorial Periods: 60 **Total Credits: 04**

OBJECTIVES:

- To make the scholars perceive the series analysis could be a powerful methodology wherever the formulas square measure integrals and to possess information of increasing periodic functions that explore sort of applications of Fourier series.
- To possess intensive information of PDE those arise in mathematical descriptions of things in engineering. To review a few amount which will take any of a given vary of values that will not be foreseen because it is however can be delineated in terms of their likelihood.
- To acquaint the student with the concepts of vector calculus needed for problems in all engineering disciplines.
- To produce a sound background of advanced analysis to perform an intensive investigation of major theorems of complex analysis and to use these ideas to a large vary of issues that features the analysis of each complex line integrals and real integrals.
- To make the student appreciate the purpose of using transforms to create a new domain in which it is easier to handle the problem that is being investigated.

UNIT I

FOURIER SERIES

Fourier series, Even odd function, Half range sine and cosine series, Parseval's theorem, practical harmonic analysis & Fourier Transform

UNIT II

PARTIAL DIFFERENTIAL EQUATION

Formation, Solution by direct integration method, Linear equation of first order, Homogeneous linear equation with constant coefficients, Non-homogeneous linear equations, Method of separation of variables & application of PDE

UNIT III

COMPLEX ANALYSIS

Derivative, Cauchy-Riemann equations, Analytic functions, Harmonic functions, Flow problems, Complex integration, Cauchy theorem, Cauchy integral formula, Taylor & Laurent series, Singularity, Residue

UNIT IV

LAPLACE TRANSFORMATION

Definition, Transform of elementary functions, Properties of Laplace transform, of derivatives & integrals, Multiplication by tn, Division by t, Evaluation of integrals, Inverse Laplace function, Convolution theorem, Unit step functions, Unit impulse function, periodic function. Application to solution of ordinary differential equations

UNIT V

VECTOR CALCULUS

Directional derivative, Gradient, Divergence and curl, Line, Surface and Volume integrals, Green's, Gauss's &Stoke's theorem (without proof) and applications

OUTCOMES:

The subject helps the students to develop the fundamentals and basic concepts in vector calculus, PDE, Laplace transform and complex functions. Students will be able to solve problems related to engineering applications by using these techniques.

TEXT BOOKS:

1. Higher Engineering Mathematics by B.S.Grewal (40th edition)-Khanna Publisher.
2. Advanced Engineering Mathematics by Erwin Kreyszig (8th edition)-John Wiley & Sons.

REFERENCE BOOKS:

1. Differential Calculus by Gorakh Prasad-Pothisala Private Limited.
2. Advanced Engineering Mathematics by R.K.Jain and S.R.K. Iyengar-Narosa Publishing House.
3. Applied Mathematics by P.N.Wartikar&J.N.Wartikar Vol-ll –Pune VidyarthiGrihaPrakasan, Pune

MATS UNIVERSITY, RAIPUR (C.G.)

SCHOOL OF ENGINEERING & I.T

Semester: II B. Tech
Subject: Engineering Chemistry
Total Theory Periods: 48
Total Credits: 03

Branch: All Streams of Engineering
Code: BT 201
Total Tutorial Periods: 00

OBJECTIVES:

- To make the students conversant with boiler feed water requirements, related problems and water treatment techniques.
- Principles of electrochemical reactions, redox reactions in corrosion of materials and methods for corrosion prevention and protection of materials.
- Principles and generation of energy in batteries, nuclear reactors, solar cells, wind mills and fuel cells.
- Preparation, properties and applications of engineering materials.
- Types of fuels, calorific value calculations, manufacture of solid, liquid and gaseous fuels

UNIT-I:

(a) ELECTROCHEMISTRY AND BATTERY TECHNOLOGY ELECTROCHEMISTRY: Introduction, Derivation of Nernst equation for electrode potential. Reference electrodes: Introduction, construction, working and applications of calomel and Ag / AgCl electrodes. Measurement of electrode potential using calomel electrode. Ion selective electrode: Introduction; Construction and working of glass electrode, determination of pH using glass electrode. Concentration cells: Electrolyte concentration cells, numerical problems.

(b) BATTERY TECHNOLOGY:

Introduction, classification - primary, secondary and reserve batteries. Characteristics - cell potential, current, capacity, electricity storage density, energy efficiency; cycle 10 hours life and shelf life. Construction, working and applications of Zinc Air, Nickel- metal hydride batteries. Lithium batteries: Introduction, construction, working and applications of Li-MnO_2 and Li-ion batteries.

(c) **FUEL CELLS:**

Introduction, difference between conventional cell and fuel cell, limitations & advantages. Construction, working & applications of methanol-oxygen fuel cell with H_2SO_4 electrolyte.

UNIT-II:

(a) CORROSION AND METAL FINISHING CORROSION:

Introduction, electrochemical theory of corrosion, galvanic series. Factors affecting the rate of corrosion: ratio of anodic to cathodic areas, nature of metal, nature of corrosion product, nature of medium – pH, conductivity, and temperature. Types of corrosion- Differential metal, differential aeration (Pitting and water line) and stress. Corrosion control: Inorganic coatings Anodizing of Al and phosphating; Metal coatings-Galvanization and Tinning. Cathodic protection (sacrificial anodic and impressed current methods).

(b) **METAL FINISHING:**

Introduction, Technological importance. Electroplating: Introduction, principles governing-Polarization, decomposition potential and overvoltage. Factors influencing the nature of electro deposit-current density, concentration of metal ion & electrolyte; pH, temperature & throwing power of plating bath; additives- brighteners, levelers, structure modifiers & wetting agents. Electroplating of Nickel (Watt's Bath) and Chromium (decorative and hard). Electro less plating: Introduction, distinction between electroplating and electro less plating, electro less plating of copper & manufacture of double sided Printed Circuit Board with copper.

UNIT-III:

(a)FUELS AND SOLAR ENERGY FUELS:

Introduction, classification, calorific value- gross and net calorific values, determination of calorific value of fuel using bomb calorimeter, numerical problems. Cracking: Introduction fluidized catalytic cracking, synthesis of petrol by Fishcher-Tropsch process, reformation of petrol, octane and cetane numbers. Gasoline and diesel knocking and their mechanism, anti-knocking agents, power alcohol & biodiesel.

(b)SOLAR ENERGY:

Introduction, utilization and conversion, photovoltaic cells- construction and working. Design of PV cells: modules, panels & arrays. Advantages & disadvantages of PV cells. Production of solar grade silicon: Union carbide process, purification of silicon (zone refining), doping of silicon-diffusion technique (N&P types).

UNIT-IV:

POLYMERS:

Introduction, types of polymerization: addition and condensation, mechanism of polymerization- free radical mechanism taking vinyl chloride as an example. Molecular weight of polymers: number average and weight average, numerical problems. Glass transition temperature (Tg): Factors influencing Tg- Flexibility, inter molecular forces, molecular mass, branching & cross linking and stereo regularity. Significance of Tg. Structure property relationship: crystallinity, tensile strength, elasticity & chemical resistivity. Synthesis, properties and applications of PMMA (plexi glass), Polyurethane and polycarbonate. Elastomers: Introduction, synthesis, properties and applications of Silicone rubber.

Adhesives: Introduction, synthesis, properties and applications of epoxy resin. Polymer Composites: Introduction, synthesis, properties and applications of Kevlar. Conducting polymers: Introduction, mechanism of conduction in Poly aniline and applications of conducting poly aniline.

UNIT-V:

WATER TECHNOLOGY AND NANOMATERIALS

(a)WATER TECHNOLOGY:

Introduction, boiler troubles with disadvantages & prevention methods-scale and sludge formation, priming and foaming, boiler corrosion (due to dissolved O2, CO2 and MgCl2). Determination of DO, BOD and COD, numerical problems on COD. Sewage treatment: Primary, secondary (activated sludge method) and tertiary methods. Softening of water by ion exchange process. Desalination of sea water by reverse osmosis & electro dialysis (ion selective).

(b)NANO MATERIALS:

Introduction, properties (size dependent). Synthesis-bottom up approach (sol-gel, precipitation, gas condensation & chemical vapour condensation processes). Nano scale materials- carbon nano tubes, nano wires, fullerenes, dendrimers, nano rods, &nano composites.

OUTCOMES:

- The knowledge gained on engineering materials, fuels, energy sources and water treatment techniques will facilitate better understanding of engineering processes and applications for further learning.

TEXTBOOKS:

1. B.S.Jai Prakash, R.Venugopal, Sivakumaraiah&PushpaIyengar., “Chemistry for Engineering Students”, Subhash Publications, Bangalore.

2. R.V.Gadag&A.Nityananda Shetty., “Engineering Chemistry”, I K International Publishing House Private Ltd. New Delhi.

3. P.C.Jain& Monica Jain., “Engineering Chemistry”, Dhanpat Rai Publications, New Delhi.

REFERENCE BOOKS:

1. O.G.Palanna,“Engineering Chemistry”, Tata McGraw Hill Education Pvt. Ltd. New Delhi, Fourth Reprint.

2. G.A.Ozin& A.C. Arsenault, “Nano chemistry A Chemical Approach to Nanomaterials”, RSC publishing, 2005.

3. “Wiley Engineering Chemistry”, Wiley India Pvt. Ltd. New Delhi. Second Edition.

4. V.R.Gowariker, N.V.Viswanathan&J.Sreedhar., “Polymer Science”, Wiley-Eastern Ltd.

5. M.G.Fontana., “Corrosion Engineering”, Tata McGraw Hill Publishing Pvt. Ltd. New Delhi

MATS UNIVERSITY

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MATS UNIVERSITY, RAIPUR (C.G.)

SCHOOL OF ENGINEERING & I.T

Semester: II B. Tech **Branch: All Streams of Engineering**
Subject: Basic Electrical & Electronics Engineering **Code: BT 202**
Total Theory Periods: 48 **Total Tutorial Periods: 00**
Total Credits: 03

COURSE OBJECTIVES

- Understand the basic concepts of DC and AC circuits.
- Analyse the series, parallel and series, parallel ac circuits.
- Acquire knowledge about working principle, construction and losses of a transformer.
- Understand the working, characteristics and applications of diodes.
- Understand the construction, working, characteristics and applications of a transistor.

Unit – I

D.C. Networks:

Elementary idea about power generation, transmission and distribution. Node voltage and mesh current method. Superposition, Thevenin's and Norton's theorems. Star- delta and Delta- star conversions.

Unit – II

Single Phase A.C. Circuits:

Single phase EMF generation, Effective & Average values of sinusoids and determination of form-factor, Analysis of simple series R-L, R-C and RLC circuits, power and power factor

Unit – III

(a) Three Phase AC circuits:

Introduction, Generation of Three-phase EMF, Phase sequence, Connection of Three-phase Windings - Delta and Star connection: Line and Phase quantities, phasor diagrams, Power equations in balanced conditions.

(b)Magnetic Circuits:

Introduction, Magneto motive force (MMF), Magnetic field strength, Reluctance, B-H curve, Comparison of the Electric and Magnetic Circuits, Series-Parallel Magnetic Circuit, Leakage flux and fringing, Magnetic Hysteresis, Eddy currents.

Unit – IV

(a)Single phase Transformers:

Introduction, Principles of operation, Constructional details, Ideal Transformer and Practical Transformer, EMF equation, Rating, Phasor diagram on no load, Losses, Efficiency calculations.

(b)Direct current machines:

Basic concepts and elementary idea of AC and DC machines, construction and working principal of DC Generator, emf and torque equation dc machine and types of dc motor.

Unit – V

(a)Semiconductor Devices and Applications

Introduction - Characteristics of PN Junction Diode – Zener Effect - Zener Diode and its Characteristics - Half wave and Full wave Rectifiers - Voltage Regulation. Bipolar Junction Transistor - CB, CE, CC Configurations and Characteristics - Elementary Treatment of Small Signal Amplifier

(b)Digital Electronics

Binary Number System – Boolean algebra theorems, Digital circuits - Introduction to sequential Circuits,

Flip-Flops - Registers and Counters – A/D and D/A Conversion.

COURSE OUTCOMES

- Apply the knowledge of basic laws to electric and magnetic circuits.
- Distinguish between various types of representation of ac quantities.
- Draw the phasor diagrams of an ideal and a practical transformer at no load.
- Analyse and design basic circuits which include diode, LED and seven segment display.
- Analyse and design circuits consisting of transistors.

TEXT BOOKS:

1. V.N. Mittle and Arvind Mittal, “Basic Electrical Engineering”, Second Edition, Tata McGraw Hill.
2. 2 Del Torro, Vincent “Electrical Engineering Fundamentals”, Second Edition Prentice Hall of India Pvt. Ltd.

REFERENCE BOOKS:

1. Fitzrald and Higgonbothom, “Basic Electrical Engineering”, Fifth Edition, McGraw Hill.
2. D.P. Kothari and I.J. Nagrath, “Theory and Problems of Basic Electrical Engineering”, PHI.
3. I.J. Nagrath and D.P. Kothari, ”Electrical Machines”, Tata McGraw Hill.
4. Ashfaq Hussain, “Fundamentals of Electrical Engineering”, Third Edition, Dhanpat Rai and Co.
5. H. Cotton, ”Advance Electrical Technology,” ISSAC Pitman, London. 6. Parker Smith S. (Ed. Parker Smith N.N.), “Problems in Electrical Engineering”, Tenth edition, Asia publication

MATS UNIVERSITY

ARANG, RAIPUR (C.G.)

MATS UNIVERSITY, RAIPUR (C.G.)

SCHOOL OF ENGINEERING & I.T.

Semester: II B. Tech. **Branch: All Streams of Engineering**
Subject: Object Oriented Programming **Code: BT 203**
Total Theory Periods: 48 **Total Tutorial Periods: 00**
Total Credits: 03

COURSE OBJECTIVES

- To learn the object-oriented programming concepts using C++.
- To design and implement C++ programs with the concept of OOP.
- To understand implementation issues related to object-oriented techniques.
- To learn how to build good quality software using object-oriented programming technique.

UNIT-I

INTRODUCTION TO OOP AND C++

Concept of Object Oriented Programming, Procedural programming Vs. Object oriented programming (OOP), Features and Benefits of OOPs, Object Oriented Languages, Introduction to C++, C++ Compiler, C++ Standard library, Basics of a typical C++ environment and C++ program, Pre-processors directives, and illustrative simple C++ programs. Header files and namespaces, library files, Data Types, Keywords, Operators and Expressions, Control Structure, Loops, Arrays, Structures, Functions.

UNIT-II

CLASSES & OBJECT, CONSTRUCTORS&DESTRUCTORS

Introduction to class, class object creation, Access of class members, Scope of class and its member, Nested class, Data hiding & encapsulation, Friend function, Array within a class, Array of object as function argument, Function returning object, Static member. Constructor function, Parameterized multiple constructor, Default constructor, Dynamic memory allocation with new and delete, Copy constructor, Constant and class, Data conversion between objects of different classes, Destructor function.

UNIT- III

INHERITANCE, POINTER, VIRTUAL FUNCTIONS & POLYMORPHISM

Fundamentals of operator overloading, restrictions on operators overloading, operator functions as class members vs. as Friend functions, Overloading, <<, >> Overloading unary operators, overloading binary operators. Introduction to inheritance, Base classes and derived classes, protected members, Casting base class pointers to derived class pointers, Using member functions, Overriding base class members in a derived class, public, protected and private inheritance, Using constructors and destructors in derived classes, Implicit derived class object to base class object conversion, Composition Vs. Inheritance. Introduction to virtual functions, Abstract base classes and concrete classes, new classes and dynamic binding, virtual destructors, polymorphism, dynamic binding.

UNIT-IV

FILE I/O, TEMPLATES& EXCEPTION HANDLING

Files and streams, Creating a sequential access file, Reading data from a sequential access file, Updating sequential access files, Random access files, creating a random access file, Writing data randomly to a random access file, reading data sequentially from a random access file. Stream Input/output classes and objects, Stream output, Stream input, Unformatted I/O (with read and write), Stream manipulators. Function templates, Overloading template functions, Class template, Class templates and non-type parameters, Templates and inheritance, Templates and friends, Templates and static members. Basics of C++ Exception handling: Try Throw, Catch, Throwing an exception, catching an exception, rethrowing an exception, Exception specifications, processing unexpected exceptions.

UNIT-V

OOPS CONCEPTS WITH PYTHON

Python Basics, Python Objects, Standard Types, Other Built-in Types, Internal Types, Standard Type Operators, Standard Type Built-in Functions, Categorizing the Standard Types, Unsupported Types Numbers - Introduction to Numbers, Integers, Floating Point Real Numbers, Complex Numbers, Operators, Built-in Functions, Related Modules Sequences - Strings, Lists, and Tuples, Mapping and Set Types. Creating classes and objects, inheritance in python.

COURSE OUTCOME:

After completion of the course study, students will be able to

1. Explain the basics of Object Oriented Programming concepts.
2. Design and develop a C++ program with concept of Object Oriented Programming.
3. Apply the object initialization and destroy concept using constructors and destructors.
4. Apply the concept of polymorphism to implement compile time polymorphism in programs by using overloading methods and operators.
5. Use the concept of inheritance to reduce the length of code and evaluate the usefulness.
6. Apply the concept of run time polymorphism by using virtual functions, overriding functions and abstract class in programs.
7. Use I/O operations and file streams in programs.
8. Make an application/project using C++.

TEXT BOOKS:

1. Object Oriented Programming in C++, Robert Lafore, CourseSams Publishing.
2. Object Oriented Programming with C++, E. Balagurusamy, McGraw Hill Education.
3. Python 3 Object-Oriented Programming - Third Edition

REFERENCE BOOKS:

1. The Complete Reference C++, Herbert Schildt, McGraw Hill Education.
2. Let Us C++, YashavantKanetkar, BPB Publication.
3. Programming with C++, John R. Hubbard, Schaum's Outlines, McGraw Hill Education.
4. Programming with C++, D. Ravichandran, McGraw Hill Education.
5. Core Python Programming, Wesley J. Chun, Second Edition, Pearson.

MATS UNIVERSITY

ARANG, RAIPUR (C.G.)

MATS UNIVERSITY, RAIPUR (C.G.)

SCHOOL OF ENGINEERING & I.T.

Semester: II B. Tech **Branch: All Streams of Engineering**
Subject: Constitution of India, Professional Ethics and Human Rights **Code: BT 204**
Total Theory Periods: 15 **Total Tutorial Periods: 00**
Total Credits: 01

COURSE OBJECTIVES

• To assimilate and get familiarized with basic information about Indian constitution and provide overall legal literacy to the young technocrats to manage complex societal issues in the present scenario.
• To identify their individual roles and ethical responsibilities towards society.
• To understand engineering ethics & responsibilities, through the learning of these topics students will be able to understand human rights/ values and its implications in their life.

UNIT-I: CONSTITUTION OF INDIA

Introduction to the Constitution of India, The Making of the Constitution and Salient features of the Constitution, Preamble to the Indian Constitution Fundamental Rights & its limitations.

UNIT-II: FUNDAMENTAL DUTIES AND UNION EXECUTIVES

Directive Principles of State Policy & Relevance of Directive Principles State Policy Fundamental Duties. Union Executives – President, Prime Minister Parliament Supreme Court of India

UNIT-III: STATE LEGISLATURE AND ELECTORAL PROCESS

State Executives – Governor Chief Minister, State Legislature High Court of State, Electoral Process in India, Amendment Procedures, 42nd, 44th, 74th, 76th, 86th &91st Amendments.

UNIT-IV: HUMAN RIGHTS

Special Provision for SC & ST Special Provision for Women, Children & Backward Classes Emergency Provisions. Human Rights –Meaning and Definitions, Legislation Specific Themes in Human Rights-Working of National Human Rights Commission in India ,Powers and functions of Municipalities, Panchyats and Co - Operative Societies..

UNIT-V: PROFESIONAL ETHICS

Scope & Aims of Engineering Ethics, Responsibility of Engineers Impediments to Responsibility. Risks, Safety and liability of Engineers, Honesty, Integrity & Reliability in Engineering.

COURSE OUTCOMES

At the end of the course students will be able to...

- Understand the meaning and importance of Constitution
- Explain about making of Indian Constitution - contribution of Constituent assembly on it.
- Describe the Salient (Outstanding) features of Indian Constitution.
- Describe the importance of Preamble of the Indian Constitution and its significance.

TEXTBOOKS:

1. Durga Das Basu: "Introduction to the Constitution on India", (Students Edn.) Prentice –Hall EEE, 19th / 20th Edn., 2001

2. Charles E. Haries, Michael S Pritchard and Michael J. Robins "Engineering Ethics" Thompson Asia, 2003-08-05.

REFERENCE BOOKS:

1. M.V.Pylee, "An Introduction to Constitution of India", Vikas Publishing, 2002.

2. M.Govindarajan, S.Natarajan, V.S.Senthilkumar, "Engineering Ethics", Prentice –Hall of India Pvt. Ltd. New Delhi, 2004

3. Brij Kishore Sharma,"Introduction to the Constitution of India", PHI Learning Pvt. Ltd., New Delhi, 2011.

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ARANG, RAIPUR (C.G.)

MATS UNIVERSITY, RAIPUR (C.G.)

SCHOOL OF ENGINEERING & I.T.

Semester: II B. Tech **Branch: Aero., Aero (Hons) Civil, Mining and Mechanical Engg.**
Subject: Fundamentals of Mechanical Engineering **Code: BT 2051**
Total Theory Periods: 48 **Total Tutorial Periods: 00**
Total Credits: 03

OBJECTIVES:

- To develop capacity to predict the effect of force and motion in the course of carrying out the design functions of engineering.

UNIT – I:

RESULTANT AND EQUILIBRIUM ANALYSIS:

Basic concepts and laws of mechanics, system of forces, free body diagram, Resultant and equilibrium of concurrent, parallel and non-concurrent co-planar force system. General numerical applications.

UNIT – II :

(a) ANALYSIS OF PLANE TRUSSES Perfect truss, basic assumptions for perfect truss, analysis of axial forces in the members by method of joint and method of sections. General numerical applications.

(b) FRICTION Static, dynamic and limiting friction, Law of limiting friction, Angle of friction,

Angle of Repose, Cone of Friction, Wedge friction. General numerical applications

UNIT –III :

PROPERTIES OF SURFACES Centre of Gravity, Second moment of area, determination of second moment of area by integration, polar moment of inertia, radius of gyration of area, Parallel axis theorem, Moment of inertia of composite areas, and determination of Product of inertia by integration.

UNIT –IV :

KINETICS OF PARTICLES

(a) D'Alembert's principle applied to bodies having rectilinear motion.

(b) Principle of work and Energy: General numerical applications

(c) Principle of Impulse and momentum: General numerical applications

UNIT – V :

LAWS OF THERMODYNAMICS

(a) Thermodynamic System, properties, process, cycle, thermodynamic equilibrium, Quasi-static Process, Zeroth Law of thermodynamics, Work and Heat transfer, flow work, general numerical application.

(b)First Law of thermodynamics, internal energy, proof of internal energy as a point function, general numerical application of first law to non-flow process and steady flow process.

OUTCOMES:

(a)Ability to explain the differential principles applies to solve engineering problems dealing with force, displacement, velocity and acceleration.
(b)Ability to analyses the forces in any structures.
(c) Ability to solve rigid body subjected to dynamic forces.

TEXT BOOKS:

1. Engineering Mechanics (Statics and Dynamics) ; A. K. Tayal ,Umesh Pub., Delhi .

2. Engineering Mechanics : S. Timoshenko and D.H. Young,TMH

3. Engineering Thermodynamics: P.K.Nag, TMH

4. Engineering Thermodynamics: C.P.Arora, TMH

REFERENCE BOOKS:

1. Engineering Mechanics (Statics and Dynamics): R.C.Hibbeler, Pearson

2. Engineering Mechanics:Meriam and Kreige ,John Wiley and sons

3. Thermodynamics: Cengel and Boles, TMH

4. Essentials of Engg Mechanics: S.Rajasekharan&G.ShankaraSubramaniyam, Vikas Publications

5. Engineering Mechanics: BasudebBhatytacharya , Oxford

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ARANG, RAIPUR (C.G.)

MATS UNIVERSITY, RAIPUR (C.G.)

SCHOOL OF ENGINEERING & I.T.

Semester: II B. Tech
Subject: Introduction to Scripting
Total Theory Periods: 48
Total Credits: 03

Branch: Comp. Sci. and Engg. and CSE(Hons)
Code: BT 2052
Total Tutorial Periods: 00

COURSE OBJECTIVE:

1. Design and develop static and dynamic web pages.
2. Familiarize with Client-Side Programming,
3. Learn web page validations.
4. To design and implement web page scripts.
5. To learn how to build good interactive web pages using HTML and Javascript.

UNIT I – INTRODUCTION TO SCRIPTING LANGUAGES

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

UNIT II - HTML BASICS

HTML basics, Elements, Attributes and Tags, Basic Tags, Advanced Tags, Frames, Images. Cascading style sheets: Adding CSS, CSS and page layout. JavaScript: Introduction, Variables, Literals, Operators, Control structure, Conditional statements, Arrays, Functions, Objects, Predefined objects, Object hierarchy, Accessing objects.

UNIT III - JAVASCRIPT PROGRAMMING OF REACTIVE WEB PAGES ELEMENTS

Events, Event handlers, multiple windows and Frames, Form object and Element, Advanced JavaScript and HTML, Data entry and Validation, Tables and Forms. Introduction to Python Programming: History of Python, Need of Python Programming, Running Python Scripts, Variables, Assignment, Keywords, Input-Output, Indentation, Types - Integers, Strings, Booleans.

UNIT IV - OPERATORS AND EXPRESSIONS

Operators- Arithmetic Operators, Comparison (Relational) Operators, Assignment Operators, Logical Operators, Bitwise Operators, Membership Operators, Identity Operators, Expressions and order of evaluations. Data Structures: Lists - Operations, Slicing, Methods; Tuples, Sets, Dictionaries, Sequences.

UNIT V - CONTROL FLOW

if, if-else, for, while, break, continue, pass Functions - Defining Functions, Calling Functions, Passing Arguments, Default Arguments, Variable-length arguments, Fruitful Functions (Function Returning Values), Scope of the Variables in a Function - Global and Local Variables. Development of sample scripts and web applications. Client Side Scripting, Server-Side Scripting, Managing data with SQL, Cookies, use the cookies, advantages of the cookies and how to create cookies. Introduction to Node.js.

COURSE OUTCOME:

After completion of the course study, students will be able to

1. Explain the basics of websites and WebPages concepts.
2. Design and develop a Web Page with DOM Elements.
3. Apply the validation and verification of data at client end.

TEXT BOOKS:

1. Beginning PERL, Curtis Poe, Wrox Publication
2. Sams Teach Yourself HTML, CSS and Java Script, Julie C, Meloni.
3. Javascript by Example, Ellie Quigley, Prentice Hall.
4. Programming Python, Mark Lutz, O'Reilly.

REFERENCE BOOKS:

1. Learning Perl: Making Easy Things Easy and Hard Things Possible 7th Edition, O'Reilly
2. Mastering HTML, CSS &Javascript Web Publishing, Laura Lemay, Rafey Colburn, BPB Publications.
3. Eloquent Javascript, MarjinHaverbeke
4. Programming Javascript Applications, Eric Elliott, O'Reilly Media.

MATS UNIVERSITY

ARANG, RAIPUR (C.G.)

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SCHOOL OF ENGINEERING & I.T.

Semester: II B. Tech **Branch: All Streams of Engineering**
Subject: Engineering Chemistry Laboratory **Code: BT 206**
Total Theory Periods: 28 **Total Tutorial Periods: 00**
Total Credits: 01

COURSE OBJECTIVE:
1. To make the student acquire practical skills in the wet chemical and instrumental methods for quantitative estimation of hardness, alkalinity, metal ion content, corrosion in metals and cement analysis.

LIST OF EXPERIMENTS
1. Acid-base titration (estimation of commercial caustic soda)

2. Redox titration (estimation of iron using permanganometry)

3. Complexometric titration (estimation of hardness of water using EDTA titration).

4. Preparation and analysis of metal complex (for example thiourea/copper sulfate or nickel chloride/ammonia complexes).

5. Chemical kinetics (determination of relative rates of reaction of iodide with H2O2 at room temperature (Clock reaction).

6. Viscosity of solutions (determination of percentage composition of sugar solution from viscosity).

7. Detection of functional groups in organic compounds.

8. Utilization of paper/thin layer/column chromatographic techniques in the separation of organic compounds

9. Conduct metric titration (determination of the strength of a given HCl solution by titration against a standard NaOH solution).

10. Determine the amount of oxalic Acid and sulphuric Acid/Hydrochloric Acid in one liter of solution given standard Sodium Hydroxide and Potassium Permangate.

11. To determine the Carbonate, Bicarbonate and Chloride contents in irrigation water.

12. Determination of dissolved Oxygen in given sample of water.

13. Determination of calorific value of fuel by Bomb Calorimeter.

14. Determination of Flash Point and Fine Point of Lubricant by Abels and Pensky Martin apparatus.

COURSE OUTCOME:
1. The students will be conversant with hands-on knowledge in the quantitative chemical analysis of water quality related parameters, corrosion measurement and cement analysis.

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ARANG, RAIPUR (C.G.)

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SCHOOL OF ENGINEERING & I.T.

Semester: II B. Tech **Branch: All Streams of Engineering**

Subject: Basic Electrical & Electronics Engineering Laboratory **Code: BT 207**

Total Theory Periods: 28 **Total Tutorial Periods: 00**

Total Credits: 01

List of Experiments (To perform minimum 10 experiments)

1. To verify Thevenin's theorem and Norton's theorem.
2. To verify Superposition theorem.
3. To verify Kirchhoff's Current Law and Kirchhoff's Voltage Law.
4. To verify Maximum Power Transfer theorem
5. To determine V– I characteristics of Incandescent lamp.
6. To study B-H curve.
7. To measure current, power, voltage and power factor of series RLC circuit.
8. To measure current, power, voltage of parallel RLC circuit.
9. To measure current, power, voltage of series parallel RLC circuit.
10. To measure R and L of choke coil.
11. To study construction of transformer.
12. To perform ratio test and polarity test of single phase transformer.
13. To calculate efficiency of single phase transformer by direct loading.
14. To study construction of D.C. machine.
15. To study charging and discharging of a capacitor.
16. To study the Wattmeter and Energy meter.

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ARANG, RAIPUR (C.G.)

MATS UNIVERSITY, RAIPUR (C.G.)

SCHOOL OF ENGINEERING & I.T.

Semester: II B. Tech **Branch: All Streams of Engineering**
Subject: Advance Programming Laboratory **Code: BT 208**
Total Theory Periods: 28 **Total Tutorial Periods: 00**
Total Credits: 01

1. Write a program to check whether a given number is Prime or not.
2. Write a program to read number and to display the largest value between two, three or four numbers by using switch-Case statements.
3. Write a program to find sum of first natural numbers : sum= 1+2+3+4+……. 100 by using
   a. for loop b. while loop c. do-while loop
4. Write a program to find sum of the following series using function:
   Sum= $x-(x)^3/3!+(x)^5/5!-\ldots\ldots\ldots..(x)^n/n!$
5. Write a program to read the elements of two matrices & to perform the matrix multiplication.
6. Write a program to swap the contents of two variable by using
   a. call by value b. Call by reference
7. Write a program to perform the following arithmetic operations on complex numbers using structure
   a. Addition of the two complex numbers b. Subtraction of two complex numbers
   c. Multiplication of two complex numbers d. Division of two complex numbers
8. Write a C++ program to declare a class. Declare pointer to class. Initialize and display the contents of the class member.
9. Write an object-oriented program (OOP) using C++ to exchange the private data members of two different functions using friend functions.
10. Write an OOP using C++ to count how many times a particular member function of a class is called by:
    a. A particular object b. Any objects
11. Write an OOP using C++ to define a constructor for a “Date” class that initializes the Date objects with initial values. In case initial values are not provided, it should initialize the objects with default values.

12 Write an OOP using C++ to overload:

a. + Operator b. = operator c. >> operator d. ++ operator

13 Write a C++ program to demonstrate how ambiguity is avoided using scope resolution operator in the following:

a. Single Inheritance b. Multiple Inheritance

14 Write a C++ Program to demonstrate function overloading for swapping of two variables of the various data types (integer, floating-point number and character type).

15 Write a C++ program to declare a class. Declare pointer to class. Initialize and display the contents of the class member.

16 Write a C++ program to access the private data of a class by non-member function through friend function where the friend function is declared:

a. in the location of public category b. in the location of private category

c. within the scope of a class definition itself d. defined with inline code subtraction

17 Write a C++ program to demonstrate how a pure virtual function is defined, declared and invoked from the object of derived class through the pointer of the base class.

18 Write a C++ program to open a file and count the number of characters, number of vowels and number of newline characters present in the file.

19 Write a program to copy the contents of one text file to another and display both the files using a text Menu.

20 Create a database of 10 students. The database should contain the name, marks of 5 subjects, aggregate marks, aggregate percentage and division according to the following conditions:

a. Percentage greater or equal to 60 – First division

b. Percentage between 50 and less than 60 – Second division

c. Percentage between 40 and less than 50 – Third division

d. Percentage below 40 – Improvement required

Display the above database of every student in a tabulated form. Implement the above program using Structures, Text-Menu and File I/O operations.

21 Write an OOP using a class template to read any five parameterized data type such as float and integer, and print the average.

22 Write a program for sorting of numbers with Bubble Sort using template function.

23 Write a C++ program to declare a class. Declare pointer to class. Initialize and display the contents of the class member.

24 Write a C++ program to read two numbers and find the division of these two numbers using exception handling.

25 Write a C++ program to create a function which take a parameter, if the value of parameter is > 0 then throw integer type, if parameter is = 0, then throw character type, if parameter is < 0 then throws float type exception but for all design use only one catch block.

26 Write a python program for finding biggest number among 3 numbers.

27 Implement Python Script to generate prime numbers series up to n

28 Implement python script to read person's age from keyboard and display whether he is eligible for voting or not.

29 Write a python program to work with classes and objects.

30 Write a python program that makes use of function to display all such numbers, which are divisible by 7 but are not a multiple of 5, between 1000 and 2000.

LIST OF EQUIPMENT/ MACHINE REQUIRED

PCs, Turbo C++ compiler, Online C++ Compiler, Python 3/Python IDE, Online python compiler

REFERENCES:

1. Programming with C++, D. Ravichandran, McGraw Hill Education.
2. Object Oriented Programming with C++, E. Balagurusamy, McGraw Hill Education.
3. Mastering C++, K. R. Venugopal, Mcgraw Hill Education.
4. The Complete Reference C++, Herbert Schildt, McGraw Hill Education.
5. Object Oriented Programming in C++, Robert Lafore, CourseSams Publishing.
6. Let Us C++, YashavantKanetkar, BPB Publication.
7. Head-First Python: A Brain-Friendly Guide (2nd Edition), Paul Barry, Oreilly.
8. Python Programming: An Introduction to Computer Science (3rd Edition), John Zelle,

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ARANG, RAIPUR (C.G.)

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SCHOOL OF ENGINEERING & I.T.

Semester: II B. Tech **Branch: Aero., Aero. (Hons.) Civil, Mining and Mechanical Engg.**
Lab: Fundamentals of Mechanical Engineering Laboratory **Code: BT 2091**
Total Practical Periods: 28 **Total Credits: 01**

Note: MINIMUM TEN NUMBERS OF EXPERIMENTS IS TO BE PERFORMED

LIST OF EXPERIMENTS

1. To verify law of triangle of forces.
2. To verify the Lami's theorem.
3. To verify the law of polygon of forces.
4. To verify the law of lever. 5. To determine the support reactions of a simply supported beam subjected to point loads.
6. To draw the variation of bending moment at a given section in a simply supported beam under a moving point load.
7. To find the coefficient of friction between surfaces of wooden plane and following blocks: i) Aluminum ii) Tin iii) Glass iv) Asbestos v) Teak ply vi) Sand paper vii) card board .
8. To determine the coefficient of friction between (i) Belt and pulley (ii) Rope and pulley.
9. To study simple jib crane and to determine the internal forces in members of jib crane.
10. To determine the stiffness of helical compression spring.
11. To study lifting machine.
12. To study the lifting machine "second order pulley system" and to draw the following characteristic diagram: (i) Load-effort diagram (ii) Load- ideal effort diagram (iii) Load-efficiency diagram Also to determine the law of machine and the maximum efficiency of machine.

13 To study the lifting machine "Wheel and Differential axle" and to draw the following characteristic diagram: (i). Load-effort diagram (ii) Load- ideal effort diagram (iii). Load-efficiency diagram. Also to determine the law of machine and the maximum efficiency of machine.

14. To study the lifting machine "Worm and worm wheel" and to draw the following characteristic diagram: (i). Load-effort diagram (ii). Load- ideal effort diagram (iii). Load-efficiency diagram. Also to determine the law of machine and the maximum efficiency of machine.

15. To study the lifting machine "Simple screw jack" and to draw the following characteristic diagrams of the machine: (i) Load-effort diagram (ii). Load- ideal effort diagram (iii) Load-efficiency diagram Also to determine the law of machine and the maximum efficiency of machine.

16. To study the lifting machine "Modified screw jack" and to draw the following characteristic diagrams of the machine: (i) Load-effort diagram (ii) Load- ideal effort diagram (iii) Load-efficiency diagram Also to determine the law of machine and the maximum efficiency of machine.

17. To study the lifting machine "Geared Jib crane" and to draw the following characteristic diagrams of the machine: (i) Load-effort diagram (ii) Load- ideal effort diagram (iii) Load-efficiency diagram Also to determine the law of machine and the maximum efficiency of machine.

18. To study the lifting machine "Single Purchase Winch crab" and to draw the following characteristic diagrams of the machine: (i) Load-effort diagram (ii) Load- ideal effort diagram

(iii) Load-efficiency diagram Also to determine the law of machine and the maximum efficiency of machine.

19. To study the lifting machine "Double Purchase Winch crab" and to draw the following characteristic diagrams of the machine: (i) Load-effort diagram (ii) Load- ideal effort diagram (iii) Load-efficiency diagram Also to determine the law of machine and the maximum efficiency of machine.

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SCHOOL OF ENGINEERING & I.T.

Semester: II B. Tech **Branch: Comp. Sci. and Engg. and CSE(Hons)**
Lab: Java Script Laboratory **Code: BT 2092**
Total Practical Periods: 28 **Total Credits: 01**

Note: MINIMUM TEN NUMBERS OF EXPERIMENTS IS TO BE PERFORMED

1. Design a HTML page describing your profile in one paragraph. Design in such a way that it has a heading, a horizontal rule, three links and your photo also write three HTML documents for the links.
2. Design HTML page describing your academic career. The page will tell about the degrees, Institutions and your hobbies. Add some lists too**.**
3. Design HTML page demonstrating concept of Internal Hyper-link
4. Design HTML page which gives the list of grocery Items by using Ordered List , List consist of Roman no, A,B…. and so on.
5. Design HTML page which gives the list of grocery Items by using Unordered List bullets are of form disc, square and circle.
6. Design a HTML page for partitioning browser window in frames display the different pages in partitioned windows.
7. Design HTML page to partition window, Design in such a way that link clicked in on page can display the corresponding pages in other window.
8. Write a Java script to prompt for users name and display it on the screen.
9. Write a java script program to test the first character of a string is uppercase or not.
10. Write a java script program for pattern that matches e-mail addresses.
11. Write a java script program to check whether a given number is Prime or not.
12. Write a java script function to print an integer with commas as thousands separators.
13. Write a java script program to sort a list of elements using any sorting algorithm.
14. Write a java script for loop that will iterate from 0 to 15. For each iteration, it will check if the current number is odd or even, and display a message to the screen.
15. Write a java script program which compute, the average marks of the following students then this average is used to determine the corresponding grade.
16. Write a java script program to sum the multiple s of 3 and 5 under 1000.
17. To design the scientific calculator and make event for each button using java script.
18. Write a java script program to find sum of first natural numbers : sum= 1+2+3+4+……. 100 by using
    a. for loop b. while loop c. do-while loop
19. Write a java script program to find sum of the following series using function:
    Sum= $x-(x)^3/3!+(x)^5/5!-\ldots\ldots\ldots..(x)^n/n!$

20 Design HTML form for keeping student record and validate it using Java script.
21 Write programs using Java script for Web Page to display browsers information.

List of Equipment/ Machine Required

PCs, Java script supported Browser, Node.js

References:

1. Mastering HTML, CSS & JavaScript Web Publishing, Laura Lemay, Rafey Colburn, BPB Publications.
2. Head First JavaScript programming, Eric Pressman & Elizabeth Robson, O'Reilly.

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SCHOOL OF ENGINEERING & I.T.

Semester: II B. Tech **Branch: All Streams of Engineering**
Manufacturing Practices– II Laboratory **Code: BT 210**
Total Practical Periods: 45 + (15 Instructional Periods) **Total Credits: 02**

Note: MINIMUM TEN NUMBERS OF EXPERIMENTS IS TO BE PERFORMED

Course Objective:
1. To make the student acquire practical skills in the machining, fitting and forging operations.

Instructional Syllabus
Machining:
Introduction to machining and common machining operations. Cutting tool materials. Definition of machine tools, specification and block diagram of lathe, shaper, drilling machine and grinder. Common lathe operations such as turning parting, chamfering and facing. Quick return mechanism of shaper. Difference between drilling and boring. Files-material and classification.
Fitting:
Need of fitting, different types of instruments used in fitting shop.
Forging:
Forging principle, materials, operations like drawing, upsetting, bending and forge welding, use of forged parts.
List of Experiments
1. Job on lathe with one step turning and chamfering operations

2. Job on shaper for finishing two sides of a job

3. (a) Drilling two holes of size 5 and 12 mm diameter on job used/to be used for shaping.

(b) Grinding a corner of above job on bench grinder
4. Finishing of two sides of a square piece of filling

5. Tin smithy for making mechanical joint and soldering of joints

6. Perform step cutting on mild steel plate.

Course Outcome:
1. The students will be conversant with hands-on knowledge in the machining, fitting and forging operations.

MATS UNIVERSITY

ARANG, RAIPUR (C.G.)

Scheme & Syllabus

(IIIrd Semester)

Bachelor of Technology

Aeronautical Engineering

MATS School of Engineering &I.T

MATS UNIVERSITY

ARANG, RAIPUR (C.G.)

Scheme of Teaching & Examination

III - Semester

S.No.	Code	Subject	Periods per Week			Scheme of Marks		Total Credit
			L	T	P	ESE	IM	
1.	BT300	Engineering Mathematics-III	3	0	-	70	30	3
2.	BT351	Elements of Aeronautics	3	0	-	70	30	3
3.	BT352	Mechanics of Solids	3	1	-	70	30	4
4.	BT353	Fluid Mechanics & Machinery	3	1	-	70	30	4
5.	BT354	Aero Engineering Thermodynamics	3	0	-	70	30	3
6.	BT305	Universal Human Values	1	0	-	70	30	1
7.	BT356	Mechanics of Solids Laboratory	-	-	2	30	20	1
8.	BT357	Fluid Mechanics & Machinery Laboratory	-	-	2	30	20	1
9.	BT358	Aero Engineering Thermodynamics Laboratory	-	-	2	30	20	1
10.	BT359	Advance Manufacturing Practices Laboratory	-	-	2	30	20	1
		Total	**16**	**2**	**8**	**540**	**260**	**22**

L – Lecture, T – Tutorial, ESE – End Semester Examination,
P – Practical, IM – Internal Marks (Include Class Test & Teacher's Assessments)

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MATS UNIVERSITY, RAIPUR (C.G.)
SCHOOL OF ENGINEERING & I.T.

Semester	:	III B.Tech
Branch	:	Aeronautical Engineering
Subject	:	Engineering Mathematics-III
Total Theory Periods	:	48
Total Tutorial Periods	:	00
Total Credits	:	03
Code	:	BT 300

COURSE OBJECTIVE:

- To provide required skills to apply different statistical tools to analyze Engineering problems
- To provide the necessary basic concepts of a few numerical methods
- To provide procedures for solving numerically different kinds of problems occurring in the field of Engineering and Technology.

UNIT-I STATISTICS

Random variables, Discrete and continuous probability distributions, Expectation, Mean and Standard Deviation, Moments and moment generating function, Distributions Binomial, Poisson and Normal distributions.

UNIT-II NUMERICAL SOLUTIONS OF ALGEBRAIC, TRANSCENDENTAL AND SIMULTANEOUS LINEAR EQUATIONS

Errors in numerical computation, Error type, Bisection Method, Regula–Falsi Method, Secant Method, Newton Raphson Method, Direct Methods: Gauss Elimination, Gauss-Jordan &Crout'sTriangularisation Method, Iterative Methods: Jacobi, Gauss-Seidel & Relaxation Methods.

UNIT-III INTERPOLATION AND CURVE FITTING

Finite differences, Forward, Backward & Central Difference Interpolation, Lagrange's method and Newton's Divided Difference method, Principle of Least Squares, Fitting a Straight Line, Fitting a Parabola, Exponential Function, Method of Group Averages.

UNIT-IV NUMERICAL DIFFERENTIATION AND INTEGRATION

Derivatives using Forward, Backward and Central Difference methods, Derivatives using unequally spaced values, Newton-Cote's Quadrature method, Trapezoidal rule, Simpson's 1/3 rule, Simpson's 3/8 rule, Weddle's rule.

UNIT-V NUMERICAL SOLUTION OF ODE & PDE

Numerical solution of ODE's by Taylor's series method, Picard's method, Euler's method, Euler's modified method, Runge–Kutta methods, Predictor-corrector methods-Milne's method, Adams-Bash forth method.

Numerical solution of PDE's , Classifications of second order PDE, Elliptic equations , solution of Laplace equations, solution of poisons equation, Solution of elliptic equation by relaxation method, Parabolic equations, Solution of one dimensional and 2-D heat equations, Hyperbolic equation, Wave equations.

COURSE OUTCOME:

On completion of course students will be able to:

- Solve statistics problems that arise during the study of Engineering
- Use various interpolation techniques for solving problems in Engineering.
- Use numerical methods to solve problems involving numerical differentiation and integration.
- Solve initial value problems numerically that arise in Science and Engineering.
- Solve boundary value problems that encounter in different fields of engineering study.

TEXT BOOK

1. B.S. Grewal, "Higher Engineering Mathematics", Khanna Publications (2007)

REFERENCES

1. Glyn James, "Advanced Modern Engineering Mathematics, Pearson Education (2007)
2. B. V. Ramana, "Higher Engineering Mathematics" Tata McGraw Hill 2007.
3. N. P. Bali, and Manish Goyal, "A Text Book of Engineering 7th Edition (2007) Lakshmi Publications (P) Limited, New Delhi.

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SCHOOL OF ENGINEERING & I.T.

Semester	:	III B.Tech
Branch	:	Aeronautical Engineering
Subject	:	Element of Aeronautics
Total Theory Periods	:	48
Total Tutorial Periods	:	00
Total Credits	:	03
Code	:	BT 351

COURSE OBJECTIVE:

- To introduce the concepts of flying machine, International standard atmosphere, structural aspects of airplanes, brief description of systems, instruments and power plants used in airplanes.

UNIT-I AIRCRAFT CONFIGURATIONS

Brief History of Aviation, Components of an airplane and their functions, Different types of flight vehicles- Classifications & Details, and Basic Flight instruments

UNIT-II INTRODUCTION TO PRINCIPLES OF FLIGHT

Physical properties and structure of the atmosphere, temperature, pressure and altitude relationships, Stability of Atmosphere, Evolution of lift, drag and moments. Different types of forces and moments.

UNIT-III INTRODUCTION TO AERODYNAMICS

Aerodynamic forces on aircraft – classification of NACA aerofoils, aspect ratio, wing loading, Mach number, centre of pressure and aerodynamic centre-aerofoil characteristics-lift, drag curves.

UNIT-IV INTRODUCTION TO AIRPLANE STRUCTURES AND MATERIALS

General types of Aircraft construction- Monocoque, semi-monocoque. Typical wing and fuselage structure, Metallic & non-metallic materials, aluminum alloy, titanium, stainless steel and composite materials.

UNIT-V POWER PLANTS USED IN AIRPLANES

Introduction to piston, turboprop and jet engines, Principle of propeller and jets for thrust production, Principles of operation of rocket, types of rockets.

COURSE OUTCOME:

- This is first exposure of Airplane as a whole to the students.
- Identify the component of Flight.
- Identify suitable materials for Aircraft structure
- Perform basic calculation on Mechanics using Newton law for lift, drag and moment.

TEXT BOOKS

1. Anderson, J.D., "Introduction to Flight", McGraw-Hill, 1995.

REFERENCE

1. Kermode, A.C., "Flight without Formulae", McGraw-Hill, 1997.
2. Kermode, A.C., "Mechanics of Flight", Pearson Education; 11th edition.

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SCHOOL OF ENGINEERING & I.T.

Semester	:	III B.Tech
Branch	:	Aeronautical Engineering
Subject	:	Mechanics of Solids
Total Theory Periods	:	48
Total Tutorial Periods	:	12
Total Credits	:	04
Code	:	BT352

COURSE OBJECTIVE:

- To introduce various behavior of structural components under various loading conditions.
- To know the phenomenon of bending of different sections and its analysis and recognize principle stresses.
- Concepts of strain energy, torsion and numerical analysis

UNIT-I SIMPLE STRESSES AND STRAIN

Stresses and strains – Hooke's law – Stress and elongation due to self weight – Stress and strain diagrams – Elastic constants – Poisson's ratio – Relation between the elastic modulii – Statically determinate and indeterminate problems in tension & compression – Thermal stresses – Hoop stress- Impact loading.

UNIT-II PRINCIPAL STRESSES AND STRAINS

Pure tensile and shear stresses – Two mutually perpendicular direct stresses – Principal Planes and Principal Stresses – Two dimensional Stress System – Graphical methods of representation of Principal Stresses (Mohr's Circle), Combined Bending and Torsion, Analysis of Strains, Mohr's Circle of Strains.

UNIT-III DEFLECTION OF BEAMS

Introduction – Double integration method – Macaulay's method – moment area method – conjugate beam method –principle of superposition–Strain Energy in axial, bending, torsion and shear loadings. Castigliano's theorem – Maxwell's theorem and their applications.

UNIT-IV TORSION – SPRINGS – COLUMNS

Torsion of solid and hollow circular shafts – shear stress variation – power transmission in shafts – open and closed coiled helical springs – stresses in helical springs – classification of columns – Euler buckling – columns with different end conditions.

UNIT-V STRESSES IN BEAMS

Introduction – Classification of beams –Shear force & bending moment diagrams – Points of contraflexure – Bending equation – Neutral Axis, Section modulas – Combined direct and bending stresses – Shear stress variation in beams of symmetric sections – Beams of uniform strength.

COURSE OUTCOME:

- Solve the problems related to the structural components under various loading conditions.
- Explain the meaning of stress, strain, establish relationship between them and apply concepts of stress, strain to solve numerical problems.
- Compute Shear Force and Bending Moment for determinate beams and draw Shear Force and draw Bending Moment Diagrams for various loading conditions.
- To apply the knowledge of bending and shear concept to determine various stresses and draw stress diagrams.
- Apply knowledge of strain energy, torsion and thin cylinders and spherical shells to solve Numerical problems

TEXT BOOK

1. Gere & Timoshenko, 'Mechanics of Materials', McGraw Hill, 1993
2. William Nash, Strength of Materials, Tata McGraw Hill, 2004.

REFERENCES:

1. Dym, C. L., and Shames, I. H., 'Solid Mechanics', McGraw Hill, Kogakusha, Tokyo, 1973.
2. Stephen Timoshenko, 'Strength of Materials', Vol I & II, CBS Publishers and Distributors, Third Edition.

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SCHOOL OF ENGINEERING & I.T.

Semester	:	III B.Tech
Branch	:	Aeronautical Engineering
Subject	:	Fluid Mechanics and Machinery
Total Theory Periods	:	48
Total Tutorial Periods	:	12
Total Credits	:	04
Code	:	BT353

COURSE OBJECTIVE:

- The applications of the conservation laws to flow through pipes and hydraulic machines are studied.
- To understand the importance of dimensional analysis.
- To understand the importance of various types of flow in pumps and turbines.

UNIT-I FLUID STATICS

Introduction, Fluid properties, Newton's viscosity law, Classification of fluids, Surface Tension and Capillarity, Compressibility and Bulk Modulus, Thermodynamic Properties, Vapour pressure and Cavitation. Pascal's Law, Hydrostatic Law, Pressure and its measurement, Hydrostatic force on surfaces.

UNIT-II KINEMATICS AND DYNAMICS OF FLOW

Kinematics of Flow- Description of Fluid Motion, Types of Fluid Flows, Continuity Equation, Continuity equation in 3D, Velocity and Acceleration of Fluid Particles, Velocity Potential function and Stream function, Streamlines, Pathline and Streakline, Types of Motion, Vortex Flow.
Dynamics of Flow - Introduction, Equations of Motion, Euler's Equation, Bernoulli's Equation, Practical application of Bernoulli's Equation in Venturimeter, Orificemeter, Pitot tube, Momentum Equation, Free liquid Jets.

UNIT-III LAMINAR - TURBULENT FLOW AND DIMENSIONAL - MODEL ANALYSIS

Laminar Flows: Viscous flow through circular pipe and parallel plates, Loss of head due to friction in viscous flow.
Turbulent Flow: Frictional Losses in pipe flow, Shear stress and Velocity Distribution in Turbulent flow in pipes.
Dimensional and model Analysis: Introduction, Derived Quantities, Dimensional Homogeneity, Methods of dimensional analysis- Rayleigh's and Buckingham Pi Method, Types of forces acting on moving fluid, Dimensionless numbers, Laws of Similarity- Reynold's, Froude's, Euler's, Weber's, Mach Model Law, Prototype and Model.

UNIT-IV FORCES ON FLOATING AND SUBMERGED BODIES

Buoyancy, Centre of Buoyancy, Metacentre, Metacentric- Height, Stability of Submerged and Floating Bodies, Forces exerted by flowing fluid on a stationary bodies – Drag and Lift, Streamline bodies, Bluffbodies, Drag on Sphere and Cylinder, Development of Lift on a circular Cylinder.

UNIT-V INTRODUCTION TO FLUID MACHINERY

Impact of Jet and Jet Propulsion, Classification of Turbines, Impulse and Reaction Turbine- Pelton Wheel, Francis Turbine and Kaplan Turbine, Velocity Triangles and Problems based on Turbines, Centrifugal and Reciprocating Pumps.

COURSE OUTCOME:

- Upon completion of this course, the students can able to apply mathematical knowledge to predict the properties and characteristics of a fluid.
- Critical analyses and the performance of pumps and turbines.

TEXT BOOKS

1. Shames I H, 'Mechanics of Fluids', Kogakusha, Tokyo, 1998
2. Robert W Fox & Alan T McDonald, 'Introduction to fluid Mechanics', John Wiley and Sons, 1995.
3. Bansal, R K, Fluid Mechanics and Hydraulic Machines, Laxmi Publications, 2005.

REFERENCE BOOKS

1. Yuan S W, 'Foundations of fluid Mechanics', Prentice-Hall, 1987.
2. Milne Thompson L M, 'Theoretical Hydrodynamics', MacMillan, 1985.
3. Rathakrishnan, E, 'Fundamentals of Fluid Mechanics', Prentice-Hall, 2007

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MATS UNIVERSITY, RAIPUR (C.G.)
SCHOOL OF ENGINEERING & I.T.

Semester	:	III B.Tech
Branch	:	Aeronautical Engineering
Subject	:	Aero Engineering Thermodynamics
Total Theory Periods	:	48
Total Tutorial Periods	:	00
Total Credits	:	03
Code	:	BT354

COURSE OBJECTIVE:

- Understand laws of thermodynamics and its applications to Aerospace Engineering.
- Comprehend the concept and applications of energy, entropy and exergy.
- Understand various gas and vapor power cycles with applications.
- Understand the gas mixture behavior and chemical reactions.
- Apply the Thermodynamic Principles to Aerospace Engineering Applications.

UNIT-I FUNDAMENTAL CONCEPTS OF THERMODYNAMICS

Thermodynamic system, state, property, change of state, thermodynamic equilibrium, path process, cycle density, pressure and their molecular interpretation - dimension and units - Zeroth law of thermodynamics and concept of temperature, temperature scales, work and heat definition and units of work and heat, work of frictionless process, PV diagram, indicator diagram.

UNIT-II FIRST LAW OF THERMODYNAMICS

First law of Thermodynamics: Statement of the first law. Energy.Internal energy and its microscopic interpretation, enthalpy, applications of first law.
Steady Flow Energy Equation (SFEE). The steady - state, steady -flow process.The Joule- Thomson coefficient and the throttling process. Uniform state, Uniform flow process, SFEE and its applications.

UNIT-III SECOND LAW OF THERMODYNAMICSANDENTROPY

Second Law of Thermodynamics: Limitations of the first law, heat engines, reversed heat engines and their performance, Kevlin-Planck's and Clausius statements of the second law reversibility-reversible and irreversible processes: Carnot cycle thermodynamic temperature scale: Clausius-Clapeyron equation.
Entropy: The property, entropy, principle of increase of entropy, calculation of entropy changes, T -S and h-s diagrams. Microscopic interpretation of entropy-Helmholtz (A) and Gibbs (G) functions.

UNIT-IV PURE SUBSTANCE AND THERMODYNAMIC RELATIONS

Ideal and Real Gases : Definition-internal energy and enthalpy, specific heats and their calculation from simple kinetic theory, gas tables, Vander Waal's equation of state, principle of corresponding states, compressibility factor, Pure substance: definition, internal energy and enthalpy of a pure substance, Maxwell relations.

UNIT-V AIR STANDARD AND VAPOUR POWER CYCLES

Vapour Power Cycles: Carnot cycle using steam, Rankine cycle, reheat cycle, binary vapour cycles.
Air Standard Power Cycles : Carnot cycle, Otto cycle, Diesel cycle, dual cycle, gas turbine cycles, inter cooling, reheating and regeneration, gas turbine jet propulsion, deviation from ideal cycles.(Use of standard thermodynamic tables, Mollier diagram and Refrigerant property tables are permitted)

COURSE OUTCOME:

- Effectively use the basic concepts of thermodynamics and its Ist law of Thermodynamics.
- Effectively use the laws of thermodynamics for basic calculations.
- Able to analyse various gas power cycles.
- Able to calculate the power developed from steam as the working medium.

TEXT BOOKS

1. Nag P. K., “Engineering Thermodynamics”, Tata McGraw-Hill, New Delhi, 2007.
2. Rathakrishnan E., “Fundamentals of Engineering Thermodynamics”, Prentice-Hall India, 2005.

REFERENCES

1. Ramalingam K.K. “Thermodynamics”, Sci-Tech Publications, 2006
2. Holman J. P., “Thermodynamics”, 3rd Ed. McGraw-Hill, 2007.
3. Merala C, Pother, Craig W, Somerton, “Thermodynamics for Engineers”, Schaum Outline Series, Tata McGraw-Hill, New Delhi, 2004.

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SCHOOL OF ENGINEERING & I.T.

Semester	:	III B.Tech
Branch	:	Aeronautical Engineering
Subject	:	Universal Human Values
Total Theory Periods	:	16
Total Tutorial Periods	:	00
Total Credits	:	01
Code	:	BT305

COURSE OBJECTIVE:

- Development of a holistic perspective based on self- exploration about themselves (human being), family, society and nature/existence.
- Understanding (or developing clarity) of the harmony in the human being, family, society and nature/existence
- Strengthening of self-reflection.
- Development of commitment and courage to act.

UNIT-I COURSE INTRODUCTION: NEED, BASIC GUIDELINES, CONTENT AND PROCESS FOR VALUE EDUCATION

Purpose and motivation for the course, recapitulation from Universal Human Values-I, Self-Exploration what is it? - and Experiential Validation- as the process for self-exploration, Continuous Happiness and Prosperity- A look at basic Human Aspirations, Right understanding, Relationship and Physical Facility- the basic requirements for fulfillment of aspirations of every human being with their correct priority, Understanding Happiness and Prosperity correctly- A critical appraisal of the current scenario, Method to fulfill the above human aspirations: understanding and living in harmony at various levels, Include practice sessions to discuss natural acceptance in human being as the innate acceptance for living with responsibility (living in relationship, harmony and co-existence) rather than as arbitrariness in choice based on liking-disliking.

UNIT-II UNDERSTANDING HARMONY IN THE HUMAN BEING: HARMONY IN MYSELF

Understanding human being as a co-existence of the sentient 'I' and the material 'body', Understanding the needs of Self ('I') and 'Body': Happiness and Physical facility, Understanding the body as an instrument of 'I' (I being the doer, seer and enjoyer), Understanding the characteristics and activities of 'I' and harmony in 'I', Understanding the harmony of 'I' with the Body: Sanyam and Health; correct appraisal of Physical needs, meaning of Prosperity in detail, Programs to ensure Sanyam and Health, Include practice sessions to discuss the role others have played in making, Differentiate between prosperity and accumulation. Discuss program for ensuring health vs dealing with disease.

UNIT-III UNDERSTANDING HARMONY IN THE FAMILY AND SOCIETY: HARMONY IN HUMAN-HUMAN RELATIONSHIP

Understanding values in human-human relationship; meaning of Justice (nine universal values in relationships) and program for its fulfillment to ensure mutual happiness; Trust and Respect as the foundational values of relationship, Understanding the meaning of Trust; Difference between intention

and competence, Understanding the meaning of Respect, Difference between respect and differentiation; the other salient values in relationship, Understanding the harmony in the society (society being an extension of family): Resolution, Prosperity, fearlessness (trust) and co-existence as comprehensive Human Goals, Visualizing a universal harmonious order in society- Undivided Society, Universal Order- from family to world family.
Include practice sessions to reflect on relationships in family, hostel and institute as extended family, real life examples, teacher-student relationship, goal of education etc. Gratitude as a universal value in relationships, Discussion.
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UNIT-IV UNDERSTANDING HARMONY IN THE NATURE AND EXISTENCE: WHOLE EXISTENCE AS COEXISTENCE

Understanding the harmony in the Nature, Interconnectedness and mutual fulfillment among the four orders of nature- recyclability and self-regulation in nature, Understanding Existence as Co-existence of mutually interacting units in all-pervasive space, Holistic perception of harmony at all levels of existence, include practice sessions to discuss human being as cause of imbalance and role of technology etc.

UNIT-V IMPLICATIONS OF HOLISTIC UNDERSTANDING OF HARMONY ON PROFESSIONAL ETHICS

Natural acceptance of human values, Definitiveness of Ethical Human Conduct, Basis for Humanistic Education, Humanistic Constitution and Humanistic Universal Order. **Competence in professional ethics:** Ability to utilize the professional competence for augmenting universal human order, Ability to identify the scope and characteristics of people friendly and eco-friendly production systems, Ability to identify and develop appropriate technologies and management patterns for above production systems, Case studies of typical holistic technologies, management models and production systems. **Strategy for transition from the present state to Universal Human Order: At the level of individual:** as socially and ecologically responsible engineers, technologists and managers, **At the level of society:** as mutually enriching institutions and organizations, Summary, include practice Exercises and Case Studies will be taken up in Practice (tutorial) Sessions e.g., to discuss the conduct as an engineer or scientist etc.

Course Outcome:

- By the end of the course, students are expected to become more aware of themselves, and their surroundings (family, society, nature); they would become more responsible in life, and in handling problems with sustainable solutions, while keeping human relationships and human nature in mind.

- They would have better critical ability. They would also become sensitive to their commitment towards what they have understood (human values, human relationship and human society). It is hoped that they would be able to apply what they have learnt to their own self in different day-to-day settings in real life, at least a beginning would be made in this direction.

Text Book:

1. Human Values and Professional Ethics by R. R. Gaur,R.Sangal, G. P.Bagaria, Excel Books, New Delhi, 2010

Reference Books:

1. Jeevan Vidya: EkParichaya,A. Nagaraj,JeevanVidyaPrakashan,Amarkantak,1999.
2. Human Values, A.N. Tripathi, New Age Intl. Publishers, New Delhi, 2004.
3. The Story of Stuff (Book).
4. The Story of My Experiments with Truth - by Mohandas Karamchand Gandhi.
5. Small is Beautiful - E. F Schumacher.
6. Slow is Beautiful - Cecile Andrews
7. Economy of Permanence - J C Kumarappa
8. Bharat Mein Angreji Raj - PanditSunderlal
9. Rediscovering India - by Dharampal
10. Hind Swaraj or Indian Home Rule - by Mohandas K. Gandhi
11. India Wins Freedom - Maulana Abdul Kalam Azad
12. Vivekananda - Romain Rolland (English)
13. Gandhi - Romain Rolland (English)

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MATS UNIVERSITY, RAIPUR (C.G.)
SCHOOL OF ENGINEERING & I.T.

Semester	:	III B.Tech
Branch	:	Aeronautical Engineering
Subject	:	Mechanics of Solids Laboratory
Total Practical Periods	:	28
Total Credits	:	01
Code	:	BT356

COURSE OBJECTIVE:

- To supplement the theoretical knowledge gained in Mechanics of Solids with practical testing for determining the strength of materials under externally applied loads.
- This would enable the student to have a clear understanding of the design for strength and stiffness.

LIST OF EXPERIMENTS

1. Brinell Hardness test
2. Rockwell Hardness test
3. Tension test
4. Torsion test
5. Izod Impact test
6. Charpy Impact test
7. Reverse plate bending Fatigue test
8. Rotating Beam Fatigue test
9. Testing of springs
10. Block Compression Test

COURSE OUTCOME:

- Ability to perform different material testing.
- Ability to characteristic of materials.
- To know about behavior under various loading

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SCHOOL OF ENGINEERING & I.T.

Semester	:	III B.Tech
Branch	:	Aeronautical Engineering
Subject	:	Fluid Mechanics & Machinery Laboratory
Total Practical Periods	:	28
Total Credits	:	01
Code	:	BT357

COURSE OBJECTIVE:

- Upon Completion of this subject, the students can able to have hands on experience in flow measurements using different devices and also perform calculation related to losses in pipes and also perform characteristic study of pumps, turbines etc.

LIST OF EXPERIMENTS

1. Calibration of Venturimeter
2. Pressure measurement with Pitot static tube
3. Determination of pipe flow losses.
4. Verification of Bernoulli's theorem
5. Flow visualization by Heleshaw apparatus
6. Performance test on centrifugal pumps
7. Performance test on reciprocating pumps
8. Performance test on piston wheel turbine
9. Performance test on Francis turbine
10. Determination of Viscosity of a Fluid

COURSE OUTCOME:

- Determination of fluid properties
- Ability to use the measurement equipment's for flow measurement.
- Ability to do performance trust on different fluid machinery

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Semester	:	III B.Tech
Branch	:	Aeronautical Engineering
Subject	:	Aero Engineering Thermodynamics Laboratory
Total Practical Periods	:	28
Total Credits	:	01
Code	:	BT358

COURSE OBJECTIVE:

- Can clearly understand the performance of a IC engine
- Clearly understand the port timing mechanism and valve timing mechanism of stroke engine
- To calculate the heating values, specific heats and thermal conductivity

LIST OF EXPERIMENTS

1. Performance test on a 4-stroke engine
2. Valve timing of a 4 – stroke engine and port timing of a 2 stroke engine
3. Determination of effectiveness of a parallel flow heat exchanger
4. Determination of effectiveness of a counter flow heat exchanger
5. Determination of heating value of a fuel
6. COP test on a vapor compression refrigeration test rig
7. COP test on a vapor compression air-conditioning test rig
8. Determination of specific heat of solid
9. Determination of Thermal Conductivity of solid.
10. Determination of Thermal Resistance of a Composite wall.

COURSE OUTCOME:

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

- Get a clear idea about effectiveness of a parallel flow heat exchanger.
- Get a clear idea about effectiveness of a counter flow heat exchanger
- Investigate about the heating value of a fuel
- Find the specific heat and Thermal Conductivity of solid

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MATS UNIVERSITY, RAIPUR (C.G.)
SCHOOL OF ENGINEERING & I.T.

Semester	:	III B.Tech
Branch	:	Aeronautical Engineering
Subject	:	Advanced Manufacturing Practices Laboratory
Total Practical Periods	:	28
Total Credits	:	01
Code	:	BT359

COURSE OBJECTIVE:

- To strengthen the students ability to measure and inspect to precise tolerances.
- To read working drawings, understand operational symbols and execute machining operations.

LIST OF EXPERIMENTS

PART A

1 Preparation of at least two fitting joint models by proficient handling and application of hand tools- Vblock, marking gauge, files, hack saw drills etc.

PART B

2 Preparation of three models on lathe involving - Plain turning, Taper turning, Step turning, Thread cutting, Facing, Knurling, Drilling, Boring, Internal Thread cutting and Eccentric turning. Exercises should include selection of cutting parameters and cutting time estimation.

PART C

3 Cutting of V Groove/ dovetail / Rectangular groove using a shaper. Cutting of Gear Teeth using Milling Machine. Exercises should include selection of cutting parameters and cutting time estimation.

PART D (DEMONSTRATION ONLY)

Study & Demonstration of power tools like power drill, power hacksaw, portable hand grinding, cordless screw drivers, production air tools, wood cutter, etc., used in Mechanical Engineering.

COURSE OUTCOME:

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

- Prepare fitting models according to drawings using hand tools- V-block, marking gauge, files, hack saw, drills etc.

- Understand integral parts of lathe, shaping and milling machines and various accessories and attachments used.
- Select cutting parameters like cutting speed, feed, depth of cut, and tooling for various machining operations.
- Perform cylindrical turning operations such as plain turning, taper turning, step turning, thread Cutting, facing, knurling, internal thread cutting, eccentric turning and estimate cutting time.
- Perform machining operations such as plain shaping, inclined shaping, keyway cutting, Indexing and Gear cutting and estimate cutting time.

MATS UNIVERSITY

ARANG, RAIPUR (C.G.)

Scheme & Syllabus

(IVth Semester)

Bachelor of Technology

Aeronautical Engineering

MATS School of Engineering &I.T

MATS UNIVERSITY

ARANG, RAIPUR (C.G.)

Scheme of Teaching & Examination

IV - Semester

S.No.	Code	Subject	Periods per Week			Scheme of Marks		Total Credit
			L	T	P	ESE	IM	
1.	BT450	Aircraft Structure-I	3	0	-	70	30	3
2.	BT451	Mechanics of Machines	3	0	-	70	30	3
3.	BT452	Aerodynamics-I	3	0	-	70	30	3
4.	BT453	Aircraft System & Instrumentation	3	0	-	70	30	3
5.	BT454	Design & Drafting Laboratory	-	-	2	30	20	1
6.	BT455	Aircraft System & Instrumentation Laboratory	-	-	2	30	20	1
7.	BT456	Aerodynamics Laboratory	-	-	2	30	20	1
8.	BT457	Mechanics of Machines Laboratory	-	-	2	30	20	1
9.	BTPXX	Professional Elective-I	3	0	-	70	30	3
10.	BTOXX	Open Elective-I	3	0	-	70	30	3
		Total	**18**	**0**	**8**	**540**	**260**	**22**

L – Lecture, T – Tutorial, ESE – End Semester Examination,
P – Practical, IM – Internal Marks (Include Class Test & Teacher's Assessments)

MATS UNIVERSITY

ARANG, RAIPUR (C.G.)

MATS UNIVERSITY, RAIPUR (C.G.)
SCHOOL OF ENGINEERING & I.T.

Semester	:	IV B.Tech
Branch	:	Aeronautical Engineering
Subject	:	Aircraft Structure-I
Total Theory Periods	:	48
Total Tutorial Periods	:	00
Total Credits	:	03
Code	:	BT 450

COURSE OBJECTIVE:

- To provide the students an understanding on the linear static analysis of determinate and indeterminate aircraft structural components.
- To make the students understand the various energy methods to compute the strain energy in axial, bending, torsion and shear loadings.
- To impart the knowledge on column structural member
- To interpret the failure behavior of materials using failure theories.
- To make the students understand the various induced stresses.

UNIT I STATICALLY DETERMINATE STRUCTURES

Statically determinate frames – plane truss analysis – method of joints – method of sections – 3-D trusses – the landing gear tripod – beams of two materials.

UNIT II STATICALLY INDETERMINATE STRUCTURES

Propped cantilevers – fixed-fixed beams– Clapeyron's 3 moment equation –moment distribution method.

UNIT III ENERGY METHODS

Strain energy evaluation in structural members – energy theorems – dummy load &unit load methods – Maxwell's reciprocal theorem – energy methods applied to statically determinate and indeterminate beams, frames, rings & trusses.

UNIT IV COLUMNS

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

UNIT V FAILURE THEORIES

Ductile and brittle materials – maximum principal stress theory - maximum principalstrain theory - maximum shear stress theory - distortion energy theory – octahedralshear stress theory.

COURSE OUTCOMES:

- Analyse the statically determinate and indeterminate using the principle of iterative methods and theorem of three moments.
- Make use of classical methods determine the deflections of beams, frames and arches
- Understand the stability, Euler buckling load and problems in column design.
- Analyse the failure of the brittle and ductile materials in comparison with simple mechanical tests.
- Interpret and Predict material failure for the induced stresses caused due to the dynamic and other environmental effects

TEXT BOOKS

1. Timoshenko and Gere, `Mechanics of Materials', Tata McGraw Hill, 1993.
2. Bruhn E F, 'Analysis and Design of Flight Vehicle Structures', Tri-State Off-set Company, USA, 1985

REFERENCES

1. Donaldson, B.K., 'Analysis of Aircraft Structures - An Introduction', McGraw Hill, 1993.
2. Megson T M G, `Aircraft Structures for engineering students' Edward ArnoldPublishers.
3. Peery, D.J., and Azar, J.J., Aircraft Structures, 2nd edition, McGraw – Hill, N.Y., 1999.

MATS UNIVERSITY

ARANG, RAIPUR (C.G.)

MATS UNIVERSITY, RAIPUR (C.G.)
SCHOOL OF ENGINEERING & I.T.

Semester	:	IV B.Tech
Branch	:	Aeronautical Engineering
Subject	:	Mechanics of Machines
Total Theory Periods	:	48
Total Tutorial Periods	:	00
Total Credits	:	03
Code	:	BT 451

COURSE OBJECTIVE:

- The knowledge of this subject is very essential for an engineer in designing the various parts of a machine
- To understand the dynamics of mechanism
- To develop the understanding of friction force, gear and cam mechanisms.
- To understand the balancing and vibration in heavy machines.

UNIT I MECHANISMS

Definition – Machine and Structure – Kinematic link, pair and chain – classification of Kinematic pairs – Constraint & motion – Degrees of freedom slider crank – Single and double – Crank rocker mechanisms – Inversions – applications, Kinematic analysis and synthesis of simple mechanisms – Determination of velocity and acceleration of simple mechanisms.

UNIT II FRICTION

Types of friction – friction in screw and nut – pivot and collar – thrust bearings – collar bearing – plate and disc clutches – belt (flat &vee) and rope drives – creep in belts –Jockey pulley – open and crossed belt drives – Ratio of tensions – Effect of centrifugal and initial tensions – Effect of centrifugal and initial tension – condition for maximum power transmission.

UNIT III GEARING AND CAMS

Gear profile and geometry – nomenclature of spur & helical gears – laws of gearing –interference – requirement of minimum number of teeth in gears – gear trains –simple and compound gear trains – determination of speed and torque in epicyclic gear trains – cams different types of followers – cam design for different follower motions.

UNIT IV BALANCING

Static and dynamic balancing – single and several masses in different planes –primary and secondary balancing of reciprocating masses – balancing single and multi-cylinder Engines – Governors and Gyroscopic effects.

UNIT V VIBRATION

Free, forced and damped vibrations of single degree of freedom systems – force transmitted to supports – vibration Isolation – vibration absorption – Torsional vibration of shafts – single and multirotor systems – geared shafts – critical speed of shafts.

COURSE OUTCOMES:

On completion of course students will be able to-

- Understand the basic law of equilibrium and application of the on a mechanism
- Knew about the Design and working principles of gear and cam.
- Knew the effects of vibration in heavy machines.

TEXT BOOKS

1. Bansal Dr. R. K. "Theory of Machines" Laxmi Publications (P) Ltd., New Delhi, 2001.
2. Rattan S. S. "Theory of machines" Tata McGraw Hill publishing Co., New Delhi, 2002.

REFERENCES:

1. Rao J. S. and Dukkipati R.V. "Mechanism and Machine Theory" Second Edition, Wiley Eastern Limited, 1992.
2. Malhotra D.R. and Gupta H.C "The Theory of machines" SatyaPrakasam, Tech. India Publications, 1989.
3. Gosh A and Mallick A.K. "Theory of Machines and Mechanisms" affiliated eastwest press, 1989.
4. Shingley J.E. and Vicker J.J. Theory of Machines and Mechanisms" McGraw Hill, 1986.
5. Burton Paul "Kinematics and Dynamics of Machinery", Prentice Hall, 1979.

MATS UNIVERSITY, RAIPUR (C.G.)
SCHOOL OF ENGINEERING & I.T.

Semester	:	IV B.Tech
Branch	:	Aeronautical Engineering
Subject	:	Aerodynamics-I
Total Theory Periods	:	48
Total Tutorial Periods	:	00
Total Credits	:	03
Code	:	BT 452

COURSE OBJECTIVES:

- To introduce fundamental aerodynamic theories and aerodynamic characteristics of airfoils and wings
- To familiarize students with viscous flows

UNIT I REVIEW OF BASIC FLUID MECHANICS

System and Control volume approach, substantial, local and convective derivative, Continuity, momentum and energy equations, inviscid flow, Euler equation, incompressible Bernoulli's Equation. Circulation and Vorticity, Green's Lemma and Stoke's Theorem, Barotropic Flow, Kelvin's theorem, Streamline, Stream Function, Irrotational flow, Potential Function, EquiPotential Lines, Elementary Flows and their combinations.

UNIT II TWO DIMENSIONAL INVISCID INCOMPRESSIBLE FLOW

Ideal Flow over a circular cylinder, D'Alembert's Paradox, Magnus effect, Kutta Joukowski's Theorem, Starting Vortex, Kutta condition, Real flow over smooth and rough cylinder.

UNIT III AIRFOIL THEORY

Cauchy-Riemann relations, Complex Potential, Methodology of Conformal Transformation, Kutta-Joukowski transformation and its applications, Karman Trefftz Profiles, Thin Airfoil theory and its applications.

UNIT IV SUBSONIC WING THEORY

Vortex Filament, Biot and Savart Law, Bound Vortex and trailing Vortex, Horse Shoe Vortex, Lifting Line Theory and its limitations.

UNIT V INTRODUCTION TO LAMINAR AND TURBULENT FLOW

Boundary layer and boundary layer thickness, displacement thickness, momentum thickness, Energy thickness, Shape parameter, Boundary layer equations for a steady, two dimensional incompressible flow,

Boundary Layer growth over a Flatplate, Critical Reynolds Number, Clasius solution, Basics of Turbulent flow, Prandtl's mixing length hypothesis, Free shear layers.

COURSE OUTCOMES:

On completion of the course students will be able to

- Classify airfoils and label their nomenclature; apply governing equations to formulate necessary
- Subsidiary equation in order to determine the aerodynamic force
- Explain potential flow theories and solve their combinations.
- Estimate the aerodynamic characteristics of airfoils
- Estimate the aerodynamic characteristics of wings
- Formulate and solve boundary layer problems

TEXT BOOKS

1. Houghton, E.L., and Caruthers, N.B., Aerodynamics for Engineering students, Edward Arnold Publishers Ltd., London, 1989.
2. Anderson, J.D., Fundamentals of Aerodynamics, McGraw Hill Book Co., 1999.

REFERENCES

1. Milne Thomson, L.H., Theoretical Aerodynamics, Macmillan, 1985.
2. John J Bertin., Aerodynamics for Engineers, Pearson Education Inc, 2002.
3. Clancey, L J., Aerodynamics, Pitman, 1986.

MATS UNIVERSITY

ARANG, RAIPUR (C.G.)

MATS UNIVERSITY, RAIPUR (C.G.)
SCHOOL OF ENGINEERING & I.T.

Semester	:	IV B.Tech
Branch	:	Aeronautical Engineering
Subject	:	Aircraft System and Instrumentation
Total Theory Periods	:	48
Total Tutorial Periods	:	00
Total Credits	:	03
Code	:	BT 453

COURSE OBJECTIVES:

- To impart knowledge of the aircraft control systems
- To gain knowledge on hydraulic and pneumatic systems of aircraft
- Basic knowledge of piston and jet engine fuel and lubrication systems
- To impart knowledge on aircraft environment systems
- To gain knowledge on flight and engine instruments.

UNIT I AIRCRAFT SYSTEMS

Hydraulic systems – Study of typical workable systems – components – Hydraulic systems controllers – Modes of operation – Pneumatic systems – Working principles– Typical Pneumatic Power system – Brake system – Components, Landing Gear Systems – Classification – Shock absorbers – Retractive mechanism.

UNIT II AIRPLANE CONTROL SYSTEMS

Conventional Systems – Power assisted and fully powered flight controls – Power actuated systems – Engine control systems – Push pull rod system – operating principles – Modern control systems – Digital fly by wire systems – Auto pilot system, Active Control Technology.

UNIT III ENGINE SYSTEMS

Fuel systems – Piston and Jet Engines – Components - Multi-engine fuel systems, lubricating systems - Piston and jet engines – Starting and Ignition systems – Piston and Jet engines.

UNIT IV AIRCONDITIONING AND PRESSURIZING SYSTEM

Basic Air Cycle systems – Vapour Cycle Systems, Boot-strap air cycle system –Evaporative vapour cycle systems – Evaporation air cycle systems –Oxygen systems – Fire protection systems, De-icing and anti-icing system.

UNIT V AIRCRAFT INSTRUMENTS

Flight Instruments and Navigation Instruments – Accelerometers, Air speed Indicators – Mach Meters – Altimeters - Gyroscopic Instruments– Principles and operation – Study of various types of engine instruments – Tachometers –Temperature gauges – Pressure gauge – Operation and principles.

COURSE OUTCOMES:

On completion of the course students will be able to:

- Understands the aircraft control systems
- Acquires knowledge on hydraulic and pneumatic systems of aircraft
- Understands piston and jet engine fuel and lubrication systems
- Understands the aircraft environment systems
- Identify flight and engine instruments

TEXT BOOKS

1. Mekinley, J.L. and R.D. Bent, Aircraft Power Plants, McGraw Hill 1993.
2. Pallet, E.H.J. Aircraft Instruments & Principles, Pitman & Co 1993.

REFERENCES

1. Teager, S. Gas Turbine technology, McGraw Hill 1997.
2. Mckinley, J.L. and Bent R.D. Aircraft Maintenance & Repair, McGraw Hill, 1993.
3. Handbooks of Airframe and Powerplant Mechanics, US Dept. of Transportation, Federal, Aviation Administration, The English Book Store, New Delhi, 1995.

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MATS UNIVERSITY, RAIPUR (C.G.)
SCHOOL OF ENGINEERING & I.T.

Semester	:	IV B.Tech
Branch	:	Aeronautical Engineering
Subject	:	Design and Drafting Laboratory
Total Practical Periods	:	28
Total Credits	:	01
Code	:	BT 454

COURSE OBJECTIVES:

- Ability to gain practical experience in handling 2D drafting and 3D drafting
- Ability to perform surface modelling on a/c and its parts
- To develop in students' graphic skills for communication of concepts, ideas of engineering products
- To familiarize with technical drawings

LIST OF EXPERIMENTS

1. Design and Drafting of riveted joints.
2. Design and Drafting of welded joints.
3. Design and Drafting Control Components Cam.
4. Design and Drafting Control Components Gear.
5. Design and Drafting Control Components Push-pull rod.
6. Three view diagram of a typical aircraft.
7. Layout of typical wing structure.
8. Layout of typical fuselage structure.

COURSE OUTCOMES:

- Explain graphic skills for communication of concepts, ideas of engineering products.
- Design surface modelling using modeling software.
- Create surface modelling in a/c and its parts
- Create drafting on 3D models
- Get job opportunities on design-based industries

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SCHOOL OF ENGINEERING & I.T.

Semester	:	IV B.Tech
Branch	:	Aeronautical Engineering
Subject	:	Aircraft system and Instrumentation Laboratory
Total Practical Periods	:	28
Total Credits	:	01
Code	:	BT 455

COURSE OBJECTIVES:

- To impart knowledge of the aircraft system and instruments
- To Examination and testing of element of flight director and various systems
- Basic knowledge of Wiring and cabling demonstration
- To know about Safety precaution associated with radio equipment
- To gain knowledge on flight instruments

LIST OF EXPERIMENTS

1. Familiarization of computer, accessories.
2. Autopilots (electrical or electronics) dismantling, examination of components, reassembly, and installation in A/C or on simulator by following the manufacturer's test programme: practice with portable test kit.
3. Examination and testing of element of flight director systems, automatic flare, automatic landing systems.
4. Safety precaution associated with radio equipment hazards: high voltage, RF emission and microwave emissions, Electrostatic discharge etc.
5. Wiring and cabling demonstration and practice in wiring and soldering radio circuits.
6. Multimeter, Megger and bonding testers: demonstration and practice.
7. Identification and inspection of antenna: external wire aerials, blade, rod and rail aerials:
8. D/F loops and suppressed aerials viewing on A/C and inspection for physical condition. Aerial masts, static dischargers' etc. inspection and servicing.
9. To demonstrate the measurements and experiments with circuit demonstration units simulating the following system elements
   TRF receiver, Intermediate frequency amplifier, Frequency convertor, Super heterodyne alignment, Buffer-doubler amplifier, RF amplifier, Modulation and demodulation, Transmission lines, Reactance tube modulators, Interference (filtering and shielding).
10. Troubleshooting Practices.

COURSE OUTCOME:

On completion of the lab students will be able to:

- Know about of the aircraft system and instruments
- Examine and testing of element of flight director and various systems
- Implement basic knowledge of Wiring and cabling
- Understand Safety precaution associated with radio equipment
- Understand the working of flight instruments

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MATS UNIVERSITY, RAIPUR (C.G.)
SCHOOL OF ENGINEERING & I.T.

Semester	:	IV B.Tech
Branch	:	Aeronautical Engineering
Subject	:	Aerodynamics Laboratory
Total Practical Periods	:	28
Total Credits	:	01
Code	:	BT 456

COURSE OBJECTIVES:

- To visualize and understand the low speed flows
- To practice techniques which predict/measure aerodynamics forces
- To understand the interactions of flow fields

LIST OF EXPERIMENTS

1. Generation of lift and tip vortices.
2. Flow visualization in water flow channel
3. Flow visualization in smoke tunnel
4. Plot of RPM Vs test section velocity in a subsonic wind tunnel.
5. Pressure distribution over circular cylinder.
6. Pressure distribution over airfoil and estimation of C_L and C_D.
7. Force measurement using wind tunnel balance.
8. Mach number distribution in nozzle of supersonic wind tunnel.
9. Use of Schlieren system to visualize shock.
10. Use of Shadow graph system to visualize shock.

COURSE OUTCOME:

- Ability to use the fundamental aerodynamic principles for aircraft testing applications
- Deep understanding of flow visualization
- Understanding about instruments and their function

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MATS UNIVERSITY, RAIPUR (C.G.)
SCHOOL OF ENGINEERING & I.T.

Semester	:	IV B.Tech
Branch	:	Aeronautical Engineering
Subject	:	Mechanics of Machines Laboratory
Total Practical Periods	:	28
Total Credits	:	01
Code	:	BT 457

COURSE OBJECTIVE:

- To develop the understanding of operation of a Porter Governor, Proell Governor and Hartnell Governor
- To investigate the behavior of a Worm wheel
- To measure the coefficient of static and kinetic friction
- To develop understanding about balancing of rod in the rotating and reciprocating system

LIST OF EXPERIMENTS

1. To observe the lift-off speed of a Porter Governor.
2. To observe the effect of varying sleeve weight or spring force on the operation of a Porter Governor.
3. To observe the lift-off speed of a Proell Governor.
4. To observe the effect of varying sleeve weight or spring force on the operation of a Proell Governor.
5. To observe the lift-off speed of a Hartnell Governor.
6. To observe the effect of varying sleeve weight or spring force on the operation of a Hartnell Governor.
7. To investigate the behavior of Flat Clutch plates and to compare the results using two different methods (uniform pressure and uniform wear) of calculations.
8. To investigate the behavior of a Worm wheel gear set.
9. To measure the coefficient of static and kinetic friction between wooden blocks.
10. To study the tension in the tight and in slack side of a square thread and a vee thread.
11. To investigate different types of epicyclical gear configurations and check ratios with theoretical values.
12. To investigate the masses which required balancing the rod in the rotating and reciprocating positions?

COURSE OUTCOME:

On completion of the lab students will be able to:

- Understand the operation of a Porter Governor, Proell Governor and Hartnell Governor
- investigate the behavior of a Worm wheel
- measure the coefficient of static and kinetic friction
- understand about balancing of rod in the rotating and reciprocating system

MATS UNIVERSITY

ARANG, RAIPUR (C.G.)

Scheme & Syllabus

(Vth Semester)

Bachelor of Technology

Aeronautical Engineering

MATS School of Engineering &I.T

MATS UNIVERSITY

ARANG, RAIPUR (C.G.)

Scheme of Teaching & Examination

V - Semester

S. No.	Code	Subject	Periods per Week			Scheme of Marks		Total Credit
			L	T	P	ESE	IM	
1.	BT550	Aircraft Propulsion	3	0	-	70	30	3
2.	BT551	Aerodynamics-II	3	0	-	70	30	3
3.	BT552	Aircraft Structure-II	3	0	-	70	30	3
4.	BT553	Flight Dynamics	3	1	-	70	30	4
5.	BT554	Aircraft Structure Laboratory	-	-	2	30	20	1
6.	BT555	Computer Aided Simulation Laboratory-I	-	-	2	30	20	1
7.	BT556	Propulsion Laboratory-I	-	-	2	30	20	1
8.	BT557	Vocational Training/ Internship-1	-	-	-	-	50	3
9.	BTPXX	Professional Elective-II	3	-	-	70	30	3
		Total	**15**	**1**	**6**	**440**	**260**	**22**

L – Lecture, T – Tutorial, ESE – End Semester Examination,
P – Practical, IM – Internal Marks (Include Class Test & Teacher's Assessments)

MATS UNIVERSITY
ARANG, RAIPUR (C.G.)

MATS UNIVERSITY, RAIPUR (C.G.)
SCHOOL OF ENGINEERING & I.T.

Semester	:	V B.Tech
Branch	:	Aeronautical Engineering
Subject	:	Aircraft Propulsion
Total Theory Periods	:	48
Total Tutorial Periods	:	00
Total Credits	:	03
Code	:	BT 550

COURSE OBJECTIVES:

- To understand the fundamental and principles of jet propulsion
- To understand about the types and operation of various parts of the jet Engines
- To understand about the performance parameter of aircraft

UNIT-I FUNDAMENTALS OF GAS DYNAMICS AND APPLICATION

Steady 1-D Gas Dynamics: Basics, Simple flows; Nozzle flow, nozzle design, nozzle operating characteristics for isentropic flow, nozzle flow and shock waves. Introduction of Rayleigh flow and Fanno flow, Inlet: design, sizing and performance for various flow regimes, Nozzle: C-D Nozzle performance - Effects of back pressure, exit area ratio and mass flow

UNIT-II GAS TURBINE ENGINES PERFORMNCE ANALYSIS

Parametric Cycle Analysis of Ideal Engines: Engine cycle analysis and basic assumptions
Applications to (i) Ramjet, (ii) Turbojet with and without after burner, (iii) Turbo fan Engine, optimum by pass ratio (iv) Turbo-Prop Engine Cycle analysis of real engines
Combustion Systems: Basics of combustion chamber, Ignition system, Flame stability and after burners

UNIT-III AXIAL FLOW COMPRESSOR

Axial Flow Compressor: Euler's Turbo-machinery equations. Axial Flow Compressor analysis, cascade action, flow field, Velocity diagrams, Degree of reaction, cascade airfoil nomenclature and loss coefficient, diffusion factor, stage loading and flow coefficient, stage pressure ratio, Blade Mach no, Repeating-stage, number of blades per stage.

UNIT-IV CENTRIFUGAL FLOW COMPRESSOR

Centrifugal Flow Compressor: Analysis, flow field, blade geometry, Velocity diagrams, stage parameters, Degree of reaction, work coefficient, slip factor, diffusion factor, flow coefficient, stage pressure ratio, Radial variation, Design Process, Performance.

UNIT VAXIAL FLOW TURBINE

Axial Flow Turbine: Introduction to turbine analysis, Stage parameters, stage loading and flow coefficients, degree of reaction, Stage temperature ratio and pressure ratio, Blade spacing, Radial Variation, Velocity ratio., Multistage design steps of design, Turbine Performance, Blade Cooling.

COURSE OUTCOMES:

On completion of the course students will be able:

- To understand the working of various air breathing engines and combustors
- To understand the design features of inlets and perform necessary calculations
- To understand the design features of compressors and perform necessary calculations
- To understand the design features of turbines and perform necessary calculations

TEXT BOOKS:

1. J D Mattingly, Elements of Gas Turbine Propulsion, McGraw Hill, 1st Ed., 1997
2. J L Kererbrock, Aircraft Engines and Gas Turbine, MIT Press, 1991

REFERENCES:

1. Cohen, H. Rogers, G.F.C. and Saravanamuttoo, H.I.H. “Gas Turbine Theory”, Longman, 1989.
2. Oates, G.C., “Aero thermodynamics of Aircraft Engine Components”, AIAA Education Series, New York, 1985.
3. “Rolls Royce Jet Engine” – Third Edition – 1983.
4. Mathur, M.L. and Sharma, R.P., “Gas Turbine, Jet and Rocket Propulsion”, Standard Publishers & Distributors, Delhi, 1999.

MATS UNIVERSITY

ARANG, RAIPUR (C.G.)

MATS UNIVERSITY, RAIPUR (C.G.)
SCHOOL OF ENGINEERING & I.T.

Semester	:	Vth B.Tech
Branch	:	Aeronautical Engineering
Subject	:	Aerodynamics-II
Total Theory Periods	:	48
Total Tutorial Periods	:	00
Total Credits	:	03
Code	:	BT 551

COURSE OBJECTIVES:

- To make the student understand the concepts of compressible aerodynamics.
- To develop understanding of isentropic and non-isentropic flow.
- Also to introduce the design concepts of transonic and supersonic wing sections.

UNIT-I FUNDAMENTAL ASPECTS OF COMPRESSIBLE FLOW

Isentropic relations, definition of compressibility of flow and its measurement, speed of sound, compressible Bernoulli's equation, Mach lines/waves/cones, Steady one-dimensional flow equations, area- velocity relation, isentropic flow through variable area duct, convergent-divergent nozzles

UNIT-II 1D-NON-ISENTROPIC FLOWS

Normal shock waves: basic equations, relations across a normal shock, calculation of normal shock wave properties, measurements of airspeed in supersonic flows. Hugoniot equation, moving normal shock waves, propagation of shock wave in front and expansion wave behind, Rayleigh flows and Fanno flows.

UNIT-III OBLIQUE SHOCKS AND EXPANSION WAVES

Oblique shock relations, Supersonic flow over wedges with attached shock, shock detachment, Oblique shock charts: strong shock and weak shock, reflection of shock, intersection of shocks, detached shock wave, Supersonic expansion by turning, Prandtl-Meyer function & expansion fan, Shock expansion theory

UNIT-IV COMPRESSIBLE SUBSONIC, TRANSONIC FLOWS

Subsonic Flow: The velocity potential, perturbation potential, linearized governing equation in two dimensions, the pressure coefficient-Prandtl-Glauert compressibility correction
Transonic Flow: The sound barrier. Buffeting, supercritical airfoils, swept wings at transonic-speeds, 2nd Order equation for transonic flows, Wing-body combination, and Whitcomb's transonic area rule

UNIT-V LOADS ON SUPERSONIC AIRFOILS AND WINGS

Linearized supersonic flow: Governing equations, boundary conditions, Pressure coefficient, application to supersonic airfoils- Lift, drag, pitching moment
Method of Characteristics – Supersonic Nozzle Design

COURSE OUTCOMES:

On completion of the course students will be able to:

- Apply the fundamental flow equations and basic solution techniques in solving compressible quasi-one-dimensional flows – Nozzle flows
- Apply the fundamental flow equations and basic solution techniques in solving compressible one dimensional flow – normal shock waves, Rayleigh and Fanno flows.
- Analyze one-dimensional flows with shock waves, expansion waves.
- Calculate the aerodynamic characteristics of airfoils and wings of use in compressible subsonic, transonic flight conditions.
- Perform calculations associated with supersonic airfoils.

TEXT BOOKS:

1. Anderson, J. D, Modern Compressible Flow, McGraw-Hill & Co., 2002.
2. Rathakrishnan, E., Gas Dynamics, Prentice Hall of India, 2004.

REFERENCES:

1. Shapiro, A. H., Dynamics and Thermodynamics of Compressible Fluid Flow, Ronald Press, 1982.
2. Zucrow, M. J. and Anderson, J. D., Elements of Gas Dynamics, McGraw- Hill &Co., 1989.
3. Oosthuizen, P. H., &Carscallen,W. E., Compressible Fluid Flow, McGraw- Hill &Co., 1997.

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SCHOOL OF ENGINEERING & I.T.

Semester	:	V B.Tech
Branch	:	Aeronautical Engineering
Subject	:	Aircraft Structures-II
Total Theory Periods	:	48
Total Tutorial Periods	:	00
Total Credits	:	03
Code	:	BT 552

COURSE OBJECTIVES

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

UNIT-I UNSYMMETRICAL BENDING

Bending of symmetric beams subject to skew loads - bending stresses in beams of unsymmetrical sections – generalized 'k' method, neutral axis method, principal axis method.

UNIT-II SHEAR FLOW IN OPEN SECTIONS

Thin walled beams – concept of shear flow – the shear centre and its determination– shear flow distribution in symmetrical and unsymmetrical thin-walled sections –structural idealization – shear flow variation in idealized sections.

UNIT-III SHEAR FLOW IN CLOSED SECTIONS

Bredt -Batho theory – single-cell and multi-cell tubes subject to torsion – shear flowdistribution in thin-walled single & multi-cell structures subject to combined bending torsion – with walls effective and ineffective in bending – shear centre of closed sections.

UNIT-IV BUCKLING OF PLATES

Bending of thin plates – rectangular sheets under compression - local buckling stress of thin walled sections – crippling strength estimation – thin-walled column strength – load carrying capacity of sheet stiffener panels – effective width.

UNIT-V STRESS ANALYSIS OF WING AND FUSELAGE

Loads on an aircraft – the V-n diagram – shear force and bending moment distribution over the aircraft wing and fuselage –shear flow in thin-webbed beams with parallel and non-parallel flanges – complete tension field beams– semi-tension field beam theory.

COURSE OUTCOME:

On completion of the course students will be able:

- To perform calculations on unsymmetrical bending
- To perform shear flow calculations in open sections and closed sections
- To perform buckling calculations in plates
- To perform stress analysis calculations on wing and fuselage structures

TEXT BOOKS:

1. Megson T M G, 'Aircraft Structures for Engineering Students', Edward Arnold, 1995.
2. Bruhn. E. H., 'Analysis and Design of Flight Vehicles Structures', Tri-state off-set company, USA, 1985.
3. Howard D Curtis, 'Fundamentals of Aircraft Structural Analysis', WCB-McGraw Hill, 1997

REFEENCES:

1. Rivello, R. M., Theory and Analysis of Flight Structures, McGraw Hill, 1993.
2. Peery, D. J., and Azar, J. J., Aircraft Structures, 2nd edition, McGraw – Hill, N.Y., 1999.

MATS UNIVERSITY

ARANG, RAIPUR (C.G.)

MATS UNIVERSITY, RAIPUR (C.G.)
SCHOOL OF ENGINEERING & I.T.

Semester	:	V B.Tech
Branch	:	Aeronautical Engineering
Subject	:	Flight Dynamics
Total Theory Periods	:	48
Total Tutorial Periods	:	12
Total Credits	:	04
Code	:	BT 553

COURSE OBJECTIVE:

- To make the student understand the performance of airplanes under various flight conditions like take off, cruise, landing, climbing, gliding, turning and other maneuvers.
- To make the student understand the concepts of stable and unstable configuration of airplanes.

UNIT-I AERODYNAMIC CHARACTERISTICS

Forces and moments from dimensional analysis, pressure distribution over airfoils, variation with angle of attack, aerodynamic centre, centre of pressure - related problems. Drag polar, estimation of drag. Estimation of C_L, C_D and C_M from pressure distribution, variation of aerodynamic coefficients with Reynolds number and Mach number.Effect of span, aspect ratio, High lift devices.

UNIT-II AIRPLANE PERFORMANCE IN STEADY AND LEVEL FLIGHT

Equations of motion of aircraft, variation of drag with flight, power required and power available, minimum drag and minimum power conditions, climbing and gliding performance.

UNIT-III AIRPLANE PERFORMANCE IN ACCELERATED FLIGHT

Take off and landing distances, Range and Endurance, Turning flight performance.

UNIT-IV STATIC STABILITY AND CONTROL

Stick fixed static longitudinal stability, neutral point, power effects, stick free static longitudinal stability, Hinge moments, Aerodynamic Balancing, Static Margin. In flight measurement of stick fixed and sticks free neutral points.
Criteria for Lateral and Directional Stability, dihedral effect, Control in Roll, Aileron control power. Cross coupling of lateral and directional effects.

UNIT-V DYNAMIC STABILITY

Equations of motion of airplane, stability derivatives, Routhdiscriminant, solving the stability quadratic, Analysis of short period and Phugoid mode, Analysis of roll and spiral modes, Dutch Roll.

COURSE OUTCOMES:

After completion of course Students will be able to-

- Understand concepts of straight and level flight and Range and Endurance
- Understand performance of climb and descent take-off, landing and turning performance.
- An understanding of the contribution to static longitudinal stability, directional stability from various components of the airplane
- To get familiarized with the longitudinal, directional and lateral dynamics of the airplane

TEXT BOOKS:

1. John D Anderson Jr., Introduction to Flight, McGraw Hill
2. Anderson, Jr., J. D. Aircraft Performance and Design, McGraw-Hill International Edition, 1999
3. R C Nelson, Flight Stability & Automation Control, McGraw Hill

REFERENCE BOOKS:

1. B Etkins, Dynamics of Flight, John Wiley
2. Perkins, C.D., and Hage, R.E., "Airplane Performance stability and Control", John Wiley & Son, Inc, New York, 1988.

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SCHOOL OF ENGINEERING & I.T.

Semester	:	V B.Tech
Branch	:	Aeronautical Engineering
Subject	:	Aircraft Structures Laboratory
Total Practical Periods	:	28
Total Credits	:	01
Code	:	BT 554

COURSE OBJECTIVES

- To enable the students, understand the behavior of aircraft structural components under different loading conditions.
- To study the failure of different component under different loading condition

LIST OF EXPERIMENTS

1. Determination of Young's modulus of steel using mechanical extensometers.
2. Determination of Young's modulus of aluminum using electrical extensometers.
3. Determination of fracture strength and fracture pattern of ductile and brittle materials.
4. Testing of Riveted Joints.
5. Determination of membrane stresses in a thin cylinder under internal pressure.
6. Deflection of beams with various end conditions and Verification of Maxwell's Reciprocal theorem & principle of superposition.
7. Column – Testing and South – well's plot.
8. Determination of Unsymmetrical bending of different materials using bend test set up.
9. Determination of Shear centre location for open sections.
10. Determination of Shear centre location for closed sections.
11. Finding out flexibility matrix for cantilever beam.
12. Testing of Beam with combined loading.

COURSE OUTCOMES:

On completion of the course students will be able to:

- Be able to understand the importance of aircraft structures which are the load carrying members
- The analytical ability of calculating the bending stresses in beams of un-symmetrical sections
- To perform buckling load calculations on columns
- To understand Shear centre location of various sections
- To understand behaviour of Beam with combined loading

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Semester	:	V B.Tech
Branch	:	Aeronautical Engineering
Subject	:	Computer Aided Simulation Laboratory-I
Total Practical Periods	:	28
Total Credits	:	01
Code	:	BT 555

COURSE OBJECTIVE:

- To develop understanding of 2-Dim and 3-Dim drawing using software
- To develop coding skill to operate the CNC machines
- To develop interest about CAD designing/solid modeling

LIST OF EXPERIMENTS

1. Draw simple line on computer screen translate, rotate reflect 2-D object about any axis and 2-Dimensional object.
2. Draw 3-D object and show scaling, rotation & translation of that object about any particular axis.
3. For given part to be machined, prepare a CNC part program to machine the holes on vertical axis CNC machining center using the ISO standard G-codes. You may choose Program Zero (Axes) to be used for the component. Show the axes chosen and write the program.
4. For a given component to be machined, prepare a CNC part program to machine the part contour on any vertical axis. Show machining center using the ISO standard G-codes. Show the axis chosen and write the program using the initial tool position.
5. Prepare a CNC part program for a component to be machined on any turning center using the ISO standard G-codes. Write the program using the initial tool position.
6. Develop a CNC milling part program in a post processor version to machine the given Component.
7. Scaling, rotation, translation, editing, dimensioning – Typical CAD command structure.
8. Wire frame modeling – surface modeling.

COURSE OUTCOME:

On completion of the course students will be able to:

- Design and analysis in 2-Dim and 3-Dim modeling using software
- Deal with advance engineering problems based on their Coding skills
- Improves design and drafting skills using Auto-CAD/SOLIDWORKS

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SCHOOL OF ENGINEERING & I.T.

Semester	:	V B.Tech
Branch	:	Aeronautical Engineering
Subject	:	Propulsion Laboratory-I
Total Practical Periods	:	28
Total Credits	:	01
Code	:	BT 556

COURSE OBJECTIVES:

- To enable the students, understand the behavior of CD-nozzle
- To enable the students, understand the behavior of choked and un-choked flow
- To enable the students, understand the behavior of subsonic speed jet engine
- To enable the students, understand the behavior supersonic speed jet engine
- To enable the students, understand the behavior of combustion chamber

LIST OF EXPERIMENTS

1. To estimate the performance of De-Laval Nozzle
2. Effect of inlet total pressure on the flow development of supersonic C-D nozzle.
3. Mach number distribution in C-D nozzle for un-choked inlet total pressure(s).
4. Mach number distribution in C-D nozzle for choked inlet total pressure(s).
5. To study about the construction and operation of Turbojet Engine.
6. To study about the construction and operation of Turbofan Engine.
7. To study about the construction and operation of Ramjet Engine.
8. To estimate the performance of Combustion Chamber of Gas Turbine Engine

COURSE OUTCOMES:

On completion of the course students will be able to:

- Perform experiments to observe the behavior of CD-nozzle
- Perform experiments to analyze choked and un-choked flow
- Perform experiments on operation of Turbojet Engine and Turbofan Engine
- Perform experiments on supersonic speed that is about ramjet engine
- Perform experiments on can type and annular type of combustion cambers

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SCHOOL OF ENGINEERING & I.T.

Semester	:	V B.Tech
Branch	:	Aeronautical Engineering
Subject	:	Vocational Training/ Internship- 1
Total Credits	:	03
Code	:	BT 557

COURSE OBJECTIVE:

- The training helps the students gain a much deeper knowledge and interest about the stream of engineering so opted for.
- The training readily enhances the technical skills of the individuals in a practical environment.
- Learning the basics about working individually as well as in a team
- The training helps in the improvement of the awareness of the overall environment of the industry and the work culture at the same time

DESCRIPTION

1. A 4-6-week industry internship is a compulsory course requirement during summer vacation (pre-semester).
2. Evaluation marks to be carried over to present Semester.
3. Every student of the course is expected to work in the industry for a period of 4 - 6 weeks, during the months of May to June, after completing four semesters of the Academic program.
4. The Industry Internship placement process is held to help the Students find internships and at the same time, help recruiters find students to intern with their firms challenging projects.

COURSE OUTCOMES:

On completion of the course students will be able to

- Understand the working procedures in industry
- Gain knowledge about contemporary technologies
- Gain hand on experience on various processes
- Apply new methods to investigate complex engineering problems
- Gain motivation towards lifelong learning

MATS UNIVERSITY

ARANG, RAIPUR (C.G.)

Scheme & Syllabus

(VIth Semester)

Bachelor of Technology

Aeronautical Engineering

MATS School of Engineering &I.T

MATS UNIVERSITY

ARANG, RAIPUR (C.G.)

Scheme of Teaching & Examination

VI - Semester

S. No.	Code	Subject	Periods per Week			Scheme of Marks		Total Credit
			L	T	P	ESE	IM	
1.	BT650	Composite Materials & Structures	3	1	-	70	30	4
2.	BT651	Rocket Propulsion	3	1	-	70	30	4
3.	BT652	Aircraft Design	3	0	-	70	30	3
4.	BT653	Aircraft Structure Repair Laboratory	-		2	30	20	1
5.	BT654	Propulsion Lab-II	-		2	30	20	1
6.	BT655	Aero Engine Repair & Maintenance Laboratory	-		2	30	20	1
7.	BT656	Project-I	-	-	4	70	30	2
8.	BTPXX	Professional Elective-III	3	0	-	70	30	3
9.	BTOXX	Open Elective-II	3	0	-	70	30	3
		Total	**15**	**2**	**10**	**510**	**240**	**22**

L – Lecture, T – Tutorial, ESE – End Semester Examination,
P – Practical, IM – Internal Marks (Include Class Test & Teacher's Assessments)

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SCHOOL OF ENGINEERING & I.T.

Semester	:	VI B.Tech
Branch	:	Aeronautical
Subject	:	Composite Materials & Structures
Total Theory Periods	:	48
Total Tutorial Periods	:	12
Total Credits	:	04
Code	:	BT 650

COURSE OBJECTIVES

- To make the student understand the analysis of composite laminates under different loading conditions and different environmental conditions.
- To understand failure types in composite materials
- Use of composite in aircraft industry

UNIT-I MICROMECHANICS

Introduction -Advantages and application of composite materials - reinforcements and matrices – Introduction to Nano composite -Micro mechanics – Mechanics of materials approach, elasticity approach-Effect of voids - hygro thermal effects on a lamina

UNIT-II MACROMECHANICS

Macro mechanics - Generalized Hooke's Law - Elastic constants for anisotropic, orthotropic and isotropic materials - Macro Mechanics – Stress-strain relations with respect to natural axis, arbitrary axis – Determination of material properties - Experimental characterization of lamina

UNIT-III LAMINATED PLATE

Governing differential equation for a unidirectional lamina and general laminate, angle ply and cross ply laminate, Failure criteria for composites

UNIT-IV FABRICATION PROCESS AND REPAIR METHODS

Various open and closed mould processes, Manufacture of fibers, Types of resins, properties and applications, netting analysis. Importance of repair and different types of repair techniques in composites

UNIT-V SANDWICH CONSTRUCTIONS

Basic design concepts of sandwich construction - Materials used for sandwich construction - Failure modes of sandwich panels - Bending stress and shear flow in composite beams

COURSE OUTCOMES

- Understanding the mechanics of composite materials
- Ability to analyze the laminated composites for various loading eases
- Knowledge gained in manufacture of composites

TEXT BOOKS

1. Jones, R.M., "Mechanics of Composite Materials," Taylor & Francis, II Edition, 2000.
2. Madhuji Mukhapadhyay, Mechanics of Composite Materials and Structures, University Press, 2004

REFERENCES

1. Agarwal, B.D., and Broutman, L.J., "Analysis and Performance of Fibre Composites," John Wiley and sons. Inc., New York, 1995.
2. Lubin, G., "Handbook on Advanced Plastics and Fibre Glass", Von Nostrand Reinhold Co., New York, 1989.

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Semester	:	VI B.Tech
Branch	:	Aeronautical
Subject	:	Rocket Propulsion
Total Theory Periods	:	48
Total Tutorial Periods	:	12
Total Credits	:	04
Code	:	BT 651

COURSE OBJECTIVE:

- To impart knowledge in non air-breathing and hypersonic propulsion methods to students so that they are familiar with various propulsion technologies associated with space launch vehicles, missiles and space probes.
- To understand the principles of operation of rocket propulsion.
- To understand about the types, operation and performance of the rocket engines.

UNIT-I GENERAL INTRODUCTION

General Introduction: Difference between Rockets and Missiles, Types of Rockets and Missiles, Satellite launch vehicles, Manned Rockets

UNIT-I I AERODYNAMICS CHARACTERISTICS OF AIR FRAME COMPONENTS

Aerodynamics characteristics of air frame components: Introduction, Bodies of revolution, Different fore-body shapes, Summary of characteristics of bodies of revolution, Base pressure. Aerodynamic controls, Jet control.

UNIT-III CHEMICAL ROCKET PROPULSION

Operating principle – specific impulse of a rocket – internal ballistics – rocket performance considerations – solid propellant rockets – selection criteria of solid propellants – propellant grain design considerations – erosive burning in solid rockets– liquid propellant rockets – selection of liquid propellants–various feed systems for liquid rockets-thrust control in liquid rockets–cooling in liquid rockets and the associated heat transfer problems – advantages of liquid rockets over solid rockets-introduction to hybrid propulsion – advantages and limitations of hybrid propulsion -static testing of rockets and safety considerations.

UNIT-IV ADVANCED PROPULSION TECHNIQUES

Introduction to nozzle less propulsion and basic concepts - Electric rocket propulsion – Ion propulsion – Nuclear rocket – comparison of performance of these propulsion systems with chemical rocket propulsion systems - Solar sail.

UNIT-V MATERIALS FOR ROCKETS AND MISSILES

Selection of Material- Special Requirements of Materials to Perform under Adverse Conditions.

COURSE OUTCOME:

- Understanding various propulsion systems
- Differentiate various rocket propulsion systems
- Knowledge about the applications and principles of liquid and solid-liquid propulsion systems
- Develop hybrid propulsion and cryogenic in rocketry

TEXT BOOKS:

1. Sutton, G.P., "Rocket Propulsion Elements", John Wiley & Sons Inc., New York, 5th Edition, 1993.
2. Mathur, M.L., & Sharma, R.P., "Gas Turbine, Jet & Rocket Propulsion", Standard Publishers and Distributors, Delhi, 1988.

REFERENCES:

1. David H. Heiser and David T. Pratt., "Hypersonic Air breathing Propulsion", AIAA Education Series, 1999.

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Semester	:	VI B.Tech
Branch	:	Aeronautical
Subject	:	Aircraft Design
Total Theory Periods	:	48
Total Tutorial Periods	:	00
Total Credits	:	03
Code	:	BT 652

COURSE OBJECTIVE:

- To introduce application of fundamental aerodynamic theories in aircraft design
- Proper use of weight estimation calculations for designing an aircraft
- Make use of historical data in new design
- Load estimation and component selection according to load on structure

UNIT-I PRELIMINARIES: AIRCRAFT DESIGN

Preliminaries: Aircraft Design Requirements, specifications, role of users, Aerodynamic and Structural Consideration, Importance of weight, Airworthiness requirements and standards, Classifications of airplanes. Special features of modern airplane

UNIT-II AIRPLANE WEIGHT ESTIMATION AND WING DESIGN

Airplane Weight Estimation: Weight estimation based on type of airplane, weight-estimation based on mission requirements, iterative approach
Basics of Wing Design: Selection of airfoil selection, Span wise load distribution and planform shapes of airplane wing. Stalling, take off and landing considerations

UNIT-III LOADS AND STRUCTURAL DESIGN

Air Loads in Flight: Symmetrical measuring loads in flight, Basic flight loading conditions, Load factor, Velocity - Load factor diagram, gust load and its estimation, Structural limits.
Structural Design: Cockpit and aircraft passenger cabin layout for different categories, types of associated structure, Structural aspects of design of airplane, Different kinds of landing gears, and associated arrangement for civil and military airplanes, Bending moment and shear force diagram

UNIT-IV INTEGRATION OF STRUCTURE AND POWER PLANT

Integration of Structure and Power Plant: Estimation of Horizontal and Vertical tail volume ratios, Choice of power plant and various options of locations, considerations of appropriate air –intakes, Integration of wing, fuselage, empennage and power plant, Estimation of centre of gravity.

UNIT-V INTRODUCTION TO ADVANCED CONCEPTS

Introduction to advanced concepts: Supercritical Wings, relaxed static Stability, controlled configured vehicles, V/STOL aircraft and, rotary wing vehicles.
Design and layout of flying controls and engine controls

COURSE OUTCOME:

- Be able to perform weight estimation calculations
- Be able perform design calculations pertaining to configuration layout and flight envelope
- Be able perform design calculations for engine selection
- Be able perform design calculations for control surface selection

TEXT BOOKS:

1. D.P. Raymer, "Aircraft Conceptual design", AIAA Series, 1988.
2. G. Corning, "Supersonic & Subsonic Airplane Design", II Edition, Edwards Brothers Inc., Michigan, 1953.
3. E.F. Bruhn, "Analysis and Design of Flight Vehicle Structures", Tristate Offset Co., U.S.A., 1980.

REFERENCES:

1. E. Torenbeek, "Synthesis of Subsonic Airplane Design", Delft University Press, London, 1976.
2. H.N.Kota, Integrated design approach to Design fly by wire" Lecture notes Interline Pub. Bangalore, 1992.
3. A.A. Lebedenski, "Notes on airplane design", Part-I, I.I.Sc., Bangalore

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SCHOOL OF ENGINEERING & I.T.

Semester	:	VI B.Tech
Branch	:	Aeronautical
Subject	:	Aircraft Structures Repair Laboratory
Total Practical Periods	:	28
Total Credits	:	01
Code	:	BT653

COURSE OBJECTIVE:

- To build skills of riveting and sheet metal work
- To build skills of patch work and metal forming
- To build skills of various types of welding

LIST OF EXPERIMENTS

1. Patch repair welding using TIG.
2. Patch repair welding using MIG.
3. Patch repair welding using Plasma Arc.
4. Exercise on pipe bending.
5. Exercise on Riveted joints & repair work.
6. Exercise on composites & repair work.
7. Repair of Sandwich panels.
8. Exercise on Sheet metal forming.
9. Exercise on cable swaging.

COURSE OUTCOME:

- Ability to join the different types of aircraft wood
- Develop skills on riveting, mooring and patch work
- Differentiate the welding process and weld the materials
- Able to perform the checks for aircraft symmetry, levelling and jacking

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Semester	:	VI B.Tech
Branch	:	Aeronautical
Subject	:	Propulsion Laboratory-II
Total Practical Periods	:	28
Total Credits	:	01
Code	:	BT 654

COURSE OBJECTIVE:

- To enable the students, understand the behavior supersonic flows
- To study the different expansion levels of jets
- To estimate engine noise level and correction technique

LIST OF EXPERIMENTS

1. Study of performance of a propeller.
2. To study about the construction and operation of Rocket Engines.
3. Determination of heat of combustion of aviation fuel.
4. Combustion performance studies in a jet engine combustion chamber.
5. Study of free jet.
6. Study of wall jet.
7. Use of Shadow graph system to visualize shock waves
8. Noise Characteristics of jets
9. Pitot Pressure study of an over-expanded jet.
10. Pitot Pressure study of correctly-expanded jet.
11. Pitot Pressure study of an under-expanded jet.
12. Pitot Pressure measurements to study characteristic decay of subsonic jet.

COURSE OUTCOME:

- Be able to perform experiments using supersonic free jet facility
- Be able to identify the flow features of jets at different expansion levels
- Be able to perform experiments to estimate jet decay and spread character
- Be able to visualize various flow features of jets using optical techniques
- Be able to perform preliminary aero-acoustic experiments

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Semester	:	VI B.Tech
Branch	:	Aeronautical
Subject	:	Aero Engine Repair & Maintenance Laboratory
Total Practical Periods	:	28
Total Credits	:	01
Code	:	BT 655

COURSE OBJECTIVE:

- To apply maintenance procedure to piston engines
- To understand the propeller theory
- To identify the jet engine and helicopter engine components and faults
- To apply non destructive testing procedures
- To apply overhauling procedure to engines

LIST OF EXPERIMENTS

1. Stripping of a piston engine.
2. Engine (Piston Engine) - cleaning, visual inspection, NDT checks.
3. Piston Engine Components - dimensional checks.
4. Piston – Engine reassembly.
5. Propeller Pitch Setting.
6. Stripping of a jet engine.
7. Jet Engine – identification of components & defects.
8. Jet Engine – NDT checks and dimensional checks
9. Jet Engine – reassembly.
10. Engine starting procedures.

COURSE OUTCOME:

- Apply maintenance procedure to piston engines
- Understand the propeller theory
- Identify the jet engine and helicopter engine components and faults
- Apply non-destructive testing procedures
- Apply overhauling procedure to engines

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Semester	:	VI B.Tech
Branch	:	Aeronautical
Subject	:	Project-I
Total Credits	:	02
Code	:	BT 656

COURSE OBJECTIVE:

- To develop the ability to solve a specific problem right from its identification and literature review
- To train the students in preparing project reports and to face reviews and viva voce examination

SUMMARY/ PROCEDURE OF PROJECT-I

1. The objective of the Project-I is to make use of the knowledge gained by the student at various stages of the degree course.
2. Students are permitted to form group of likeminded colleagues (not more than 4 members) for working on a particular project/topic.
3. Students will also be permitted to undertake industrial/consultancy project Work, outside the department, in industries/Research labs.
4. There shall be four assessments during the semester by a review committee.
5. The student shall make four presentations on the progress made before the committee at various stages of the Project work.
6. The Head of the Department shall constitute the review committee for each branch of study.
7. There will be a viva-voce examination at the end of the Project work, conducted by one internal examiner and one external examiner.
8. The total marks secured will be the sum of marks secured in the Project reviews and Viva Voce Examination.
9. Each student is required to submit a Project report on the project assigned to him/group by the department.
10. The report should be based on the information available in the literature or data obtained by the student by way of experiments conducted in the laboratory/industry.

COURSE OUTCOME:

- On Completion of the project -1, students will be in a position to conduct experimental or Computational investigations relevant to practical problems by formulating proper methodology.

MATS UNIVERSITY

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Scheme & Syllabus

(VIIth Semester)

Bachelor of Technology

Aeronautical Engineering

MATS School of Engineering &I.T

MATS UNIVERSITY

ARANG, RAIPUR (C.G.)

Scheme of Teaching & Examination

VII - Semester

S. No.	Code	Subject	Periods per Week			Scheme of Marks		Total Credit
			L	T	P	ESE	IM	
1.	BT750	Avionics	3	0	-	70	30	3
2.	BT751	Finite Elements Methods	3	0	-	70	30	3
3.	BT752	Introduction to Space Technology	3	0	-	70	30	3
4.	BT753	Avionics Laboratory	-	-	2	30	20	1
5.	BT754	Computer Aided Simulation Laboratory-II	-	-	2	30	20	1
6.	BT755	Internship-II	-	-	-	0	50	3
7.	BT756	Project-II	-	-	4	70	30	2
8.	BTPXX	Professional Elective-IV	3	0	-	70	30	3
9.	BTOXX	Open Elective -III	3	0	-	70	30	3
		Total	**15**	**0**	**8**	**480**	**270**	**22**

L – Lecture, T – Tutorial, ESE – End Semester Examination,
P – Practical, IM – Internal Marks (Include Class Test & Teacher's Assessments)

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Semester	:	VII B.Tech
Branch	:	Aeronautical
Subject	:	Avionics
Total Theory Periods	:	48
Total Tutorial Periods	:	00
Total Credits	:	03
Code	:	BT 750

COURSE OBJECTIVE:

- To introduce the basic of avionics and its need for civil and military aircrafts
- To impart knowledge about the avionic architecture and various avionics data buses
- To gain more knowledge on various avionics subsystems

UNIT-I INTRODUCTION TO AVIONICS

Need for avionics in civil and military aircraft and space systems – Integrated avionics and weapon systems – Typical avionics subsystems, design, technologies.

UNIT-II PRINCIPLE OF DIGITAL SYSTEMS

Digital computer – Microprocessors – Memories.

UNIT-III DIGITAL AVIONICS ARCHITECTURE

Avionics system architecture – Databuses – MIL-STD-1553B – ARINC – 420 –ARINC – 629.

UNIT-IV FLIGHT DECKS AND COCKPITS

Control and display technologies: CRT, LED, LCD, EL and plasma panel – Touch screen – Direct voice input (DVI) – Civil and Military Cockpits: MFDS, HUD, MFK, HOTAS.

UNIT-V INTODUCTION TO AVIONICS SYSTEMS

Communications systems- Navigation systems – Flight control systems – Radar –Electronic Warfare – Utility systems Reliability and maintainability – Certification.

COURSE OUTCOME:

- Students will be able to understand the concept of designing avionics systems
- Be able to understand the principle of digital avionics systems
- Able to know the practical and working of flight deck equipment
- Students understand the principle and working of navigation system
- Be able to understand the air data systems and auto pilot.

TEXT BOOKS:

1. Middleton, D.H., Ed., Avionics systems, Longman Scientific and Technical, Longman Group UK Ltd., England, 1989.
2. Spitzer, C.R. Digital Avionics Systems, Prentice-Hall, Englewood Cliffs, N.J., U.S.A. 1987.

REFERENCES:

1. Malvino, A.P. and Leach, D.P. Digital Principles and Applications, Tata McGraw Hill, 1990.
2. Gaokar, R.S. Microprocessors Architecture-Programming and Applications, Wiley and Sons Ltd., New Delhi, 1990.

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Semester	:	VII B.Tech
Branch	:	Aeronautical
Subject	:	Finite Element Methods
Total Theory Periods	:	48
Total Tutorial Periods	:	00
Total Credits	:	03
Code	:	BT 751

COURSE OBJECTIVE:

- To give exposure various methods of solution and in particular the finite element method
- It gives exposure to the formulation and the procedure of the finite element method and its application to varieties of problems

UNIT-I INTRODUCTION

Review of various approximate methods –Raleigh Ritz's, Galerkin and finite difference methods- Governing equation and convergence criteria of finite element method.

UNIT-II DISCRETE ELEMENTS

Bar elements, uniform sections, mechanical and thermal loading, varying section, truss analysis. Beam element - problems for various loadings and boundary conditions - longitudinal and lateral vibration. Use of local and natural coordinates.

UNIT-III CONTINUUM ELEMENTS

Plane stress, Plane strain and axisymmetric problems, constant and linear strain, triangular elements, stiffness matrix, axisymmetric load vector,

UNIT-IV ISOPARAMETRIC ELEMENTS

Definitions, Shape function for 4, 8 and 9 nodal quadrilateral elements, Stiffness matrix and consistent load vector, Gaussian integration

UNIT-V FIELD PROBLEM

Heat transfer problems, Steady state fin problems, Derivation of element matrices for two dimensional problems, Torsion problems

COURSE OUTCOME:

- To obtain an overall understanding of Finite Element analysis
- To be able to perform discrete element analysis
- To be able to perform continuum element analysis
- To be able to perform isoparametric element analysis
- To be able to apply FEM methods to typical engineering situations

TEXT BOOKS:

1. Tirupathi R. Chandrapathala and Ashok D. Belegundu – Introduction to Finite Elements in Engineering – Prentice Hall India, Third Edition, 2003.
2. Rao. S.S., Finite Element Methods in Engineering, Butterworth and Heinemann, 2001

REFERENCES:

1. Reddy J.N. – An Introduction to Finite Element Method – McGraw Hill – 2000.
2. Krishnamurthy, C.S., Finite Element Analysis, Tata McGraw Hill, 2000.
3. Bathe, K. J. and Wilson, E. L., Numerical Methods in Finite Elements Analysis, Prentice Hall of India, 1985.
4. Robert D Cook, David S Malkus, Michael E Plesha, 'Concepts and Applications of Finite Element Analysis', 4th edition, John Wiley and Sons, Inc., 2003.
5. Larry J Segerlind, 'Applied Finite Element Analysis', Second Edition, John Wiley and Sons, Inc. 1984.

MATS UNIVERSITY

ARANG, RAIPUR (C.G.)

MATS UNIVERSITY, RAIPUR (C.G.)
SCHOOL OF ENGINEERING & I.T.

Semester	:	VI B.Tech
Branch	:	Aeronautical
Subject	:	Introduction to Space Technology
Total Theory Periods	:	48
Total Tutorial Periods	:	00
Total Credits	:	03
Code	:	BT752

COURSE OBJECTIVE:

- To introduce fundamental concepts of orbital mechanics
- To introduce concepts of satellite injection and satellite perturbations, trajectory computation for interplanetary travel and flight of ballistic missiles based on the fundamental concepts of orbital mechanics.

UNIT I SPACE ENVIRONMENT

Peculiarities of space environment and its description– effect of space environment on materials of spacecraft structure and astronauts- manned space missions – effect on satellite life time

UNIT II BASIC CONCEPTS AND THE GENERAL N- BODY PROBLEM

The solar system – reference frames and coordinate systems – terminology related to the celestial sphere and its associated concepts – Kepler's laws of planetary motion and proof of the laws –Newton's universal law of gravitation - the many body problem - Lagrange-Jacobi identity – the circular restricted three body problem libration points – the general N-body problem – two body problem – relations between position and time.

UNIT III SATELLITE INJECTION AND SATELLITE PERTURBATIONS

General aspects of satellite injection – satellite orbit transfer – various cases – orbit deviations due to injection errors – special and general perturbations – Cowell's method and Encke's method – method of variations of orbital elements – general perturbations approach.

UNIT IV INTERPLANETARY AND BALLISTIC MISSILE TRAJECTORIES

Two-dimensional interplanetary trajectories – fast interplanetary trajectories – three dimensional interplanetary trajectories – launch of interplanetary spacecraft – trajectory estimation about the target Introduction to ballistic missile trajectories – boost phase – the ballistic phase – trajectory geometry – optimal flights – time of flight – re-entry phase – the position of impact point – influence coefficients.

UNIT-V MATERIALS FOR SPACECRAFT

Space environment – peculiarities of space environment – effect of space environment on materials of spacecraft structure – materials required for the construction of space craft – TPS for re-entry space vehicles.

COURSE OUTCOME:

- Ability to perform satellite injection, satellite perturbations and trajectory control
- Apply orbital mechanics to control ballistic missile
- Material/composite used for space mission

TEXT BOOKS:

1. Cornelisse, J.W., "Rocket Propulsion and Space Dynamics", J.W. Freeman & Co, Ltd, London, 1982
2. Parker, E.R., "Materials for Missiles and Spacecraft", McGraw Hill Book Co. Inc., 1982.

REFERENCES:

1. Sutton, G.P., "Rocket Propulsion Elements", John Wiley & Sons Inc., New York, 5th Edition, 1993.

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SCHOOL OF ENGINEERING & I.T.

Semester	:	VII B.Tech
Branch	:	Aeronautical
Subject	:	Avionics Laboratory
Total Practical Periods	:	28
Total Credits	:	01
Code	:	BT 753

COURSE OBJECTIVE:

- To gain the knowledge about Addition/Subtraction of 8 bit and 16-bit data for control surface deflection.
- Learning about Sorting of Data in Ascending & Descending order for voting mechanism.
- To know about adder/ Subtractor and Multiplexer/Demultiplexer Circuits
- Function of Encoder and Decoder circuits.
- Leaning about data Buses Configuration

LIST OF EXPERIMENTS

DIGITAL ELECTRONICS

1. Addition/Subtraction of binary numbers.
2. Multiplexer/ Demultiplexer Circuits.
3. Encoder/Decoder Circuits.
4. Timer Circuits, Shift Registers, Binary Comparator Circuits.

MICROPROCESSORS

5. Addition and Subtraction of 8-bit and 16-bit numbers.
6. Sorting of Data in Ascending & Descending order.
7. Sum of a given series with and without carry.
8. Greatest in a given series & Multi-byte addition in BCD mode.
9. Interface programming with 4 digit 7 segment Display & Switches & LED's.

AVIONICS DATA BUSES

10. Study of Different Avionics Data Buses.
11. MIL-Std – 1553 Data Buses Configuration with Message transfer.
12. MIL-Std – 1553 Remote Terminal Configuration.

COURSE OUTCOME:

1. Know about Addition/Subtraction of 8 bit and 16-bit data for control surface deflection.
2. Know about Sorting of Data in Ascending & Descending order for voting mechanism.
3. Know about adder/ Subtractor and Multiplexer/Demultiplexer Circuits
4. Detail Functioning of Encoder and Decoder circuits.
5. Detail Leaning about data Buses Configuration

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SCHOOL OF ENGINEERING & I.T.

Semester	:	VII B.Tech
Branch	:	Aeronautical
Subject	:	Computer Aided Simulation Laboratory-II
Total Practical Periods	:	28
Total Credits	:	01
Code	:	BT 754

COURSE OBJECTIVES:

- Ability to gain practical experience in handling 2D drafting and 3D modelling software
- Ability to draw and model the components in 2D & 3D views
- Ability to perform modelling and kinematics on various machine components
- To develop in students' graphic skills for communication of concepts, ideas of engineering products
- To familiarize with technical drawings

LIST OF EXPERIMENTS

1. Introduction to 3D Modelling software
2. Drafting of 3D isometric models
3. Solid Modeling and Advanced modeling.
4. CFD/FEM Fundamentals.
5. Flow Simulation over a Symmetrical Airfoil Using CFD.
6. Flow Simulation over a Cambered Airfoil Using CFD.
7. Flow Simulation over a Turbine Blade (static analysis) Using CFD.
8. Stress Analysis and Thermal Analysis of a Turbine Blade (Rotation only and no pressure loads).
9. Kinematics of four bar mechanism
10. Kinematics of gears.

COURSE OUTCOMES:

- Describe the graphic skills for communication of concepts, ideas of engineering products
- Design 3D assembly using modeling software
- Create kinematics on various machine assemblies
- Create drafting on 3D assembled models
- Get job opportunities on design based industries

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SCHOOL OF ENGINEERING & I.T.

Semester	:	VII B.Tech
Branch	:	Aeronautical
Subject	:	Internship-II
Total Credits	:	03
Code	:	BT 755

COURSE OBJECTIVE:

- The Internship-II helps the students gain a much deeper knowledge and interest about there learning in Internship-I
- The training readily enhances the technical skills of the individuals in a practical environment.
- The training helps in the improvement of the awareness of the overall environment of the industry and the work culture at the same time

DESCRIPTION

1. A 4-6 week industry internship-II is a compulsory course requirement during summer vacation.
2. It is compulsory for every student to submit their daily report once the back to campus after completing the internship period.
3. Every student of the course is expected to work in the industry for a period of 4 - 6 weeks, during the months of June-July, after completing sixth semesters of the Academic program.
4. The Industry Internship placement process is held to help the Students find internships and at the same time, help recruiters find students to intern with their firms challenging projects.
5. Evaluation marks to be carried over to present Semester.

COURSE OUTCOME:

- Understand the working procedures in industry with more interest as in phase-I
- Gain knowledge about modern technologies adopted in engineering works
- Apply new methods to investigate complex engineering problems
- Gain motivation towards lifelong learning

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Semester	:	VII B.Tech
Branch	:	Aeronautical
Subject	:	Project-II
Total Credits	:	02
Code	:	BT 756

COURSE OBJECTIVE:

- To utilize the knowledge gained from literature survey and continue to solve the chosen problem (in Project-I) till the successful solution of the same.
- To train the students in preparing project reports and to face reviews and viva voce examination
- Success /failure in project work built confidence in students

SUMMARY/ PROCEDURE OF PROJECT-II

1. The objective of the Project-II is to make use of the knowledge gained by the student at various stages of the degree course.
2. Students are permitted to form group of likeminded colleagues (not more than 3 members) for working on a particular project/topic.
3. Students will also be permitted to undertake industrial/consultancy project Work, outside the department, in industries/Research labs.
4. There shall be four assessments during the semester by a review committee.
5. The student shall make four presentations on the progress made before the committee at various stages of the Project work.
6. The Head of the Department shall constitute the review committee for each branch of study.
7. There will be a viva-voce examination at the end of the Project work, conducted by one internal examiner and one external examiner.
8. The total marks secured will be the sum of marks secured in the Project reviews and Viva Voce Examination.
9. Each student is required to submit a Project report on the project assigned to him/group by the department.
10. The report should be based on the information available in the literature or data obtained by the student by way of experiments conducted in the laboratory/industry.

COURSE OUTCOME:

- On Completion of the project-II work students will be in a position to take up any challenging practical problems and find solution by formulating proper methodology.
- Gain confidence to deal real life problems

MATS UNIVERSITY

ARANG, RAIPUR (C.G.)

Scheme & Syllabus

(VIIIth Semester)

Bachelor of Technology

Aeronautical Engineering

MATS School of Engineering &I.T

MATS UNIVERSITY

ARANG, RAIPUR (C.G.)

Scheme of Teaching & Examination

VIII - Semester

S. No.	Code	Subject	Periods per Week			Scheme of Marks		Total Credit
			L	T	P	ESE	IM	
1.	BT850	Internship/ Training-3	-	-	-	70	30	6
2.	BT851	Project-III	-	-	-	120	80	6
3.	BTPXX	Professional Elective-5- Online Mode/ MOOCs	3	0	-	70	30	3
4.	BTOXX	Open Elective - IV - Through Online Mode/ MOOCs	3	0	-	70	30	3
		Total	**6**	**0**	**-**	**330**	**170**	**18**

L – Lecture, T – Tutorial, ESE – End Semester Examination,
P – Practical, IM – Internal Marks (Include Class Test & Teacher's Assessments)

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Semester	:	VIII B.Tech
Branch	:	Aeronautical
Subject	:	Internship-III
Total Credits	:	06
Code	:	BT 850

COURSE OBJECTIVE:

- It gives career alternatives prior to graduation
- Provides a platform to Integrate theory and practice
- Assess interests and abilities in their field of study
- Develop communication, interpersonal and other critical skills in the job interview process
- Acquire employment contacts leading directly to a full-time job following graduation from college

DESCRIPTION:

1. A 6-8 week industry internship-III is a compulsory course requirement during winter vacation.
2. It is compulsory for every student to submit their daily report once the back to campus after completing the internship period.
3. Every student of the course is expected to work in the industry for a period of 6-8 weeks, during the months of December-January, after completing seventh semesters of the Academic program.
4. The Industry Internship placement process is held to help the Students find internships and at the same time, help recruiters find students to intern with their firms challenging projects.
5. Evaluation marks to be carried over to present Semester.

COURSE OUTCOME:

- Develop work habits and attitudes necessary for job success
- Identify, write down, and carry out performance objectives (mutually agreed upon by the employer and the student) related to their job assignment.
- Application of theory into practice develop confidence and improve understanding
- Job/work environment help student for interview and job opportunity

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Semester	:	VIII B.Tech
Branch	:	Aeronautical
Subject	:	Project-III
Total Credits	:	06
Code	:	BT 851

COURSE OBJECTIVE:

- Final Year Projects offer the opportunity to apply and extend material learned throughout the engineering
- Assessment is by means of a seminar presentation, submission of a thesis, and a public demonstration of work undertaken.
- In contrast to the majority of courses studied elsewhere in the program, projects are undertaken individually or in small groups.
- The projects undertaken span a diverse range of topics, including theoretical, simulation and experimental studies, and vary from year to year.
- The emphasis is necessarily on facilitating student learning in technical, project management and presentation spheres.

SUMMARY/PROCEDURE OF PROJECT-III

1. The objective of the project-III work is to enable the students to work in a group of likeminded colleagues on a project involving theoretical and experimental studies related to the branch of study.
2. Students will also be permitted to undertake industrial/consultancy project Work, outside the department, in industries/Research labs.
3. Students are permitted to form group of likeminded colleagues (not more than 3 members) for working on a particular project/topic.
4. Students can opt for the co-guide from industries/ other colleges to get the necessary supervision.
5. There shall be four assessments during the semester by a review committee.
6. The student shall make four presentations on the progress made before the committee at various stages of the Project work.
7. The Head of the Department shall constitute the review committee for each branch of study.
8. The total marks obtained in the four reviews, shall be taken in to account.
9. There will be a viva-voce examination at the end of the Project-III work, conducted by one internal examiner and one external examiner.
10. The total marks secured will be the sum of marks secured in the Project reviews and Viva Voce Examination.
11. Every project work shall have a guide who is the member of the faculty of the institution.
12. Eighteen periods per week shall be allotted in the time table and this time shall be utilized by the students to receive the directions from the guide, on library reading, laboratory work, computer analysis or field work as assigned by the guide and also to present in periodical seminars on the progress made in the project.

13. Each student/group shall finally produce a comprehensive report in the form of Thesis covering background information, literature survey, problem statement, project work details and conclusion.
14. This final report shall be typewritten form as specified in the guidelines.

COURSE OUTCOME:

- Demonstrate a sound technical knowledge of their selected project topic
- Undertake problem identification, formulation and solution
- Design engineering solutions to complex problems utilizing a systems approach
- Communicate with engineers and the community at large in written an oral forms
- Demonstrate the knowledge, skills and attitudes of a professional engineer

MATS UNIVERSITY

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Syllabus

Professional Electives

Bachelor of Technology

Aeronautical Engineering

MATS School of Engineering &I.T

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Scheme of Teaching & Examination

S.No.	Subject Code	Subject Name	Total Credits
1	BTP501	Ground Handling and Support System	3
2	BTP502	Experimental Stress Analysis	3
3	BTP503	Control System Engineering	3
4	BTP504	Microprocessor and Applications	3
5	BTP505	Total Quality Management	3
6	BTP506	Operation Research	3
7	BTP507	Computer Aided Design	3
8	BTP508	Resource Management Techniques	3
9	BTP509	Theory of Vibration	3
10	BTP510	Missile Aerodynamics	3
11	BTP511	Space Mechanics	3
12	BTP512	Satellite Technology	3
13	BTP513	Wind Tunnel Techniques	3
14	BTP514	Unmanned Aircraft Systems	3
15	BTP515	Experimental Aerodynamics	3
16	BTP516	Aircraft General Engg. & Maintenance Practices	3
17	BTP517	Aero Engine Maintenance and Repair	3
18	BTP518	Air Traffic Control and Aerodrome Design	3
19	BTP519	Aviation Management	3
20	BTP520	Computational Fluid Dynamics	3
21	BTP521	Air Transportation and Aircraft Maintenance	3
22	BTP522	Industrial Aerodynamics	3
23	BTP523	Airframe Maintenance and Repair	3
24	BTP524	Fatigue And Fracture Mechanics	3
25	BTP525	Helicopter Aerodynamics	3
26	BTP526	Theory of Plates and Shells	3
27	BTP527	High Temperature Materials	3
28	BTP528	Gas Dynamics	3
29	BTP529	Theory of Elasticity	3
30	BTP530	Wind Engineering	3

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Course	:	B.Tech
Branch	:	Aeronautical
Subject	:	Ground Handling and Support System
Total Theory Periods	:	48
Total Tutorial Periods	:	00
Total Credits	:	03
Code	:	BTP501

UNIT-I
General knowledge of ground handling of Aircraft, Aircraft Safety; Mooring, Jacking, Leveling, Hoisting of aircraft, Towing, Mooring of an a/c during adverse conditions. Aircraft cleaning and maintaining. Ground signaling/marshalling of aircraft in day & night time.

UNIT-II
Brief knowledge of airport and its procedures. Control tower, Dispersal areas, Aprons, Tarmac, Taxi track, Runway and its ends. Approach and clear zone layout. Brief knowledge of the signals given by the control tower. Knowledge of Airfield lighting system, Aircraft Rescue & Fire Fighting.

UNIT-III
Maintenance and handling of ground equipment's used in maintenance of aircraft. Compressors, Portable hydraulic test stands, Electrical power supply equipment, charging trolley. Air-conditioning and Heating unit, Ground support air start unit. Pressure oil unit, Fire extinguishers, jacks, Hoisting cranes/gantry, Ladders, Platforms, Trestles, and Chocks.

UNIT-IV
Maintenance of landing gear (L/G), Shock strut charging and bleeding, Maintenance of L/G brakes i.e., Dragging, Grabbing, Fading, Brakes and excessive brake pedal travel. Maintenance on wheels, tyres and tubes i.e., dismantling,

UNIT-V
Knowledge of safety and fire precautions to be observed during maintenance including refueling, defueling & engine start. Maintenance of hydraulic accumulators, reservoirs and filters: Rigging of flight control surfaces and duplicate inspection; Rigging checks-Angular alignment checks and symmetry checks, Knowledge and use of Tensiometers, Protractors etc.

TEXT BOOKS:

1. Michacl J Kroes and William A Watkins, Aircraft Maintenance and Repair, McGraw Hill
2. Airframe & Powerplant Mechanics, Airframe Handbook AC 65-15A By US Dept. of Transportation, FAA

REFERENCES:

1. Civil Aircraft Inspection Procedure, Part - II- Aircraft
    a. AL/3-6 - Landing Gear
    b. AL/3-7- Control Systems
    c. AL/3-8 to AL/3-10 - Fire
    d. AL/3-18 to AL/3-20 - Tyres, Wheels & Brakes
    e. Al/3-21 - Hydraulic systems
    f. GOL/1-1 & GOL/1-2 - Ground Operations
2. Airframe & Powerplant Mechanics, General Handbook AC65-9A By US Department of Transportation, FAA
3. Civil Aviation Requirement - Section - 2- Airworthiness Series H for Safety & Fire Precautions in Fuelling & Defueling issued by DGCA

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SCHOOL OF ENGINEERING & I.T.

Course	:	B.Tech
Branch	:	Aeronautical
Subject	:	Experimental Stress Analysis
Total Theory Periods	:	48
Total Tutorial Periods	:	00
Total Credits	:	03
Code	:	BTP502

UNIT-I EXTENSOMETERS
Principles of measurements, Accuracy, Sensitivity and range of measurements, Mechanical, Optical, Acoustical and Electrical extensometers and their uses, Advantages and disadvantages**.**

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

UNIT-III PHOTOELASTICITY
Two dimensional photo elasticity, Photo elastic materials, Concept of light - photo elastic effects, stress optic law, Transmission and Reflection polariscopes, Interpretation of fringe pattern, Compensation and separation techniques, Introduction to three dimensional photo elasticity.

UNIT-IV BRITTLE COATING AND MOIRE METHODS
Introduction to Moiré techniques, Brittle coating methods and Holography

UNIT-V NON – DESTRUCTIVE TESTING
Fundamentals of NDT, Radiography, Ultrasonics, Eddy Current testing, Fluorescent Penetrant Testing, Acoustic Emission Technique,

TEXT BOOKS

1. Dally, J.W., and Riley, W.F., Experimental Stress Analysis, McGraw Hill Inc., NewYork 1998.
2. Srinath, L.S., Raghava, M.R., Lingaiah, K., Garagesha, G., Pant B., and Ramachandra, K., Experimental Stress Analysis, Tata McGraw Hill, New Delhi, 1984.

REFERENCES

1. Hetenyi, M., Hand book of Experimental Stress Analysis, John Wiley and Sons Inc., New York, 1972.
2. Pollock A.A., Acoustic Emission in Acoustics and Vibration Progress, Ed. Stephens R.W.B., Chapman and Hall, 1993.
3. Max Mark Frocht, Photo Elasticity, John Wiley and Sons Inc., New York, 1968
4. A.J.Durelli, Applied Stress Analysis, Prentice Hall of India Pvt Ltd., New Delhi, 1970.

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Course	:	B.Tech
Branch	:	Aeronautical
Subject	:	Control System Engineering
Total Theory Periods	:	48
Total Tutorial Periods	:	00
Total Credits	:	03
Code	:	BTP503

UNIT-I INTRODUCTION
Historical review, Simple pneumatic, hydraulic and thermal systems, Series and parallel system, Analogies, mechanical and electrical components, Development off light control systems.

UNIT-II OPEN AND CLOSED LOOP SYSTEMS
Feedback control systems Block diagram representation of control systems, Reduction of block diagrams, Output to input ratios.

UNIT-III CHARACTERISTIC EQUATION AND FUNCTIONS
Laplace transformation, Response of systems to different inputs viz., Step impulse, pulse, parabolic and sinusoidal inputs, Time response of first and second order systems, steady state errors and error constants of unity feedback circuit.

UNIT-IV CONCEPT OF STABILITY
Necessary and sufficient conditions, Routh-Hurwitz criteria of stability, Root locusand Bode techniques, Concept and construction, frequency response.

UNIT-V SAMPLED DATA SYSTEMS
Z-Transforms, Introduction to digital control system, Digital Controllers and Digital PID controllers

TEXT BOOKS:
1. OGATO, Modern Control Engineering, Prentice-Hall of India Pvt. Ltd., New Delhi, 1998.
2. Azzo, J.J.D. and C.H. Houpis, Feedback control system analysis and synthesis, McGraw-Hill international 3rs Edition, 1998.

REFERENCES:
1. Kuo, B.C. Automatic control systems, Prentice-Hall of India Pvt.Lted., New Delhi,1998.
2. Houpis, C.H. and Lamont, G.B. Digital control Systesm, McGraw Hill Book co.,New York, U.S.A. 1995.
3. Naresh K Sinha, Control Systems, New Age International Publishers, New Delhi, 98.

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SCHOOL OF ENGINEERING & I.T.

Course	:	B.Tech
Branch	:	Aeronautical
Subject	:	Microprocessor and Applications
Total Theory Periods	:	48
Total Tutorial Periods	:	00
Total Credits	:	03
Code	:	BTP504

UNIT-I ELECTRONIC COMPONENTS AND DEVICES
Resistors, Capacitors, Inductors and Transformers - properties, types.Simple PN Junction Diodes, Zener diode, Bipolar Junction transistor and Field EffectTransistors – operating principles and characteristics. Other Devices – UJT, SCR, LED, Photo detectors.

UNIT-II ANALOG CIRCUITS
Rectifier and Power Supply Circuits, clipper, clamper using diodes, Operational Amplifiers (Ideal) – properties and typical circuits like differentiator, integrator, summer, comparator, single-stage BJT's and FET's amplifiers – Multistage Amplifier Principles(Qualitative Treatment only).

UNIT-III DIGITAL CIRCUITS
Basics of Boolean Logic – Logic Gates, Flip-Flops, Shift-Registers, Counters, Decoders/Drivers, Timer, Display Devices, A/D and D/A Converter.

UNIT-IV MEASUREMENTS AND INSTRUMENTS
Definitions of Accuracy, Precision, Sensitivity, Resolution, Linearity, Range, Measurement of Electrical Quantities – Voltmeter, Ammeter, Watt-Meter, DMM,CRO, DSO, Transducers and signal conditioning systems for pressure, temperature, acceleration measurements (Qualitative Treatment only).

UNIT V MICROPROCESSORS AND APPLICATIONS 8
Architecture of 8085 processors, Address Modes, Instruction set, simple programming like addition, subtraction, multiplication, logical operation, Peripherals and Interfacing – 8255, 8251. Applications like motor control, keyboard and PC interface, Introduction to Microcontrollers.

TEXT BOOK

1. Millman, J. and Halkias, C., "Integrated Electronics", Tata McGraw Hill, 2004.
2. Paul Horowitz and Wilfred Hill "The Art of Electronics", Cambridge University press, 1989.

REFERENCES

1. Donald P Leach, Albert Paul Malvino and GoutamSaha," Digital Principles & Applications", 6E, Tata McGraw Hill, 2006.
2. A. K. Sawhney, A course in Electrical and Electronic Measurement and Instrumentation", Dhanpat Rai and Sons, New Delhi, 1999
3. Helfrick, A. D., & Cooper, W. D., "Electronic Instrumentation and Measurement techniques ", Prentice Hall of India, 1998.

4. Gaonkar. Ramesh S, “Microprocessor Architecture Programming & Applications with 8085 ”, 5th Ed. Penram International Publishing (India), 2003.
5. Kenneth J.Ayala., “The 8051 Microcontroller Architecture Programming and Applications”, 2ed, Penram International Publishing (India), 2004.

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Course	:	B.Tech
Branch	:	Aeronautical
Subject	:	Total Quality Management
Total Theory Periods	:	48
Total Tutorial Periods	:	00
Total Credits	:	03
Code	:	BTP 505

UNIT - I INTRODUCTION

Introduction - Need for quality - Evolution of quality - Definitions of quality - Dimensions of product and service quality - Basic concepts of TQM - TQM Framework - Contributions of Deming, Juran and Crosby - Barriers to TQM - Quality statements - Customer focus - Customer orientation, Customer satisfaction, Customer complaints, Customer retention - Costs of quality.

UNIT- II TQM PRINCIPLES

Leadership - Strategic quality planning, Quality Councils - Employee involvement - Motivation, Empowerment, Team and Teamwork, Quality circles Recognition and Reward, Performance appraisal- Continuous process improvement - PDCA cycle, 5S, Kaizen - Supplier partnership - Partnering, Supplier selection, Supplier Rating.

UNIT- III TQM TOOLS AND TECHNIQUE I

The seven traditional tools of quality - New management tools - Six sigma: Concepts, Methodology, applications to manufacturing, service sector including IT - Bench marking - Reason to bench mark, Bench marking process -FMEA - Stages, Types.

UNIT - IV TQM TOOLS AND TECHNIQUES II

Control Charts - Process Capability - Concepts of Six Sigma - Quality Function Development (QFD) - Taguchi quality loss function - TPM - Concepts, improvement needs - Performance measures.

UNIT - V QUALITY SYSTEMS

Need for ISO 9000 - ISO 9001-2008 Quality System - Elements, Documentation, Quality Auditing -QS 9000 - ISO 14000 - Concepts, Requirements and Benefits - TQM Implementation in manufacturing and service sectors.

TEXTBOOK

1. Dale H. Besterfiled, et at., "Total quality Management", Pearson Education Asia, Third Edition, Indian Reprint (2006).

REFERENCES

1. James R. Evans and William M. Lindsay, "The Management and Control of Quality", 8th Edition,
2. First Indian Edition, Cengage Learning, 2012.
3.Suganthi L and Anand Samuel, "Total Quality Management", Prentice Hall (India) Pvt. Ltd., 2006.

MATS UNIVERSITY

ARANG, RAIPUR (C.G.)

MATS UNIVERSITY, RAIPUR (C.G.)
SCHOOL OF ENGINEERING & I.T.

Course	:	B.Tech
Branch	:	Aeronautical
Subject	:	Operation Research
Total Theory Periods	:	48
Total Tutorial Periods	:	00
Total Credits	:	03
Code	:	BTP 506

UNIT-I INTRODUCTION

Introduction to OR: Definition, role of operations research in decision-making, applications in industry, Concept on O.R., model building –Types & methods.

Linear Programming: Programming definition, formulation, solution- graphical, simplex methods, BIG-M methods computational, problems, degeneracy.

UNIT-II TRANSPORTATION AND ASSIGNMENT

Transportation: Introduction, Formulation, optimal solution, unbalanced transportation problem, MODI Method, Stepping Stone method, initial basic feasible solution, degeneracy.

Assignment: Introduction, Mathematical Formulation of the Problem, Hungarian Method Algorithm, Variants of Assignment Problem, Travelling Salesman Problem.

UNIT-III WAITING LINE THEORY AND SIMULATION

Waiting Line Theory: Basic queuing process, Terminology, Single Channel, basic structure of queuing models, some commonly known queuing situations Kendall's service time, solution to M/M/1: FCFS models.

Simulation: Basic concept of simulation, applications of simulation, merits and demerits of simulation, Monte Carlo simulation, simulation of Inventory system, simulation of Queuing system.

UNIT-IV NETWORK ANALYSIS

Network Analysis: CPM/PERT, Network Representation, Techniques for drawing network. Resource smoothing and leveling, project cost, Optimum project duration, project crashing, updating, Time estimation in PERT.

UNIT-V GAME THEORY

Introduction, two person zero sum game, methods for solving two person zero sum game: when saddle point exists, when no saddle point exists, solution of 2xn and mx2 game

TEXT BOOKS:

1. Hira& Gupta, Operation Research – S. Chand Publication.
2. Quantitative Techniques- Vohra, TMH, New Delhi.
3.

REFERENCE BOOKS:

1. Gupta & Sharma, Operation Research-, National Publishers, New Delhi
2. H.M.Wagher, Principles of operation Research, Prentice Hall of India, New Delhi.

MATS UNIVERSITY

ARANG, RAIPUR (C.G.)

MATS UNIVERSITY, RAIPUR (C.G.)
SCHOOL OF ENGINEERING & I.T.

Course	:	B.Tech
Branch	:	Aeronautical
Subject	:	Computer Aided Design
Total Theory Periods	:	48
Total Tutorial Periods	:	00
Total Credits	:	03
Code	:	BTP 507

UNIT - I INTRODUCTION TO COMPUTER GRAPHICS FUNDAMENTALS
Output primitives (points, lines, curves etc.,), 2-D & 3-D transformation (Translation, scaling, rotation) windowing - view ports - clipping transformation.

UNIT - II CURVES AND SURFACES MODELLING
Introduction to curves - Analytical curves: line, circle and conics – synthetic curves: Hermite cubic spline- Bezier curve and B-Spline curve – curve manipulations.
Introduction to surfaces - Analytical surfaces: Plane surface, ruled surface, surface of revolution and tabulated cylinder – synthetic surfaces: Hermitebicubic surface- Bezier surface and B-Spline surface-surface manipulations.

UNIT - III NURBS AND SOLID MODELLING
NURBS- Basics- curves, lines, arcs, circle and bi linear surface. Regularized Boolean set operations - primitive instancing - sweep representations - boundary representations – constructive solid Geometry - comparison of representations - user interface for solid modeling.

UNIT - IV VISUAL REALISM
Hidden – Line – Surface – solid removal algorithms shading – coloring. Introduction to parametric and variational geometry based software's and their principles creation of prismatic and lofted parts using these packages.

UNIT - V ASSEMBLY OF PARTS AND PRODUCT DATA EXCHANGE
Assembly modeling - interferences of positions and orientation - tolerances analysis – mass property calculations - mechanism simulation.Graphics and computing standards– Open GL Data Exchange standards – IGES, STEP etc–Communication standards.

REFERENCES:

1. David F. Rogers, James Alan Adams "Mathematical elements for computer graphics" second edition, Tata McGraw-Hill edition.2003
2. Donald Hearn and M. Pauline Baker "Computer Graphics", Prentice Hall, Inc., 1992.
3. Foley, Wan Dam, Feiner and Hughes – Computer graphics principles & practices, Pearson Education – 2003.
4. Ibrahim Zeid Mastering CAD/CAM – McGraw Hill, International Edition, 2007.
5. William M Neumann and Robert F.Sproull "Principles of Computer Graphics", McGraw Hill Book Co. Singapore, 1989.

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ARANG, RAIPUR (C.G.)

MATS UNIVERSITY, RAIPUR (C.G.)
SCHOOL OF ENGINEERING & I.T.

Course	:	B.Tech
Branch	:	Aeronautical
Subject	:	Resource Management Techniques
Total Theory Periods	:	48
Total Tutorial Periods	:	00
Total Credits	:	03
Code	:	BTP 508

UNIT-I LINEAR PROGRAMMING
Principal components of decision problem –Modeling phases –LP Formulation and graphic solution – Resource allocation problems –Simplex method –Sensitivity analysis.

UNIT-II DUALITY AND NETWORKS
Definition of dual problem –Primal –Dual relationships –Dual simplex methods –Post optimality analysis –Transportation and assignment model –Shortest route problem.

UNIT-III INTEGER PROGRAMMING
Cutting plan algorithm – Branch and bound methods, Multistage (Dynamic) programming.

UNIT-IV CLASSICAL OPTIMISATION THEORY
Unconstrained external problems, Newton –Ralphson method –Equality constraints–Jacobean methods – Lagrangian method –Kuhn –Tucker conditions –Simple problems.

UNIT-V OBJECT SCHEDULING:
Network diagram representation –Critical path method –Time charts and resource leveling –PERT.

TEXT BOOKS:

1. H.A. Taha, "Operation Research", Prentice Hall of India, 2002.
2. Vohra, 'Quantitative Techniques in Management', Tata McGraw Hill, 2002.

REFERENCES:

1. PaneerSelvam, 'Operations Research', Prentice Hall of India, 2002.
2. Anderson 'Quantitative Methods for Business', 8th Edition, Thomson Learning, 2002.
3. Winston 'Operation Research', Thomson Learning, 2003.AnandSarma, 'Operation Research', Himalaya Publishing House, 2003.

MATS UNIVERSITY

ARANG, RAIPUR (C.G.)

MATS UNIVERSITY, RAIPUR (C.G.)
SCHOOL OF ENGINEERING & I.T.

Course	:	B.Tech
Branch	:	Aeronautical
Subject	:	Theory of Vibration
Total Theory Periods	:	48
Total Tutorial Periods	:	00
Total Credits	:	03
Code	:	BTP 509

UNIT-I SINGLE DEGREE OF FREEDOM SYSTEMS
Introduction to simple harmonic motion, D'Alembert's Principle, Free vibrations–Damped vibrations – Forced Vibrations, with and without damping – support excitation– Vibration measuring instruments.

UNIT-II MULTI DEGREES OF FREEDOM SYSTEMS
Two degrees of freedom systems - Static and Dynamic couplings – vibration absorber- Principal co-ordinates - Principal modes and orthogonal condition – Eigenvalue problems - Hamilton's principle - Lagrangean equations and application.

UNIT-III CONTINUOUS SYSTEMS
Vibration of elastic bodies - Vibration of strings - Longitudinal - Lateral and Torsional vibrations

UNIT-IV APPROXIMATE METHODS
Approximate methods -Rayleigh's method -Dunkerlay's method – Rayleigh-Ritz method, Matrix Iteration method.

UNIT-V ELEMENTS OF AEROELASTICITY
Vibration due to coupling of bending and torsion-Aero elastic problems – Collars triangle - Wing Divergence - Aileron Control reversal – Flutter – Buffeting.

TEXT BOOKS:

1. Thomson W T, 'Theory of Vibration with Application' - CBS Publishers, 1990.
2. G.K. Grover, "Mechanical Vibrations", 7th Edition, Nem Chand Brothers, Roorkee, India, 2003.

REFERENCES:

1. Timoshenko S., Vibration Problems in Engineering – John Wiley and Sons, NewYork, 1993.
2. Bisplinghoff R.L., Ashely H and Hogman R.L., Aero elasticity – Addision Wesley Publication, New York, 1983.
3. William W Seto, 'Mechanical Vibrations' – McGraw Hill, Schaum Series.
4. TSE. F.S., Morse, I.F., Hunkle, R.T., Mechanical Vibrations – Prentice Hall, New York, 1984.
5. Leonard Meirovitch, 'Elements of Vibration Analysis' – McGraw Hill International Edition Clarence W DeSilva, `Vibration – Fundamentals and Practice', CRCPress, Special Indian Edition, 2005.

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MATS UNIVERSITY, RAIPUR (C.G.)
SCHOOL OF ENGINEERING & I.T.

Course	:	B.Tech
Branch	:	Aeronautical
Subject	:	Missile Aerodynamics
Total Theory Periods	:	48
Total Tutorial Periods	:	00
Total Credits	:	03
Code	:	BTP 510

UNIT-I FUNDAMENTALS OF HYPERSONIC AERODYNAMICS
Introduction to hypersonic aerodynamics – differences between hypersonic aerodynamics and supersonic aerodynamics - concept of thin shock layers and entropy layers – hypersonic flight paths – hypersonic similarity parameters – shock wave and expansion wave relations of inviscid hypersonic flows.

UNIT-II SIMPLE SOLUTION METHODS FOR HYPERSONIC INVISCID FLOWS
Local surface inclination methods – Newtonian theory – modified Newtonian law –tangent wedge and tangent cone and shock expansion methods – approximate methods - hypersonic small disturbance theory – thin shock layer theory.

UNIT-III VISCOUS HYPERSONIC FLOW THEORY
Boundary layer equations for hypersonic flow – hypersonic boundary layers – self similar and non self similar boundary layers – solution methods for non self similar boundary layers – aerodynamic heating.

UNIT IV VISCOUS INTERACTIONS IN HYPERSONIC FLOWS
Introduction to the concept of viscous interaction in hypersonic flows - Strong and weak viscous interactions - hypersonic viscous interaction similarity parameter –introduction to shock wave boundary layer interactions.

UNIT-V INTRODUCTION TO HIGH TEMPERATURE EFFECTS
Nature of high temperature flows – chemical effects in air – real and perfect gases –Gibb's free energy and entropy - chemically reacting mixtures – recombination and dissociation.

TEXT BOOKS:

1. John D. Anderson. Jr., "Hypersonic and High Temperature Gas Dynamics", Mc.Graw hill Series, New York, 1996.

REFERENCES:

1. John D. Anderson. Jr., "Modern Compressible flow with historical Perspective", Mc. Graw Hill Publishing Company, New York, 1996.
2. John T. Bertin, "Hypersonic Aerothermodynamics", Published by AIAA Inc., Washington. D. C., 1994.

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MATS UNIVERSITY, RAIPUR (C.G.)
SCHOOL OF ENGINEERING & I.T.

Course	:	B.Tech
Branch	:	Aeronautical
Subject	:	Space Mechanics
Total Theory Periods	:	48
Total Tutorial Periods	:	00
Total Credits	:	03
Code	:	BTP511

UNIT-I BASIC CONCEPTS AND THE GENERAL N- BODYPROBLEM

The solar system – reference frames and coordinate systems – terminology related to the celestial sphere and its associated concepts – Kepler's laws of planetary motion and proof of the laws – Newton's universal law of gravitation - the many body problem – L
agrange-Jacobi identity – the circular restricted three body problem –liberation points – the general N-body problem – two body problem – relations between position and time.

UNIT-II SATELLITE INJECTION AND SATELLITE PERTURBATIONS

General aspects of satellite injection – satellite orbit transfer – various cases – orbit deviations due to injection errors – special and general perturbations – Cowell's method and Encke's method – method of variations of orbital elements – general perturbations approach.

UNIT-III INTERPLANETARY TRAJECTORIES

Two-dimensional interplanetary trajectories – fast interplanetary trajectories – three dimensional interplanetary trajectories – launch of interplanetary spacecraft –trajectory estimation about the target planet – concept of sphere of influence –Lambert's theorem

UNIT-IV BALLISTIC MISSILE TRAJECTORIES

Introduction to ballistic missile trajectories –boost phase–the ballistic phase –trajectory geometry – optimal flights–time of flight–re-entry phase–the position of impact point–influence coefficients.

UNIT-V MATERIALS FOR SPACECRAFT

Space environment – peculiarities of space environment – effect of space environment on materials of spacecraft structure – materials required for the construction of space craft – TPS for re-entry space vehicles.

TEXT BOOKS:

1. Cornelisse, J.W., "Rocket Propulsion and Space Dynamics", J.W. Freeman & Co, Ltd, London, 1982
2. Parker, E.R., "Materials for Missiles and Spacecraft", McGraw Hill Book Co. Inc., 1982.

REFERENCES:

1. Sutton, G.P., "Rocket Propulsion Elements", John Wiley & Sons Inc., New York, 5th Edition, 1993.

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SCHOOL OF ENGINEERING & I.T.

Course	:	B.Tech
Branch	:	Aeronautical
Subject	:	Satellite Technology
Total Theory Periods	:	48
Total Tutorial Periods	:	00
Total Credits	:	03
Code	:	BTP512

UNIT-I INTRODUCTION TO SATELLITE SYSTEMS
Common satellite applications and missions – Typical spacecraft orbits – Definitions of spin the three axis stabilization-Space environment – Launch vehicles – Satellite system and their functions (structure, thermal, mechanisms, power, propulsion, guidance and control, bus electronics).

UNIT-II ORBITAL MECHANICS
Fundamental of flight dynamics – Time and coordinate systems – Orbit determination and prediction – Orbital maneuvers – GPS systems and application for satellite/orbit determination – Ground station network requirements.

UNIT-III SATELLITE STRUCTURES & THERMAL CONTROL
Satellite mechanical and structural configuration: Satellite configuration choices, launch loads, separation induced loads, deployment requirements – Design and analysis of satellite structures – Structural materials and fabrication – The need of thermal control: externally induced thermal environment – Internally induced thermal environment - Heat transfer mechanism: internal to the spacecraft and external heat load variations – Thermal control systems: active and passive methods.

UNIT-IV SPACECRAFT CONTROL
Control requirements: attitude control and station keeping functions, type of control maneuvers – Stabilization schemes: spin stabilization, gravity gradient methods, 3 axis stabilization – Commonly used control systems: mass expulsion systems, momentum exchange systems, gyro and magnetic torquer - Sensors star and sun sensors, earth sensor, magnetometers and inertial sensors.

UNIT-V POWER SYSTEM AND BUS ELECTRONICS
Solar panels: Silicon and Ga-As cells, power generation capacity, efficiency – Space battery systems – battery types, characteristics and efficiency parameters – Power electronics. Telemetry and tele command systems: Tm & TC functions, generally employed communication bands (UHF/VHF, S, L, Ku, Kaetc), their characteristics and applications- Coding Systems – Onboard computer- Ground checkout Systems.

TEXT BOOKS:

1. Analysis and Design of Flight Vehicle Structures, Tri-State off set company, USA, 1980.
2. Space Systems Engineering Rilay, FF, McGraw Hill, 1982.
3. Principles of Astronautics Vertregt.M.,Elsvier Publishing Company, 1985.
4. Introduction Space Flight, Francis J. Hale Prentice Hall, 1994.
5. Space Vehicle Design, Michael D. Griffin and James R. French, AIAA Education Series, 1991.

REFERENCES:

1. Spacecraft Thermal Control, Hand Book, Aerospace Press, 2002.
2. Structural Design of Missiles & Space Craft Lewis H. Abraham, McGrawHill, 1992.
3. Space Communications Systems, Richard.F, FilipowskyEugen I Muehllorf, Prenctice Hall, 1995.
4. Hughes, P.C. Space Craft Altitude Dynamics, Wiley, 1986.
5. Gebmart, Heat Transfer, McGraw Hill, Martin J. Communication Satellite Systems, McGraw Hill, 1978.

MATS UNIVERSITY
ARANG, RAIPUR (C.G.)

MATS UNIVERSITY, RAIPUR (C.G.)
SCHOOL OF ENGINEERING & I.T.

Course	:	B.Tech
Branch	:	Aeronautical
Subject	:	Wind Tunnel Techniques
Total Theory Periods	:	48
Total Tutorial Periods	:	00
Total Credits	:	03
Code	:	BTP513

UNIT-I PRINCIPLES OF MODEL TESTING
Buckingham Theorem – Non dimensional numbers – Scale effect – Geometric Kinematic and Dynamic similarities.

UNIT-II WIND TUNNELS
Classification – special problems of testing in subsonic, transonic, supersonic and hypersonic speed regions – Layouts – sizing and design parameters.

UNIT-III CALIBRATION OF WIND TUNNELS
Test section speed – Horizontal buoyancy – Flow angularities – Turbulence measurements – Associated instrumentation – Calibration of supersonic tunnels.

UNIT-IV WIND TUNNEL MEASUREMENTS
Steady and Unsteady Pressure and velocity measurements – Force measurements –Three component and six component balances – Internal balances – Principles of Hotwire Anemometer.

UNIT-V FLOW VISUALIZAITON
Smoke and Tuft grid techniques – Dye injection special techniques – Optical methods of flow visualization.

TEXT BOOKS:

1. Rae, W.H. and Pope, A., Low Speed Wind Tunnel Testing, John Wiley Publication, 1984.
2. R. C. Pankhurst, Douglas William Holder, Wind-tunnel technique: an account of experimental methods in low- and high-speed wind tunnels, Pitman, 1952.

REFERENCES:

1. Pope, A., and Goin, L., High Speed Wind Tunnel Testing, John Wiley, 1985.
2. Wind Tunnels and Wind Tunnel Test Techniques, The Royal Aeronautical Society, London, 1992.

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MATS UNIVERSITY, RAIPUR (C.G.)
SCHOOL OF ENGINEERING & I.T.

Course	:	B.Tech
Branch	:	Aeronautical
Subject	:	Unmanned Aircraft Systems
Total Theory Periods	:	48
Total Tutorial Periods	:	00
Total Credits	:	03
Code	:	BTP514

UNIT-I INTRODUCTION TO UAS

History of unmanned aerial vehicles- types- Introduction to Unmanned aircraft systems-Unmanned aerial vehicles–Micro aerial vehicles definitions, history, classification- applications-recent research and development in civil and defense applications – autonomous vehicles -future research in autonomous vehicles – design standards and regulatory aspects introduction to design and selection of systems.

UNIT-II ASPECTS OF UAS SYSTEMS

Involvement of different aspects in the development of UAV-aerodynamic configurations -Aspects of airframe design- Stealth design, payload types, communication, navigations & guidance systems, control & stability, launch, recovery and support systems, reliability design.

UNIT III MODELING AND CONTROL HELICOPTER MODEL

Modeling and control of small and miniature unmanned helicopters –single rotor helicopter design – coaxial rotor helicopter design - autonomous control of a mini quadrotor vehicle using LQG controllers – linearization and identification of helicopter model.

UNIT-IV UAV DESIGN MODELING & CONTROL

Development of autonomous quad tilt wing – advanced flight control systems for rotorcraft UAV and MAV –mathematical modeling and non linear control of VTOL aerial vehicles.

UNIT-V DEPLOYMENT OF UAS/UAV SYSTEMS

Only application point of view of various UAS roles played in civil, defense applications -vision based navigation company trails- certification of UAS/UAV/MAV systems.

TEXT BOOKS:

1. Reg Austin, Unmanned Aircraft Systems: UAVS Design, Development and Deployment John Wiley, UK, 2010.
2. Elizabeth Bone, Christopher Bolkcom, Unmanned aerial vehicles, Novinka Books, United Kingdom, 2004.
3. KimonValavanis, Advances in unmanned aerial vehicles, Springer, Netherlands, 2007.

REFERENCES:

1. K. Nonami, F. Kendoul, S. Suzuki, W. Wang, Daisuke Nakazawa, Modeling and Control of Unmanned Small Scale Rotorcraft UAVS & MAVS, Springer, New York, 2010.
2. Laurence R. Newcome, Unmanned aviation: a brief history of unmanned aerial vehicles, American Institute of Aeronautics and Astronautics, New York, 2004.
4. Rogelio Lozano, Unmanned Aerial Vehicles Embedded Control, John Wiley & Sons, 2010.
5. Pedro Castillo, Rogelio Lozano, Alejandro E. Dzul, Modelling and control of mini-flying machines, Advances in industrial control (AIC), Springer-Verlag, London, 2005.
6. Bernard Mettler, Identification modeling and characteristics of miniature rotorcraft, Kluwer Publishers, USA, 2003.

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ARANG, RAIPUR (C.G.)

MATS UNIVERSITY, RAIPUR (C.G.)
SCHOOL OF ENGINEERING & I.T.

Course	:	B.Tech
Branch	:	Aeronautical
Subject	:	Experimental Aerodynamics
Total Theory Periods	:	48
Total Tutorial Periods	:	00
Total Credits	:	03
Code	:	BTP515

UNIT-I WIND TUNNEL TESTING

Low speed wind tunnels-estimation of energy ratio and power required supersonic wind tunnels-calculation of running time and storage tank requirements.

UNIT-II EXPERIMENTS IN SUBSONIC WIND TUNNELS

Estimation of flow angularity and turbulence factor-calculation of CL and CD on airfoils from pressure distribution- CD from wake survey-Test section average velocity using traversing rakes-span wise load distribution for different taper ratios of wing.

UNIT-III EXPERIMENTS IN HIGH SPEED TUNNELS

Mach number estimation in test section by pressure measurement & using a wedge – preliminary estimates of blowing and running pressures, nozzle area ratios, mass flow for a given test section size and Mach number-starting problem and starting loads.

UNIT-IV MEASUREMENT TECHNIQUES

Hot wire anemometer and laser Doppler anemometer for turbulence and velocity measurements-Use of thermocouples and pyrometers for measurement of static and total temperatures-Use of pressure transducers, Rotameters and ultrasonic flow meters.

UNIT-V SPECIAL PROBLEMS

Pitot-static tube correction for subsonic and supersonic Mach numbers-boundary layer velocity profile on a flat plate by momentum-integral method -Calculation of CD from wall shear stress-Heating requirements in hypersonic wind tunnels-Re-entry problems.

TEXT BOOKS:

1. H. C. Pavian, Experimental Aerodynamics, Pitman Publising, 1st Edition, 1940.
2. Stefano Discetti, Andrea Ianiro, Experimental Aerodynamics, CRC Press, 2017

REFERENCES:

1. Rae W.H., and Pope, A, “Low speed wind tunnel testing” John Wiley Publication, 1984.
2. Pope A and Goin L “High speed wind tunnel testing” John Wiley, 1985.
3. Rathakrishnan. E “Instrumentation, Measurement and Experiments in Fluids”, CRC Press, London, 2007.

MATS UNIVERSITY

ARANG, RAIPUR (C.G.)

MATS UNIVERSITY, RAIPUR (C.G.)
SCHOOL OF ENGINEERING & I.T.

Course	:	B.Tech
Branch	:	Aeronautical
Subject	:	Aircraft General Engineering & Maintenance Practices
Total Theory Periods	:	48
Total Tutorial Periods	:	00
Total Credits	:	03
Code	:	BTP516

UNIT-I AIRCRAFT MAINTENANCE PRACTICES

General knowledge of procedure of jacking, leveling and mooring of aircraft.Knowledge of maintenance and handling of ground equipment such as engine starting trolley, hydraulic trolley, air condition trolley used in the maintenance of aircraft.Knowledge of safety and fire precautions to be observed during maintenance, refueling and defueling of aircraft.Knowledge of aircraft fire extinguishers Maintenance safety.

UNIT-II WORKSHOP PRACTICES

Uses of Hand tools in aircraft maintenance, precision measuring instruments.Knowledge& terminology, of aircraft bolts, nuts, rivets, screws and locking devices.Knowledge of various types of gears and bearings, their use and common defects.Knowledge of various types of threads, drills, taps, reamers.

UNIT-III AIRCRAFT MATERIALS

Principal of Heat treatment of aircraft steel, Heat treatment of non ferrous metal –solution hardening ,precipitation hardening ,forms of corrosion , & factor affecting corrosion. Process and material used in corrosion control – electroplating, Parco lubrizing, alodizing, anodizing.

UNIT-IV INSPECTION

Purpose –type-inspection interval & inspection schedule. Special inspection.FAR Air worthiness directive Type certificate data sheet, service bulletin.

UNIT-V AIRCRAFT ENGINE, ELECTRICAL & INSTRUMENT

Theory & construction of aircraft engines- reciprocating & turbojet engine, Knowledge of lead & cadmium Batteries and their maintenance, Knowledge of principle of operation of aircraft fuel flow meter, oil temperature indicator, oil pressure indicator.

TEXT BOOKS:

1. Air frame & power plant Mechanics (General Hand book EA-AC 65 -9A)
2. U S Department of transportation Air frame & power plant Mechanics (Power plant Hand book EA-AC 65 -12A) U S Department of transportation.

REFERENCES:

1. James Anderson, Earl E. Tatro, “Shop Theory”.
2. Larry Reithmaier, “Standard Aircraft handbook”.
3. E H J Pallet, “Aircraft Electrical Systems”.
4. Aircraft materials & processes by Titterton

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ARANG, RAIPUR (C.G.)

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SCHOOL OF ENGINEERING & I.T.

Course	:	B.Tech
Branch	:	Aeronautical
Subject	:	Aero Engine Maintenance and Repair
Total Theory Periods	:	48
Total Tutorial Periods	:	00
Total Credits	:	03
Code	:	BTP517

UNIT-I CLASSIFICATION OF PISTON ENGINE COMPONENTS

Types of piston engines – Principles of operation – Function of components – Materials used – Details of starting the engines – Details of carburetion and injection systems for small and large engines – Ignition system components – Spark plug details – Engine operating conditions at various altitudes – Maintenance and inspection check to be carried out.

UNIT-II INSPECTIONS OF PISTON ENGINES

Inspection and maintenance and troubleshooting – Inspection of all engine components– Daily and routine checks – Overhaul procedures – Compression testing of cylinders–Special inspection schedules – Engine fuel, control and exhaust systems– Engine mount and super charger – Checks and inspection procedures.

UNIT-III INSPECTIONS OF PISTON ENGINES

Symptoms of failure – Fault diagnostics – Case studies of different engine systems –Tools and equipment requirements for various checks and alignment during overhauling–Tools for inspection – Tools for safety and for visual inspection – Methods and instruments for non destructive testing techniques – Equipment for replacement of part and their repair. Engine testing: Engine testing procedures and schedule preparation – Online maintenance.

UNIT-IV CLASSIFICATION OF JET ENGINE COMPONENTS

12 Types of jet engines – Principles of operation – Functions of components – Materials used – Details of starting and operating procedures – Gas turbine engine inspection & checks –Use of instruments for online maintenance – Special inspection procedures: Foreign Object Damage– Blade damage–etc. Maintenance procedures of gas turbine engines–Trouble shooting and rectification procedures– Component maintenance procedures–Systems maintenance procedures. Gas turbine testing procedures – test schedule preparation – Storage of Engines–Preservation and de-preservation procedures.

UNIT-V OVERHAUL PROCEDURES

Engine Overhaul procedures – Inspections and cleaning of components – Repairs schedules for overhaul – Balancing of Gas turbine components. Troubleshooting - Procedures for rectification – Condition monitoring of the engine on ground and at altitude – engine health monitoring and corrective methods.

TEXT BOOK

1. Kroes& Wild, "Aircraft Power plants", 7th Edition – McGraw Hill, New York, 1994.

REFERENCES

1. Turbomeca, "Gas Turbine Engines", The English Book Store, New Delhi, 1993.
2. United Technologies' Pratt & Whitney, "The Aircraft Gas turbine Engine and its Operation", (latest edition) The English Book Store, New Delhi.

MATS UNIVERSITY

ARANG, RAIPUR (C.G.)

MATS UNIVERSITY, RAIPUR (C.G.)
SCHOOL OF ENGINEERING & I.T.

Course	:	B.Tech
Branch	:	Aeronautical
Subject	:	Air Traffic Control and Aerodrome Design
Total Theory Periods	:	48
Total Tutorial Periods	:	00
Total Credits	:	03
Code	:	BTP518

UNIT-I BASIC CONCEPTS

Objectives of ATS - Parts of ATC service – Scope and Provision of ATCs – VFR & IFR operations – Classification of ATS air spaces – Varies kinds of separation – Altimeter setting procedures – Establishment, designation and identification of units providing ATS– Division of responsibility of control.

UNIT-II AIR TRAFFIC SERVICES

Area control service, assignment of cruising levels minimum flight altitude ATS routes and significant points – RNAV and RNP – Vertical, lateral and longitudinal separations based on time / distance –ATC clearances – Flight plans – position report.

UNIT-III FLIGHT INFORMATION ALERTING SERVICES, COORDINATION, EMERGENCY PROCEDURES AND RULES OF THE AIR

Radar service, Basic radar terminology – Identification procedures using primary /secondary radar – performance checks – use of radar in area and approach control services – assurance control and co-ordination between radar / non radar control –emergencies – Flight information and advisory service – Alerting service – Co-ordination and emergency procedures – Rules of the air.

UNIT-IV AERODROME DATA, PHYSICAL CHARACTERISTICS AND OBSTACLE RESTRICTION

Aerodrome data - Basic terminology – Aerodrome reference code – Aerodrome reference point – Aerodrome elevation – Aerodrome reference temperature – Instrument runway, physical Characteristics; length of primary / secondary runway – Width of runways –Minimum distance between parallel runways etc. – obstacles restriction.

UNIT-V VISUAL AIDS FOR NAVIGATION, VISUAL AIDS FOR DENOTING OBSTACLES EMERGENCY AND OTHER SERVICES

Visual aids for navigation Wind direction indicator – Landing direction indicator –Location and characteristics of signal area – Markings, general requirements – Various markings – Lights, general requirements – Aerodrome beacon, identification beacon –Simple approach lighting system and various lighting systems – VASI & PAPI – Visual aids for denoting obstacles; object to be marked and lighter – Emergency and other services.

TEXT BOOKS:

1. AIP (India) Vol. I & II, "The English Book Store", 17-1, Connaught Circus, New Delhi.

REFERENCES:

1. Aircraft Manual (India) Volume I, latest Edition – The English Book Store, 17-1, Connaught Circus, New Delhi.
2. PANS – RAC – ICAO DOC 4444, Latest Edition, The English Book Store, 17-1, Connaught Circus, New Delhi.

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SCHOOL OF ENGINEERING & I.T.

Course	:	B.Tech
Branch	:	Aeronautical
Subject	:	Aviation Management
Total Theory Periods	:	48
Total Tutorial Periods	:	00
Total Credits	:	03
Code	:	BTP519

UNIT-I
Introduction to Aviation Management – Aviation – Aviation Sector in India - Civil Aviation –Airport – Air Traffic Control – Flight Data Recorder – Airline – Case Study.

UNIT-II
International Civil Aviation Organization – Aeropol Aviation Services Corporation – AviationManagement Consulting Group - AOPA – International Association of Airport Executives – Federal Aviation Interactive Reporting Systems - Case Study.

UNIT-III
Aircraft Regulations and Guidance – Convention on International Civil Aviation – Inter AgencyCommittee for Aviation Policy – Active Level of Services Reviews – Aircraft Engineers International Affiliation – AVSEC Rules and Regulations – Overview of Indian Air Travel – Case Study.

UNIT-IV:
Air Safety – FAA Aviation Safety Draft Documents – Aircraft Management Interagency Committee for Aviation Policy Safety Standards – Aircraft Management Safety Standards Guidelines for Federal Flight Programmes – National Transportation Safety Board – Airline Water Supplies –JFIM.Overview of Contemporary Global Industry – Airline Industry Profitability – Present State of the Air Transport Industry – Aviation Industry – Global Aviation Industry – Indian Aviation.

UNIT-V
International Air Transport Association (IATA) – Fact Sheet – Financial Services – IATA at theAir Transport Industry - IATA Industrial Priorities – IATA Partners – IATA Corporate and Corporate Governance Structure – IATA Human Capital – IATA Committee's – Cargo, Mandate, Environment, Financial, Legal, Operations, Industry Affairs – Rules and Regulations of the Industry Committee.

TEXT BOOKS:

1. Ratandeep Singh, "Aviation Management", Kanishka Publishers, 2008.
2. Andreas Wald, Christoph Fay, Ronald Gleich, Introduction to Aviation Management, LIT VerlagMünster, 2010.

REFERENCES:

1. J. F. Rodwell, A. Coulby, T. Carney, J. Mott, Essentials of Aviation Management: A Guide for Aviation Businesses, 8th Edition, Kendall/Hunt Publishing Company, 2003.

MATS UNIVERSITY

ARANG, RAIPUR (C.G.)

MATS UNIVERSITY, RAIPUR (C.G.)
SCHOOL OF ENGINEERING & I.T.

Course	:	B.Tech
Branch	:	Aeronautical
Subject	:	Computational Fluid Dynamics
Total Theory Periods	:	48
Total Tutorial Periods	:	00
Total Credits	:	03
Code	:	BTP520

UNIT-I FUNDAMENTAL CONCEPTS

Introduction - Basic Equations of Fluid Dynamics - Incompressible In viscid flows: Source, vortex and doublet panel, methods - lifting flows over arbitrary bodies. Mathematical properties of Fluid Dynamics Equations -Elliptic, Parabolic and Hyperbolic equations - Well posed problems - Discretization of partial Differential Equations -Transformations and grids - Explicit finite difference methods of subsonic, supersonic and viscous flows.

UNIT-II PANEL METHODS

Introduction – Source panel method – Vortex panel method – Applications.

UNIT-III DISCRETIZATION

Boundary layer Equations and methods of solution -Implicit time dependent methods for inviscid and viscous compressible flows - Concept of numerical dissipation –Stability properties of explicit and implicit methods - Conservative upwind discretization for Hyperbolic systems - Further advantages of upwind differencing.

UNIT-IV FINITE ELEMENT TECHNIQUES

Finite Element Techniques in Computational Fluid Dynamics; introduction - Strong and Weak Formulations of a Boundary Value Problem-Strong formulation–Weighted Residual Formulation - Galerkin Formulation - Weak Formulation – Variational Formulation - Piecewise defined shape functions - Implementation of the FEM – The Solution Procedure.

UNIT-V FINITE VOLUME TECHNIQUES

Finite Volume Techniques - Cell Centered Formulation - ~ Lax - Vendoroff Time Stepping - Runge - Kutta Time Stepping - Multi - stage Time Stepping -Accuracy- Cell Vertex Formulation - Multistage Time Stepping - FDM -like Finite Volume Techniques - Central and Up-wind Type Discretizations - Treatment of Derivatives.

TEXT BOOK

1. Fletcher, C.A.J., “Computational Techniques for Fluid Dynamics”, Vols. I and II, Springer - Verlag, Berlin, 1988.
2. “Computational Fluid Dynamics”, T. J. Chung, Cambridge University Press, 2002.

REFERENCES

1. John F. Wendt (Editor), "Computational Fluid Dynamics - An Introduction", Springer – Verlag, Berlin, 1992.
2. Charles Hirsch, "Numerical Computation of Internal and External Flows", Vols. I and II, John Wiley & Sons, New York, 1988.
3. Klaus A Hoffmann and Steve T. Chiang. "Computational Fluid Dynamics for Engineers", Vols. I & II Engineering Education System, P.O. Box 20078, W. Wichita, K.S., 67208 - 1078 USA, 1993.
4. Anderson, John D., "Computational Fluid Dynamics", McGraw-Hill, 1995.

MATS UNIVERSITY

ARANG, RAIPUR (C.G.)

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SCHOOL OF ENGINEERING & I.T.

Course	:	B.Tech
Branch	:	Aeronautical
Subject	:	Air Transportation and Aircraft Maintenance
Total Theory Periods	:	48
Total Tutorial Periods	:	00
Total Credits	:	03
Code	:	BTP521

UNIT-I INTRODUCTION
Development of air transportation, comparison with other modes of transport – Role of IATA, ICAO – The general aviation industry airline – Factors affecting general aviation, use of aircraft, airport: airline management and organization – levels of management, functions of management, Principles of organization planning the organization –chart, staff departments & line departments

UNIT-II AIRLINE ECONOMICS
Forecasting – Fleet size, Fleet planning, the aircraft selection process, operating cost, passenger capacity, load factor etc. – Passenger fare and tariffs – Influence of geographical, economic & political factors on routes and route selection.
FLEET PLANNING: The aircraft selection process – Fleet commonality, factors affecting choice of fleet, route selection and Capitol acquisition – Valuation & Depreciation – Budgeting, Cost planning – Aircrew evaluation – Route analysis – Aircraft evaluation.

UNIT-III PRINCIPLES OF AIRLINES SCHEDULING
Equipment maintenance, Flight operations and crew scheduling, Ground operations and facility limitations, equipments and types of schedule –hub & spoke scheduling, advantages/ disadvantages & preparing flight plans – Aircraft scheduling in line with aircraft maintenance practices.

UNIT-IV AIRCRAFT RELIABILITY
Aircraft reliability – The maintenance schedule & its determinations – Condition monitoring maintenance – Extended range operations (EROPS) & ETOPS – Ageing aircraft maintenance production.

UNIT-V TECHNOLOGY IN AIRCRAFT MAINTENANCE
Airlines scheduling (with reference to engineering) – Product support and spares –Maintenance sharing – Equipments and tools for aircraft maintenance – Aircraft weight control – Budgetary control. On board maintenance systems – Engine monitoring – Turbine engine oil maintenance –Turbine engine vibration monitoring in aircraft – Life usage monitors – Current capabilities of NDT – Helicopter maintenance – Future of aircraft maintenance.

TEXT BOOKS

1. Fedric J.H., “Airport Management”, 2000.
2. C.H. Friend, “Aircraft Maintenance Management”, 2000.

REFERENCES

1. Gene Kropf, Airline Procedures.
2. Wilson & Bryon, Air Transportation.
3. Philip Locklin D, Economics of Transportation.
4. "Indian Aircraft manual" – DGCA Pub.
5. Alexander T Wells, Air Transportation, Wadsworth Publishing Company, California, 1993.

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SCHOOL OF ENGINEERING & I.T.

Course	:	B.Tech
Branch	:	Aeronautical
Subject	:	Industrial Aerodynamics
Total Theory Periods	:	48
Total Tutorial Periods	:	00
Total Credits	:	03
Code	:	BTP522

UNIT-I ATMOSPHERE
Types of winds, Causes of variation of winds, Atmospheric boundary layer, Effect of terrain on gradient height, Structure of turbulent flows.

UNIT-II WIND ENERGY COLLECTORS
Horizontal axis and vertical axis machines, Power coefficient, Betz coefficient by momentum theory.

UNIT-III VEHICLE AERODYNAMICS
Power requirements and drag coefficients of automobiles, Effects of cut back angle, Aerodynamics of trains and Hovercraft.

UNIT-IV BUILDING AERODYNAMICS
Pressure distribution on low rise buildings, wind forces on buildings. Environmental winds in city blocks, Special problems of tall buildings, Building codes, Building ventilation and architectural aerodynamics.

UNIT-V FLOW INDUCED VIBRATIONS
Effects of Reynolds number on wake formation of bluff shapes, Vortex induced vibrations, galloping and stall flutter.

TEXT BOOKS

1. M.Sovran (Ed), “Aerodynamics and drag mechanisms of bluff bodies and road vehicles”, Plenum press, New York, 1978.
2. P. Sachs, “Winds forces in engineering”, Pergamon Press, 1978.

REFERENCES

1. R.D. Blevins, “Flow induced vibrations”, Van Nostrand, 1990.
2. N.G. Calvent, “Wind Power Principles”, Charles Griffin & Co., London, 1979.

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SCHOOL OF ENGINEERING & I.T.

Course	:	B.Tech
Branch	:	Aeronautical
Subject	:	Airframe Maintenance and Repair
Total Theory Periods	:	48
Total Tutorial Periods	:	00
Total Credits	:	03
Code	:	BTP523

UNIT-I WELDING IN AIRCRAFT STRUCTURAL COMPONENTS
Equipments used in welding shop and their maintenance – Ensuring quality welds –Welding jigs and fixtures – Soldering and brazing.

SHEET METAL REPAIR AND MAINTENANCE
Inspection of damage – Classification – Repair or replacement – Sheet metal inspection– N.D.T. Testing – Riveted repair design, Damage investigation – reverse technology.

UNIT-II PLASTICS AND COMPOSITES IN AIRCRAFT
Review of types of plastics used in airplanes – Maintenance and repair of plastic components – Repair of cracks, holes etc., various repair schemes – Scopes. Inspection and Repair of composite components – Special precautions – Autoclaves.

UNIT-III AIRCRAFT JACKING, ASSEMBLY AND RIGGING
Airplane jacking and weighing and C.G. Location.Balancing of control surfaces –Inspection maintenance. Helicopter flight controls. Tracking and balancing of main rotor.

UNIT-IV REVIEW OF HYDRAULIC AND PNEUMATIC SYSTEM
Trouble shooting and maintenance practices–Service and inspection–Inspection and maintenance of landing gear systems. – Inspection and maintenance of air-conditioning and pressurization system, water and waste system. Installation and maintenance of Instruments –handling– Testing – Inspection. Inspection and maintenance of auxiliary systems – Fire protection systems – Ice protection system – Rain removal system –Position and warning system – Auxiliary Power Units (APUs).

UNIT-V SAFETY PRACTICES
Hazardous materials storage and handling, Aircraft furnishing practices – Equipments.Trouble shooting - Theory and practices.

TEXT BOOK

1. Kroes, Watkins, Delp, “Aircraft Maintenance and Repair”, McGraw-Hill, New York, 1992.

REFERENCES

1. Larry Reithmeir, “Aircraft Repair Manual”, Palamar Books, Marquette, 1992.
2. Brimm D.J. Bogges H.E., “Aircraft Maintenance”, Pitman Publishing corp. New York, 1940.

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SCHOOL OF ENGINEERING & I.T.

Course	:	B.Tech
Branch	:	Aeronautical
Subject	:	Fatigue and Fracture Mechanics
Total Theory Periods	:	48
Total Tutorial Periods	:	00
Total Credits	:	03
Code	:	BTP524

UNIT-I FATIGUE OF STRUCTURES

S.N. curves - Endurance limits - Effect of mean stress, Goodman, Gerber and Soderberg relations and diagrams - Notches and stress concentrations - Neuber's stress concentration factors - Plastic stress concentration factors - Notched S.N. curves.

UNIT-II STATISTICAL ASPECTS OF FATIGUE BEHAVIOUR

Low cycle and high cycle fatigue - Coffin - Manson's relation - Transition life – cyclic strain hardening and softening - Analysis of load histories - Cycle counting techniques -Cumulative damage - Miner's theory - Other theories.

UNIT-III PHYSICAL ASPECTS OF FATIGUE

Phase in fatigue life - Crack initiation - Crack growth - Final Fracture - Dislocations -fatigue fracture surfaces.

UNIT-IV FRACTURE MECHANICS

Strength of cracked bodies - Potential energy and surface energy - Griffith's theory -Irwin - Orwin extension of Griffith's theory to ductile materials - stress analysis of cracked bodies - Effect of thickness on fracture toughness - stress intensity factors for typical geometries.

UNIT-V FATIGUE DESIGN ANDTESTINIG

Safe life and Fail-safe design philosophies - Importance of Fracture Mechanics in aerospace structures - Application to composite materials and structures.

TEXT BOOKS

1. Prasanth Kumar – "Elements of fracture mechanics" – Wheeter publication, 1999.
2. Barrois W, Ripely, E.L., "Fatigue of aircraft structure", Pegamon press. Oxford, 1983.
3. J. A. Bannantine, J. J. Comer, J. L. Handrock, Fundamentals of Metal Fatigue Analysis, Prentice Hall, 1990.

REFERENCES

1. Sin, C.G., "Mechanics of fracture" Vol. I, Sijthoff and w Noordhoff International Publishing Co., Netherlands, 1989.
2. Knott, J.F., "Fundamentals of Fracture Mechanics", Buterworth& Co., Ltd., London, 1983.

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SCHOOL OF ENGINEERING & I.T.

Course	:	B.Tech
Branch	:	Aeronautical
Subject	:	Helicopter Maintenance
Total Theory Periods	:	48
Total Tutorial Periods	:	00
Total Credits	:	03
Code	:	BTP525

UNIT-I HELICOPTER FUNDAMENTAL
Basic directions – Ground handling, bearing – Gears.

UNIT-II MAIN ROTOR SYSTEM
Head maintenance – blade alignment – Static main rotor balance – Vibration – Tracking – Span wise dynamic balance – Blade sweeping–Electronic balancing–Dampener maintenance– Counter weight adjustment – Auto rotation adjustments – Mast & Flight Control Rotor -Mast – Stabilizer, dampeners – Swash plate flight control systems collective – Cyclic – Push pull tubes – Torque tubes –Bell cranks – Mixer box –Gradient unit control boosts – Maintenance & Inspection control rigging.

UNIT-III MAIN ROTOR TRANSMISSIONS
Engine transmission coupling – Drive shaft – Maintenance clutch – Freewheeling units –Spray clutch – Roller unit – Torque meter –Rotor brake–Maintenance of these components – vibrations – Mounting systems – Transmissions.

UNIT-IV POWER PLANTS & TAIL ROTORS
Fixed wing power plant modifications – Installation –Different type of power plant maintenance. Tail rotor system – Servicing tail rotor track – System rigging.

UNIT-V AIRFRAMES AND RELATED SYSTEMS
Fuselage maintenance – Airframe Systems – Special purpose equipment.

TEXT BOOKS:

1. Jeppesen, “Helicopter Maintenance”, Jeppesons and Sons Inc., 2000.

REFERENCES:

1. “Civil Aircraft Inspection Procedures”, Part I and II, CAA, English Book House, New Delhi, 1986.
2. Larry Reithmier, “Aircraft Repair Manual”, Palamar Books Marquette, 1992.

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SCHOOL OF ENGINEERING & I.T.

Course	:	B.Tech
Branch	:	Aeronautical
Subject	:	Theory of Plates and Shells
Total Theory Periods	:	48
Total Tutorial Periods	:	00
Total Credits	:	03
Code	:	BTP526

UNIT-I CLASSICAL PLATE THEORY
Classical Plate Theory – Assumptions – Differential Equation – Boundary Conditions.

UNIT-II PLATES OF VARIOUS SHADES
Navier's Method of Solution for Simply Supported Rectangular Plates – Leavy's Method of Solution for Rectangular Plates under Different Boundary Conditions. Governing Equation – Solution for Axisymmetric loading – Annular Plates – Plates of other shapes.

UNIT-III EIGEN VALUE ANALYSIS
Stability and free Vibration Analysis of Rectangular Plates.

UNIT-IV APPROXIMATE METHODS
Rayleigh–Ritz, Galerkin Methods– Finite Difference Method–Application to Rectangular Plates for Static, Free Vibration and Stability Analysis.

UNIT-V SHELLS
Basic Concepts of Shell Type of Structures – Membrane and Bending Theories for Circular Cylindrical Shells.

TEXT BOOKS:

1. Timoshenko, S.P. Winowsky S., and Kreger, "Theory of Plates and Shells", McGraw-Hill Book Co. 1990.

REFERENCES:

1. Flugge, W. "Stresses in Shells", Springer – Verlag, 1985.
2. Timoshenko, S.P. and Gere, J.M., "Theory of Elastic Stability", McGraw-Hill Book Co. 1986.

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SCHOOL OF ENGINEERING & I.T.

Course	:	B.Tech
Branch	:	Aeronautical
Subject	:	High Temperature Materials
Total Theory Periods	:	48
Total Tutorial Periods	:	00
Total Credits	:	03
Code	:	BTP527

UNIT-I CREEP
Factors influencing functional life of components at elevated temperatures, definition of creep curve, various stages of creep, metallurgical factors influencing various stages, effect of stress, temperature and strain rate.

UNIT-II DESIGN FOR CREEP RESISTANCE
Design of transient creep time, hardening, strain hardening, expressions of rupture life of creep, ductile and brittle materials, Monkman-Grant relationship.

UNIT-III FRACTURE
Various types of fracture, brittle to ductile from low temperature to high temperature, cleavage fracture, ductile fracture due to micro void coalescence-diffusion controlled void growth; fracture maps for different alloys and oxides.

UNIT-IV OXIDATION AND HOT CORROSION
Oxidation, Pilling, Bedworth ratio, kinetic laws of oxidation- defect structure and control of oxidation by alloy additions, hot gas corrosion deposit, modified hot gas corrosion, fluxing mechanisms, effect of alloying elements on hot corrosion, interaction of hot corrosion and creep, methods of combat hot corrosion.

UNIT-V SUPERALLOYS AND OTHER MATERIALS
Iron base, Nickel base and Cobalt base super alloys, composition control, solid solution strengthening, precipitation hardening by gamma prime, grain boundary strengthening, TCP phase, embrittlement, solidification of single crystals, Inter metallics, high temperature ceramics.

TEXT BOOKS:

1. Raj. R., “Flow and Fracture at Elevated Temperatures”, American Society for Metals, USA, 1985.
2. Hertzberg R. W., “Deformation and Fracture Mechanics of Engineering materials”, 4th Edition, John Wiley, USA, 1996.
3. Courtney T.H, “Mechanical Behavior of Materials”, McGraw-Hill, USA, 1990.

REFERENCES:

1. Boyle J.T, Spencer J, “Stress Analysis for Creep”, Butterworths, UK, 1983.
2. Bressers. J., “Creep and Fatigue in High Temperature Alloys”, Applied Science, 1981.

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SCHOOL OF ENGINEERING & I.T.

Course	:	B.Tech
Branch	:	Aeronautical
Subject	:	Gas Dynamics
Total Theory Periods	:	48
Total Tutorial Periods	:	00
Total Credits	:	03
Code	:	BTP528

UNIT-I SHOCK WAVES

Normal Shock Waves : Equation of motion for a normal shock, normal shock relations for a perfect gas, stagnation conditions, Rankine-Hugoniot relations Propagating shock waves, weak shock, Reflected shock wave, centered expansion waves, shock tube.

Oblique Shock Waves : Introduction, oblique shock relations, relation between shock angle and turning angle, use of oblique shock chart, Supersonic flow over a wedge, weak oblique shocks, Supersonic compression, Detached shock.

UNIT-II EXPANSION FANS

Expansion Waves: Supersonic expansion by turning, Prandtl-Meyer flow. Simple and non-simple regions.Reflection and interaction of shocks and expansion waves, Mach reflection, method of characteristics.

Airfoils in Compressible Flow : Introduction: Linearized compressible flow, Airfoils in subsonic flow, Prandtl-Glauert transformation, critical Mach number, supercritical flow, Airfoils in Transonic flow, Governing equation, Shock wave-boundary layer interaction, stability and control problems.

UNIT-IV SUPERSONICE FLOW

Lift and drag in supersonic flow: Shock expansion theory, Flow field in supersonic flow. Thin airfoil theory, Analytical determination of lift, drag coefficients on flat plate, bi- convex, diamond -shaped profiles in supersonic flow. Supersonic flow past wings.

UNIT-III COMPRESSIBLE FLOW

Potential equation for compressible flows: Introduction, Crocco's theorem, derivation of basic potential equation for compressible flow, linearization of potential equation & boundary conditions. Small perturbation theory, application to wavy wall and bodies of revolution.

UNIT-III MEASUREMENTS IN COMPRESSIBLE FLOW

Measurements in compressible flows; Instruments used in compressible flow; Rayleigh - Pitot-formula, Subsonic, transonic and supersonic wind tunnels- Design and operation of supersonic wind tunnel. Flow visualization by interferometer, schlieren and shadow graph methods. Instrumentation for Hypersonic wind and shock tunnels, Aeroballistic range, Terminal ballistic range. Rocket-sled facility.

TEXT BOOKS:

1. John D Anderson, Modern Compressible Flow with Historical Perspective
2. E Rathakrishnan, Gas Dynamics
3. Arnold M KuetheChuenyen, Chow, Foundations of Aerodynamics, 4th Ed., John Wiley & Sons

REFERENCE BOOKS:

1. M J Zucrow and Hoffman, Gas Dynamics
2. A Pope & K L Goin, High Speed Wind Tunnel Testing
3. J Lucasiwicz. Experimental Methods in Hypersonics

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SCHOOL OF ENGINEERING & I.T.

Course	:	B.Tech
Branch	:	Aeronautical
Subject	:	Theory of Elasticity
Total Theory Periods	:	48
Total Tutorial Periods	:	00
Total Credits	:	03
Code	:	BTP529

UNIT-I BASIC EQUATIONS OF ELASTICITY
Stress – Strain – Stress Strain relationships - Equations of Equilibrium, Compatibility equations and strains, Boundary Conditions, Saint Venant's principle – Principal Stresses Stress Ellipsoid - Stress invariants.

UNIT-II PLANE STRESS AND PLANE STRAIN PROBLEMS
Airy's stress function, Bi harmonic equations, Polynomial solutions, Simple two dimensional problems in Cartesian coordinates like bending of cantilever and simply supported beams.

UNIT-III POLAR COORDINATES
Equations of equilibrium, Strain displacement relations, Stress – strain relations, Airy's stress function, Axi – symmetric problems, Kirsch, Michell's and Boussinesque problems – Rotating discs.

UNIT-IV TORSION
Navier's theory, St. Venant's theory, Prandtl's theory on torsion, the semi- inverse method and applications to shafts of circular, elliptical, equilateral triangular and rectangular sections.

UNIT-V THEORY OF PLATES
Classical plate theory – Assumptions – Governing equations – Boundary conditions –Navier's method of solution for simply supported rectangular plates – Levy's method of solution for rectangular plates under different boundary conditions.

TEXT BOOKS

1. Timoshenko, S., and Goodier, T.N., Theory of Elasticity, McGraw – Hill Ltd., Tokyo, 1990.
2. Ansel C Ugural and Saul K Fenster, 'Advanced Strength and Applied Elasticity', 4th Edition, Prentice Hall, New Jersey, 2003.

REFERENCES

1. Wang, C.T., Applied Elasticity, McGraw – Hill Co., New York, 1993.
2. Sokolnikoff, I.S., Mathematical Theory of Elasticity, McGraw – Hill New York, 1978.
3. Enrico Volterra& J.H. Caines, Advanced Strength of Materials, Prentice Hall New Jersey, 1991.

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SCHOOL OF ENGINEERING & I.T.

Course	:	B.Tech
Branch	:	Aeronautical
Subject	:	Wind Engineering
Total Theory Periods	:	48
Total Tutorial Periods	:	00
Total Credits	:	03
Code	:	BTP530

UNIT-I OVERVIEW OF WIND ENGINEERING
Introduction to Winds, Classification, Benefits of Wind Engineering, Assessment of Wind Resources, Assessment of means of energy production, consumption and cost, green credit.

UNIT-II WIND TURBINE
Wind Turbine terminology and definitions, types of wind turbines, HAWT, VAWT, Actuator disk model of HAWT and VAWT.

UNIT-III AERODYNAMICS OF WIND TURBINE
Lift, Drag and Pitching moment, Panel method for aerofoil analysis, modelling laminar and turbulent boundary layers and transitions, aerofoil design for wind energy applications.
BLADE ELEMENT THEORY: Inflow models based on combined blade element theory, incorporation of swirl losses in inflow, root and tip losses, and stall delay models, assessment of publically available wind turbine modelling tools, HAWT design using blade element theory.

UNIT-IV POWER CONVERSION AND GENERATION
Conversion of Mechanical energy into electricity, basic AC power generators, induced and synchronous generator, grid integration, tower, rotor, gear box, power regulation, safety mechanism, hybrid power systems and hybrid system modelling and simulation.

UNIT-V ECONOMICS AND IMPACT
Economic analysis of wind turbine system and wind energy, factors influencing the cost of energy generation, site specific and machine parameters, life cycle cost analysis, environmental benefits and problems of wind energy, impact of wind turbines on the environment, Application of wind energy.

TEXT BOOKS:

1. Henry, Liu, Wind Engineering- A Handbook for structural Engineers, Pearson Education, 1990.
2. Tamura, Yukio, Kareem, Ahsan, Advanced Structural Wind Engineering, Springer, 2013.

REFERENCES:

1. A. R. Jha, Wind Turbine Technology, CRC Press, Taylor Francis, 2011.
2. P. Jain, Wind Energy Engineering, McGraw Hill, 2011.