TULSIRAMJI GAIKWAD-PATIL
College of Engineering & Technology
Mohgaon, Wardha Road, Nagpur - 441 108

DEPARTMENT OF AERONAUTICAL ENGINEERING

Structure & Curriculum

Semester -Fifth

From

Academic Year 2023-24

Tulsiramji Gaikwad-Patil College of Engineering and Technology
Wardha Road, Nagpur - 441108
Accredited with NAAC A+ Grade
Approved by AICTE, New Delhi, Govt. of Maharashtra
(An Autonomous Institution Affiliated to RTM Nagpur University, Nagpur**)**

DEPARTMENT OF AERONAUTICAL ENGINEERING

Institute Vision & Mission

Vision:

- To emerge as a learning Center of Excellence in the National Ethos in domains of Science, Technology and Management.

Mission:

- To strive for rearing standard and stature of the students by practicing high standards of professional ethics, transparency and accountability.
- To provide facilities and services to meet the challenges of Industry and Society.
- To facilitate socially responsive research, innovation and entrepreneurship.
- To ascertain holistic development of the students and staff members by inculcating knowledge and profession as work practices.

Program Outcomes (POs)

1. Engineering Knowledge
2. Problem Analysis
3. Design/development of solutions
4. Conduct investigations of complex problems
5. Modern tool usage
6. The engineer and society
7. Environment and sustainability
8. Ethics
9. Individual and team work
10. Communication
11. Project management and finance
12. Lifelong learning

Tulsiramji Gaikwad-Patil College of Engineering and Technology
Wardha Road, Nagpur - 441108
Accredited with NAAC A+ Grade
Approved by AICTE, New Delhi, Govt. of Maharashtra
(An Autonomous Institution Affiliated to RTM Nagpur University, Nagpur**)**

DEPARTMENT OF AERONAUTICAL ENGINEERING

Department Vision & Mission

Vision:

- To foster technically skilled Aeronautical Engineers of the utmost academic principles, to convene the needs of academia, industry and society.

Mission:

- Impart quality technical education and unique interdisciplinary experiences.
- Develop the analytical, computational and design capabilities to provide sustainable solutions.
- Expose the students to the current trends and opportunities in the Aerospace industry.
- Inculcate professional responsibility based on an innate ethical value system.

Program Educational Objectives (PEOs)

1. Under graduate students will acquire knowledge to investigate and solve Aeronautical Engineering problems using basics of applied science and engineering.
2. Under graduate students will utilize the modern technology and techniques to explore new skills and ideas to satisfy the need of society as well as industry.
3. Under graduate students will get finest employment opportunities in the field of Aeronautical Engineering.
4. To develop the environment of societal and ethical values to concern with engineering issues.
5. Under graduate students will contribute in the domain specific and inter disciplinary research through the project based learning.

Program Specific Outcomes (PSO)

- Develop profound working knowledge to solve combination of complex problems in aerodynamics, propulsion, structures, flight mechanics and allied courses.
- Be equipped to use CAE packages, simulation languages and advanced tools to solve practical design and analysis problems.
- Under graduates will be able to utilize the extensive knowledge of design, manufacturing, testing or maintenance of systems and subsystems to pursue career in aeronautical engineering.

Tulsiramji Gaikwad-Patil College of Engineering & Technology, Nagpur

SCHEME OF INSTRUCTION & SYLLABI

Programme: Aeronautical Engineering

Scheme of Instructions: Third Year B. Tech. in Aeronautical Engineering Semester – V

Sr. No.	Course Category	Course Code	Course Title	L	T	P	Contact Hrs./Wk	Credits	EXAM SCHEME				
									CT1	CT2	TA/CA	ESE	TOTAL
1	PCC	BAE3501	Propulsion-I	3	-	-	3	3	15	15	10	60	100
2	PCC	BAE3502	Aircraft Structures	4	-	-	4	4	15	15	10	60	100
3	PCC	BAE3503	Aircraft Structures Lab	-	-	2	2	1	-	-	25	25	50
4	PCC	BAE3504	Propulsion-I Lab	-	-	2	2	1	-	-	25	25	50
5	PCC	BAE3505	Aero Modeling Lab	-	-	2	2	1	-	-	25	25	50
6	PEC	BAE3506-9	Program Elective-I	3	-	-	3	3	15	15	10	60	100
7	PEC	BAE3510-13	Program Elective-II	3	-	-	3	3	15	15	10	60	100
8	OEC	B$$XX01-18	Open Elective-I	3	-	-	3	3	15	15	10	60	100
9	HSMC	BSH3501	Aviation Laws	2	-	-	2	2	15	15	10	60	100
10	MCC	BAU3501	Heritage	2	-	-	2	Audit	-	-	-	-	-
			Total	**20**	**-**	**6**	**26**	**21**	**90**	**90**	**135**	**435**	**750**

L- Lecture T-Tutorial P-Practical

CT1- Class Test 1 TA/CA- Teacher Assessment/Continuous Assessment

CT2- Class Test 2 ESE- End Semester Examination (For Laboratory End Semester performance)

Course Category	HSMC (Hum. Soc. Sc, Mgmt.)	BSC (Basic Sc.)	ESC (Engg. Sc.)	PCC (Programme Core courses)	PEC (Programme Elective courses)	OEC (Open Elective courses from other discipline)	Project / Seminar/ Industrial Training	MCC (Mandatory Courses)
Credits	02	--	--	10	06	03	00	Yes
Cumulative Sum	08	26	21	36	06	03	01	--

PROGRESSIVE TOTAL CREDITS : 80+21=101

Head Of Department
Aeronautical Engineering
Tulsiramji Gaikwad- Patil
College Of Engineering And
Technology, Nagpur.

Dean Academics
Tulsiramji Gaikwad-Patil
College Of Engineering
and Technology, Nagpur

Vice Principal
Tulsiramji Gaikwad-Patil
College Of Engineering &
Technology, Nagpur.

Principal
Tulsiramji Gaikwad Patil College Of
Engineering and Technology, Nagpur

Program: Bachelor of Aeronautical Engineering

List of Electives offered

By

Aeronautical Engineering Department

Program Elective- I	Program Elective- II
Semester V	Semester V
BAE3506- High Speed Aerodynamics	**BAE3510- Helicopter Aerodynamics**
BAE3507- Design of Compressor and Turbines	**BAE3511- Introduction to Cryogenics**
BAE3508- Heat & Mass Transfer	**BAE3512- Civil Aviation Requirements**
BAE3509- Aircraft Maintenance and Repair	**BAE3513- Aircraft Systems**

List of Open Electives

Sr. No.	Course Code	Course Title	Sr. No.	Course Code	Course Title
1	BCSXX01	Fundamentals of Database Management System	11	BEEXX11	Power Plant System
2	BCSXX02	Python Programming	12	BEEXX12	Electrical Materials
3	BITXX03	Cyber Security	13	BAEXX13	Avionics
4	BITXX04	Artificial Intelligence	14	BAEXX14	Unmanned Aerial Vehicles
5	BECXX05	Internet of Things	15	BBTXX15	Biomaterials
6	BECXX06	Embedded Systems	16	BBTXX16	Food and Nutrition Technology
7	BCEXX07	Introduction to Art and Aesthetics	17	BBAXX17	Industry 4.0
8	BCEXX08	Metro Systems and Engineering	18	BAEXX18	Aircraft Systems & Instrumentation
9	BMEXX09	Additive Manufacturing Techniques	19	BDSXX19	Introduction to Data Science
10	BMEXX10	Automobile Engineering			

Head Of Department
Aeronautical Engineering
Tulsiramji Gaikwad- Patil
Collage Of Engineering And
Technology, Nagpur.

Dean Academics
Tulsiramji Gaikwad-Patil
College Of Engineering
and Technology, Nagpur

Vice Principal
Tulsiramji Gaikwad-Patil
College Of Engineering &
Technology, Nagpur.

Principal
Tulsiramji Gaikwad Patil College Of
Engineering and Technology, Nagpur

Tulsiramji Gaikwad-Patil College of Engineering and Technology
Wardha Road, Nagpur-441 108
NAAC Accredited (A+ Grade)

Third Year (Semester-V) B. Tech. Aeronautical Engineering

BAE3501: Propulsion-I

Teaching Scheme	
Lectures	03 Hrs/Week
Tutorials	00 Hrs/Week
Total Credits	03

Examination Scheme	
CT-1	15 Marks
CT-2	15 Marks
CA	10 Marks
ESE	60 Marks
Total	100 Marks
Duration of ESE: 03 Hrs	

Course Contents

Unit I	**Introduction** History of the Air breathing Jet Engine, Twentieth Century Inventions, The Beginning, Innovations in Gas Turbine Engines, Multi-spool Configuration, Variable Stator, Transonic Compressor, Low Emission Combustor, Turbine Cooling, Exhaust Nozzles Modern Materials and Manufacturing Techniques, New Engine Concepts, Advanced Turboprop (ATP) and Geared Turbofan (GTF), Advanced Air breathing Rocket Technology, Wave Rotor Topping Cycle, Pulse Detonation Engine (PDE), Millimeter-Scale Gas Turbine, Engines Combined Cycle Propulsion.
Unit II	**Fundamentals of Gas Turbine Engines** Illustration of working of gas turbine engine, the thrust equation, Factors affecting thrust, Effect of pressure, velocity and temperature changes of air entering compressor, Propulsive efficiency, Specific fuel consumption, Thrust and power, Factors affecting thrust and power, Characteristics of turboprop, turbofan and turbojet, Ram jet, Scram jet, Methods of Thrust augmentation, Gas Turbine, Engine Cycle Analysis.
Unit III	**Inlet and Nozzles** Internal flow and Stall in Subsonic inlets, Inlet Diffuser performance, Supersonic inlets, Shock swallowing by area variation, Modes of inlet operation. Exhaust Nozzle, Nozzle Adiabatic Efficiency, Total Pressure Ratio, Pressure Ratio (NPR) and Critical Nozzle Pressure Ratio (NPR_{crit}). Relation Between Nozzle Figures of Merit, efficiency and pressure ratio. The Effect of Boundary Layer on Nozzle, Nozzle Exit Flow, Effect of Flow Angularity on Gross Thrust Nozzle, Gross Thrust Coefficient Cfg, over expanded Nozzle Flow, Shock Losses, Nozzle Area Scheduling, Nozzle Cooling Thrust Reverser and Thrust Vectoring, Nozzle-Turbine (Structural) Integration.
Unit IV	**Compressor and Turbine** Introduction to centrifugal compressors, Axial flow compressor, geometry, twin spools, three spools, stage analysis, velocity polygons, degree of reaction, radial equilibrium theory, performance maps. Axial flow turbines: Geometry, velocity polygons, stage analysis, performance maps, thermal limit of blades and vanes, cascade study of LP turbine.
Unit V	**Combustion Chamber and matching of component** Classification of combustion chambers, Important factors affecting combustion chamber design, Combustion process, Combustion chamber performance, effect of operating variables on performance. Flame tube cooling, Flame stabilization, Use of flame holders, Numerical problems. Inlet, compressor, combustion chamber, turbine, and nozzle. Numerical problems on matching.

Text Books

1	Hill, P. G. & Peterson, G. R., Mechanics of Thermodynamics of Propulsion, Addison – Wesley Longman JNC,2nd Edition, 1999.

2	Cohen, H., Rogers, G. F. C. and Saravanamuttoo, H. I. H., Gas Turbine Theory, Longman, 3rd Edition 1989.
3	Mathur, M. L., and Sharma, R. P., Gas Turbine, Jet and Rocket Propulsion, Standard Publishers and Distributors, Delhi, 3rd Edition 1988.
Reference Books	
1	Oates, G. C., Aerothermodynamics of Aircraft Engine Components, AIAA Education Series, New York, 1985.
Useful Links	
1	https://nptel.ac.in/courses/101/106/101106033/
2	https://nptel.ac.in/courses/101/101/101101002/
3	https://nptel.ac.in/courses/112/103/112103281/

	Course Outcomes	CL	Class Sessions	Lab Sessions
BAE3501.1	**Apply** the working concept of various types of gas turbine engines in practical applications.	3	9	2
BAE3501.2	**Differentiate** between a subsonic and a supersonic inlet and further relate it to aerospace applications.	2	9	2
BAE3501.3	**Analyze** the working concept of various types of inlets and nozzles.	4	9	2
BAE3501.4	**Illustrate** the operational and designing concepts of compressors and turbines.	4	9	2
BAE3501.5	**Examine** the suitability of the combustion chamber and nozzle for a given gas turbine engine.	4	9	2

Tulsiramji Gaikwad-Patil College of Engineering and Technology

Wardha Road, Nagpur-441 108

NAAC Accredited (A+ Grade)

Third Year (Semester-V) B. Tech. Aeronautical Engineering

BAE3502: Aircraft Structures

Teaching Scheme	
Theory	4 Hrs/Week
Tutorial	0 Hrs/Week
Total Credits	4

Examination Scheme	
CT-I	15 Marks
CT-II	15 Marks
CA	10 Marks
ESE	60 Marks
Total	100 Marks
Duration of ESE: 3 Hrs	

Course Contents

Unit I	**Theories of failure:** Maximum normal stress theory, Maximum shear stress theory, Maximum strain theory, Strain energy theory, and Distortion energy theory, failure of brittle and ductile materials, Stress concentration, and Determination of Stress concentration factor.
Unit II	**Unsymmetrical Bending of Beam:** Elementary theory of bending, Introduction to semi-Monocoque structures, Stresses in beams of symmetrical and unsymmetrical sections, Box beams, General formula for bending stresses, principal axes method, Neutral axis method. Generalized k-method, Advantages and Disadvantages of three methods.
Unit III	**Shear Flow and Analysis:** Shear stresses in beams, Shear flow in stiffened panels, Shear flow in thin walled open tubes, Shear centre, Shear flow in open sections with stiffeners. Shear flow in closed sections with stiffeners, Angle of twist, Shear flow in two flange and three flange box beams, Shear centre, Shear flow in thin walled closed tubes, Bredth-Batho theory, Torsional shear flow in multi cell tubes, Flexural shear flow in multi cell stiffened structures.
Unit IV	**Combined Open and Closed Section Beam:** Bending, Shear, Torsion for combined sections, Structural Idealization, Idealization of a panel, Effect of idealization on the analysis of open and closed section beams, Bending of open and closed section beams, Shear of open section beams, Shear loading of closed section beams, Alternative method for the calculation of shear flow distribution, Torsion of open and closed section beams, Deflection of open and closed section beams, Numerical problems.
Unit V	**Plates and Fuselage:** Rectangular sheets under compression, Local buckling stress of thin walled sections, Crippling stresses by Needham's and Gerard's methods, Procedure, Shear and bending moment distribution for semi cantilever and other types of wings and fuselage, thin webbed beam. With parallel and non-parallel flanges, Shear resistant web beams, Tension field web beams (Wagner's). Fuselages: Bending, Shear, Torsion, Cut-outs in fuselages, Wings Three-boom shell, Bending, Torsion, Shear centre, Tapered wings, Cut-outs in wings, problems **Fuselage frames and wing ribs:** Principles of stiffener/web construction, Fuselage frames, Wing ribs, Problems.

Text Books

1	Megson, T. H. G., Aircraft Structures for Engineering Students, Butterworth Heinemann, 4th Ed., 2007.
2	Peery, D. J., Aircraft Structures, McGraw-Hill Education, 1st Ed., 1950.
3	Donaldson, B. K., Analysis of Aircraft Structures, Cambridge Aerospace, 2nd Ed., 1993.

Reference Books

1	Sun, C. T., Mechanics of Aircraft Structures, Wiley-Interscience, 2nd Ed., 2006.
2	Bruhn, E. F., Analysis and Design of Flight Vehicle Structures, Jacobs Pub., 3rd Ed., 1973.
3	Niu, M., Airframe Stress Analysis & Sizing, Adaso Adastra Engineering Center, 2nd Ed.,1999.
Useful Links	
1	https://nptel.ac.in/courses/101/105/101105084/
2	https://onlinecourses.nptel.ac.in/noc20_ae08/preview
3	https://nptel.ac.in/noc/courses/noc20/SEM2/noc20-ae08/

	Course Outcomes	CL	Class Sessions	Lab Sessions
BAE3502.1	**Apply** the basic concepts of stress and strain analysis to compute the strength of material.	3	9	2
BAE3502.2	**Predict** life of materials and structures by using different failure theories and its application.	4	9	2
BAE3502.3	**Predict** the fatigue life of the structure and calculate impact and fatigue strength.	4	9	2
BAE3502.4	**Calculate** loads on the aircraft for different maneuvering conditions.	4	9	2
BAE3502.5	**Identify** determinate and indeterminate structures and solve the problems of truss structures using different methods.	4	9	2

Tulsiramji Gaikwad-Patil College of Engineering and Technology
Wardha Road, Nagpur-441 108
NAAC Accredited (A+ Grade)

Third Year (Semester-V) B. Tech. Aeronautical Engineering

BAE3503: Aircraft Structures Lab

Teaching Scheme		Examination Scheme	
Practical	**2 Hrs/week**	**CA**	**25 Marks**
Total Credit	**1**	**ESE**	**25 Marks**
		Total	**50 Marks**
		Duration of ESE: 02 Hrs	

Course Outcomes (CO)

Students will be able to

BAE3503.1	**Apply** the basic concepts of stress and strain analysis to compute the strength of material.
BAE3503.2	**Predict** life of materials and structures by using different failure theories and its application.
BAE3503.3	**Predict** the fatigue life of the structure and **calculate** impact and fatigue strength.
BAE3503.4	**Calculate** loads on the aircraft for different maneuvering conditions.
BAE3503.5	**Identify** determinate and indeterminate structures and solve the problems of truss structures using different methods.

Sr. No.	List of Experiment	CO
1	Determination of unsymmetrical Bending of Z section Beam.	**1**
2	Testing of deflection of a beam under combined loading.	**1**
3	Demonstration of Simply supported Beam test setup.	**1**
4	Determination of Shear Center location for open channel sections.	**2**
5	To find Shear Center location for closed D sections.	**2**
6	Experiment on Constant strength Beam.	**3**
7	Demonstration of Flexibility matrix for cantilever Beam.	**3**
8	Verification of Castingliano's load theorem with different end conditions.	**4**
9	Verification of Maxwell's Reciprocal Theorem and Superposition Principle with different end conditions.	**4**
10	To find Young's modulus using dial gauge.	**5**
11	Strain measurement using electrical resistance strain gauges.	**5**
12	Buckling load of slender eccentric columns and construction of Southwell plot.	**5**

Text Books

1	Megson, T. H. G., Aircraft Structures for Engineering Students, Butterworth Heinemann, 4th Ed., 2007.
2	Peery, D. J., Aircraft Structures, McGraw-Hill Education, 1st Ed., 1950.
3	Donaldson, B. K., Analysis of Aircraft Structures, Cambridge Aerospace, 2nd Ed., 1993.

Reference Books

1	Sun, C. T., Mechanics of Aircraft Structures, Wiley-Interscience, 2nd Ed., 2006.
2	Bruhn, E. F., Analysis and Design of Flight Vehicle Structures, Jacobs Pub., 3rd Ed., 1973.
3	Niu, M., Airframe Stress Analysis & Sizing, Adaso Adastra Engineering Center, 2nd Ed., 1999.

Tulsiramji Gaikwad-Patil College of Engineering and Technology
Wardha Road, Nagpur-441 108
NAAC Accredited (A+ Grade)

Third Year (Semester-V) B. Tech. Aeronautical Engineering

BAE3504: Propulsion-I Lab

Teaching Scheme		Examination Scheme	
Practical	**2 Hrs/week**	**CA**	**25 Marks**
Total Credit	**1**	**ESE**	**25 Marks**
		Total	**50 Marks**
		Duration of ESE: 02 Hrs	

Course Outcomes (CO)

Students will be able to

BAE3504.1	**Apply** the working concept of various types of gas turbine engines in practical applications.
BAE3504.2	**Differentiate** between a subsonic and a supersonic inlet and further relate it to aerospace applications.
BAE3504.3	**Analyze** the working concept of various types of inlets and nozzles.
BAE3504.4	**Illustrate** the operational and designing concepts of compressors and turbines.
BAE3504.5	**Examine** the suitability of the combustion chamber and nozzle for a given gas turbine engine.

Sr. No.	List of Experiment	CO
1	Determine the velocity profile of free jet from out let of orifice	**1**
2	Determine the velocity profile of wall jet from out let of orifice	**1**
3	Perform free convective heat transfer over a flat plate	**2**
4	Perform forced convective heat transfer over a flat plate	**2**
5	Determine the calorific value of aviation fuel	**3**
6	To determine the calorific value of Solid Rocket Propellant	**3**
7	Determine the performance of a propeller	**4**
8	Conduct Performance Test on Single Cylinder, Two stroke Petrol engine at different loads.	**4**
9	Conduct Performance Test on Single Cylinder, Four stroke Petrol engine at different compression ratio and different loads	**4**
10	Determine Flash & Fire Point of liquid aviation fuel (ATF)	**5**

Text Books

1	Hill Philip, Peterson Carl, Mechanics and Thermodynamics of Propulsion, 2nd edition, 1992, Addison Wesley
2	El Sayed Ahmed, Aircraft Propulsion & Gas Turbine Engines, Taylor & Francis, CRC Press, 3rd Edition, 2008.

Useful Links

1	Mattingly J D, Elements of Propulsion: Gas Turbines and Rockets, AIAA Education Series, 2006.

Third Year (Semester-V) B. Tech. Aeronautical Engineering

BAE3505: Aero-modelling Lab

Teaching Scheme			Examination Scheme	
Practical	**2 Hrs/week**		**CA**	**25 Marks**
Total Credit	**01**		**ESE**	**25 Marks**
			Total	**50 Marks**
			Duration of ESE: 02 Hrs	

Course Outcomes (CO)

Students will be able to

BAE3505.1	Do the comparative analysis of different aircraft configurations
BAE3505.2	Prepare and assemble different components of aircraft models (unpowered) with given material.
BAE3505.3	Prepare and assemble different components of aircraft models (powered) with given material.
BAE3505.4	Carry out the flight test of aircraft models on flight simulator.
BAE3505.5	Carry out the flight test of prepared aircraft models.

Sr. No.	List of Experiment	CO
1	Comparative configuration study of different types of airplane configurations	**1**
2	Preparation of hot air balloons	**2**
3	Preparation of chuck glider aircraft models.	**2**
4	Preparation of boomerang models.	**2**
5	Preparation of R.C. glider aircraft models.	**2**
6	Preparation of control line aircraft models.	**3**
7	Preparation of R.C. powered aircraft models	**3**
8	Drone flight simulator training	**4**
9	Flight test of all the aircraft models prepared	**5**

Tulsiramji Gaikwad-Patil College of Engineering and Technology

Wardha Road, Nagpur-441 108

NAAC Accredited (A+ Grade)

Third Year (Semester-V) B. Tech. Aeronautical Engineering

BAE3506: High Speed Aerodynamics

Teaching Scheme		Examination Scheme	
Lectures	03 Hrs/Week	CT-1	15 Marks
Tutorials	00 Hrs/Week	CT-2	15 Marks
Total Credits	03	CA	10 Marks
		ESE	60 Marks
		Total	100 Marks
		Duration of ESE: 03 Hrs	

Course Contents

Unit I	**Introductory concepts** Compressibility Thermodynamic Concepts, Conservation equations, Communication in gases, Stagnation state, One Dimensional Flow, Pressure waves in gases Communication in gases Stagnation state Differential equations for 1D flow, Isentropic Flow with area variations, Numerical example.
Unit II	**Shock Waves** Normal Shock Concept Normal Shock relations Moving normal shocks Numerical Examples (stationary and moving) Concept and theory Oblique Shock relations Property variations Detached Shocks Shock Reflections Numerical Examples Shock-Shock Interactions,1-D Expansion wave Expansion Fan Prandtl Meyer Function Smooth expansions/compressions Numerical Examples, Shock expansion theory and its applications.
Unit III	**Nozzle flow** Quasi-1D flow with area variations, Geometric Choking Numerical Examples Divergent Nozzles Convergent-Divergent Nozzles Numerical Examples Multiple Choking points, Supersonic Jet, Jet structure Numerical Examples and Supersonic Shear layers. **Non-isentropic flows** Crocco's Theorem Fanno Flow Numerical Examples Rayleigh Flow Numerical Examples Various Choking mechanisms, Ramjets and scramjets.
Unit IV	**Experimental setups and Flow Visualization** Shock Tubes Compressible flow facilities Measurement Techniques Experiment Design, Schlieren, Shadowgraph, Interferometry.
Unit V	**2D Method of Characteristics** Characteristics concept Characteristic directions; and constitutive relations, Subroutines, Marching techniques, Example simulations, Fanno flow, Reyleigh Flow.

Text Books

1	Liepmann, H.W. and Roshko, A., Elements of Gas Dynamics Dover Publications, Inc., Mineola, NY, USA. 1st Edition, 2001.
2	Oosthuizen, P.H. and Carscallen, W.E., Compressible Fluid Flow McGraw-Hill international editions, McGraw-Hill Companies, Inc., Singapore.
3	Babu V., Fundamentals of Gas Dynamics, Ane Books India, Chennai.

Reference Books

1	Chapman A.J. and Walker W.F. Introductory Gas Dynamics Holt, Reinhart and Winston, Inc. NY, USA.

Useful Links

1	https://nptel.ac.in/courses/101/106/101106044/
2	https://nptel.ac.in/courses/112/106/112106166/
3	https://nptel.ac.in/courses/112/103/112103021/

	Course Outcomes	CL	Class Sessions
BAE3506.1	**Classify** the wind tunnel testing.	1	9
BAE3506.2	**Evaluate** the boundary corrections and image processing.	3	9
BAE3506.3	**Portray** flow measurement technique using advance visualization methods	2	9
BAE3506.4	**Conduct** quantitative analysis of forces on aircraft.	3	9
BAE3506.5	**Understand** advance flow visualization techniques.	2	9

Tulsiramji Gaikwad-Patil College of Engineering and Technology

Wardha Road, Nagpur-441 108

NAAC Accredited (A+ Grade)

Third Year (Semester-V) B. Tech. Aeronautical Engineering

BAE3507: Design of Compressor and Turbines

Teaching Scheme	
Lectures	03 Hrs/Week
Tutorials	00 Hrs/Week
Total Credits	03

Examination Scheme	
CT-1	15 Marks
CT-2	15 Marks
CA	10 Marks
ESE	60 Marks
Total	100 Marks
Duration of ESE: 03 Hrs	

Course Contents

Unit I	**Introduction to Turbomachines** Classification of Turbomachines, Second Law of Thermodynamics, turbine/ compressor work, Nozzle/diffuser work. Fluid equations, continuity, Euler's, Bernoulli's equation and its applications. Expansion and compression processes, Reheat Factor, Preheat Factor.
Unit II	**Design of impeller**: Types of impellers, centrifugal and axial. Design of a diffuser, Vaneless and vanned diffuser. Types of casings, casing design. Performance characteristics of turbo compressors.
Unit III	**Euler's Equation:** Energy Transfer, vane congruent flow, influence of relative circulation, thickness of vanes, number of vanes on velocity triangles, slip factor, Stodola, Stanitz and Balje's slip factor. Suction pressure and net positive suction head. Phenomena of cavitation in pumps. Concept of specific speed, Shape number. Axial, Radial and Mixed Flow Machines. Similarity laws.
Unit IV	**Axial turbine:** Stages, stage velocity triangles, work, efficiency, blade loading, flow coefficient. Single stage impulse and reaction turbines, degree of reaction, 50% reaction turbine stage, Radial equilibrium and Actuator disc approach for design of turbine blades. Partial admission problems in turbines. Losses in turbo machines.
Unit V	**Flow through Centrifugal compressor:** Stage velocity triangles, specific work, forward, radial and backward swept vanes. Enthalpy entropy diagram, degree of reaction, slip factor, efficiency. Vane less and vaned diffuser systems, volute as spiral casing. Surge and stall in compressors

Text Books

1	. S.M. Yahya, Turbines, Compreessors and Fans, Tata Mcgraw Hill, 4th edition 2001.
2	Gopalakrishnan G., Prithvi Raj D, "A treatise on Turbomachines", Scitech Publications, Chennai, 2002.

Reference Books

1	Sheppard, Principles of Turbomachinery, 1st edition, 1961.
2	R. K. Turton, Principles of Turbomachinery, E & F N Spon Publishers, London & New York, 2nd edition 1995.
3	Balajee, Designing of Turbomachines, 3rd edition, 1996

Useful Links

1	https://nptel.ac.in/courses/112/104/112104168/
2	https://www.youtube.com/watch?v=VMH6qbED7pg&ab_channel=nptelhrd
3	https://nptel.ac.in/courses/112/104/112104161/

	Course Outcomes	CL	Class Sessions
BAE3507.1	**Describe** the fundamentals of Turbo machines.	2	9
BAE3507.2	**Analyze** the design parameters of Impeller.	4	9
BAE3507.3	**Apply** the knowledge of Euler's equation to estimate the performance of axial, radial and mix flow machines.	3	9
BAE3507.4	**Examine** the performance of axial flow turbine under various operating conditions.	3	9
BAE3507.5	**Compute** degree of reaction, slip factor, efficiency and related performance parameters for centrifugal flow compressors.	3	9

Tulsiramji Gaikwad-Patil College of Engineering and Technology

Wardha Road, Nagpur-441 108

NAAC Accredited (A+ Grade)

Third Year (Semester-V) B. Tech. Aeronautical Engineering

BAE3508: Heat & Mass Transfer

Teaching Scheme	
Lectures	03 Hrs/Week
Tutorials	00 Hrs/Week
Total Credits	03

Examination Scheme	
CT-1	15 Marks
CT-2	15 Marks
CA	10 Marks
ESE	60 Marks
Total	100 Marks
Duration of ESE: 03 Hrs	

Course Contents

Unit I	Introduction, Basic modes of Heat Transfer, Conduction, Convection & Radiation. Laws of Heat transfer, General heat conduction equation in Cartesian, Cylindrical and Spherical coordinates. One dimensional steady state heat conduction equation for the plane wall, cylinder and sphere, Overall heat transfer coefficient. Thermal resistance of composite structure, contact resistance, variable thermal conductivity, critical thickness of insulation.
Unit II	Conduction with internal heat generation for plane wall, Cylinder and Sphere, Extended surface, Types of Fins, Fins of uniform cross section area, temperature distribution and their heat transfer rate, Fin efficiency & Effectiveness. Unsteady state heat transfer, lumped heat capacity analysis, Heisler's charts. Biot's Number, Fourier's Number & its significance. Approximate solution to unsteady state conduction heat transfer by the use of Heisler's chart
Unit III	Forced convection, Concept of hydrodynamics & thermal boundary layer thickness, local and average heat transfer coefficient. Empirical co-relations for external, internal flows, laminar & turbulent flow through conduits. Free or Natural Convection, Grashof's number, Rayleigh number, flow over horizontal and vertical plate, Empirical co-relations for cylinders and sphere. Introduction to cooling of electronic devices. Heat transfer enhancement using nano fluids. Boiling and Condensation heat transfer: Pool boiling curve and regimes of pool boiling, Film and Drop wise condensation
Unit IV	Radiation, spectrum of radiation, black body radiation, radiation intensity, Laws of radiation- Kirchhoff, Planck's, Wien's displacement law, Stefan Boltzmann & Lamberts Co-sine law. Emissivity, Absorbtivity, Transmisivity, Reflectivity, Radiosity, Emissive power, Irradiation. Radiation exchange between surfaces, shape factor & its laws, radiation between parallel plates, cylinder & spheres. Radiation shields
Unit V	Heat exchanger: Detail Classification, Overall Heat Transfer Coefficient, Fouling Factor, LMTD & Effectiveness -NTU method of heat exchanger analysis for parallel, counter flow & cross flow arrangement, Introduction to compact heat exchanger, Heat Pipe.

Text Books

1	Fundamentals of Heat & Mass Transfer, Incropera, F.P., Dewitt, D. P., John Wiley & Sons .
2	Heat Transfer, J.P. Holman, McGraw Hill Book Company, New York.
3	Heat Transfer, R.K Rajput

Reference Books

1	Fundamentals of Heat and Mass Transfer, Venkanna B.K., PHI Publication.
2	Heat & Mass Transfer, M.N. Ozisik, Tata McGraw Hill Publishing Company Ltd., New Delhi.
3	Principles of Heat Transfer, Frank Kreith, Harper and Row Publishers, New York.

Data Books

D. 1	Heat & Mass Transfer, C.P. Kothandaraman, PHI publishers.
D. 2	Heat & Mass Transfer, Domkundwar, Dhanapat Rai & Sons Publication.
Useful Links	
1	https://nptel.ac.in/courses/112108149
2	https://nptel.ac.in/courses/112106315

	Course Outcomes	CL	Class Sessions
BAE3508.1	**Understand** the Basic Mode of Heat Transfer	**2**	**9**
BAE3508.2	**Describe** and analyze conduction heat transfer problem**.**	**4**	**9**
BAE3508.3	**Analyze** convection heat transfer problem.	**4**	**9**
BAE3508.4	**Analyze** radiative heat transfer problem	**4**	**9**
BAE3508.5	**Examine** different types of heat exchangers and aerodynamic Heating.	**3**	**9**

Tulsiramji Gaikwad-Patil College of Engineering and Technology

Wardha Road, Nagpur-441 108

NAAC Accredited (A+ Grade)

Third Year (Semester-V) B. Tech. Aeronautical Engineering

BAE3509: Aircraft Maintenance and Repair

Teaching Scheme	
Lectures	03 Hrs/Week
Tutorials	00 Hrs/Week
Total Credits	03

Examination Scheme	
CT-1	15 Marks
CT-2	15 Marks
CA	10 Marks
ESE	60 Marks
Total	100 Marks

Duration of ESE: 03 Hrs

Course Contents

Unit I	**WELDING IN AIRCRAFT STRUCTURAL COMPONENTS** Equipment's used in welding shop and their maintenance, ensuring quality welds, welding. Jigs and fixtures, Soldering and brazing. Sheet Metal Repair and Maintenance: Selection of materials; Repair schemes; Fabrication of replacement patches; Tools, power/hand; Repair techniques; Close tolerance fasteners; Sealing compounds; forming/shaping; Calculation of weight of completed repair; Effect of weight, change on surrounding structure. Sheet metal inspection, N.D.T. Testing. Riveted repair design, Damage investigation, Reverse engineering.
Unit II	**PLASTICS AND COMPOSITES IN AIRCRAFT** Plastics in Aircraft: Review of types of plastics used in airplanes, Maintenance and repair of plastic components, Repair of cracks, holes etc., and various repairs schemes, Scopes. Advanced Composites in Aircraft: Cleaning of fibre reinforced plastic (FRP) materials prior to repair; Break test, Repair Schemes; FRP/honeycomb sandwich materials; laminated FRP structural members and skin panels; Tools/equipment; Vacuum-bag process. 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, trouble-shooting. Theory and practices.

Text Books

1	K.K Chawla, Composite Materials- Science and Engineering, Springer Verlag, 2nd edition, 1998.
2	Autar Kaw, Mechanics of Composites, CRC Press, 2nd edition, 2006.

Reference Books

1	Mein Schwartz, Composite Materials Handbook, Vol.3, Department of Defense, USA, 2002.
2	Ajay Kapadia, Non-Destructive Testing of Composite Materials, National Composites Network, Best Practices Guide, TWI Publications, 2006.
3	R M Jones, Mechanics of Composite Materials, 2nd Edn, Taylor & Francis, 2015.

Useful Links	
1	https://nptel.ac.in/courses/112/104/112104168/
2	https://nptel.ac.in/courses/112/104/112104161/

	Course Outcomes	CL	Class Sessions
BAE3509.1	**Apply** the principles of function and safe operation to aircraft as per FAA.	3	9
BAE3509.2	**Demonstrate** the general airframe structural repairs, the structural repair manual and structural control programme.	4	9
BAE3509.3	**Perform** airframe structural component inspection, corrosion repair and non-destructive inspection.	3	9
BAE3509.4	**Perform** the aircraft component disassembly, reassembly and troubleshooting.	3	9
BAE3509.5	**Acquire** knowledge on aircraft adhesives, sealants, bonding techniques, repair procedures	2	9

Tulsiramji Gaikwad-Patil College of Engineering and Technology

Wardha Road, Nagpur-441 108

NAAC Accredited (A+ Grade)

Third Year (Semester-V) B. Tech. Aeronautical Engineering

BAE3510: Helicopter Aerodynamics

Teaching Scheme	
Lectures	03 Hrs/Week
Tutorials	00 Hrs/Week
Total Credits	03

Examination Scheme	
CT-1	15 Marks
CT-2	15 Marks
CA	10 Marks
ESE	60 Marks
Total	100 Marks

Course Contents

Unit I	**Introduction** Historical Development of Helicopters. Helicopter Configuration. Control Requirements. Types of Rotor Systems. Basic Power Requirements.
Unit II	**Introduction to Hovering Theory** Momentum Theory. Blade Element Theory. Combined Blade Element and Momentum theories for non-uniform inflow calculation. Ideal Rotor vs Optimum Rotor.
Unit III	**Vertical Flight** Various flow states of Rotor. Autorotation in Vertical Descent. Ground Flight.
Unit IV	**Forward Flight** Momentum Theory. Variable inflow Models. Blade Element Theory. Rotor Reference Planes. Hub Loads. Power variation with forward speed. Rotor Blade Flapping Motion: Simple Mode.
Unit V	**Helicopter Trim and Stability** Equilibrium condition of helicopter, Trim analysis, Basics of helicopter stability.

Text Books

1	Bramwell, Done and Balmford: Helicopter Dynamics, Elsevier, 2nd Edition, 2001.
2	Gordon Leishman: Principles of Helicopter Aerodynamics, Cambridge Aerospace Series.
3	Stepniewski & Keys: Rotarywing Aerodynamics, Dover Publications, 3rd Edition, 2004

Reference Books

1	Wayne Johnson: Helicopter Theory, Dover Publications.

Useful Links

1	https://nptel.ac.in/courses/101/104/101104017/
2	https://nptel.ac.in/courses/101/104/101104015/
3	https://nptel.ac.in/courses/101/104/10110401654/

	Course Outcomes	CL	Class Sessions
BAE3510.1	**Explain** the different configurations of helicopter.	2	9
BAE3510.2	**Solve** the problems on the concepts of rotor dynamics and related theories.	3	9
BAE3510.3	**Compute** the power required for vertical flight.	4	9
BAE3510.4	**Examine** the stability and control of forward moving helicopter.	5	9
BAE3510.5	**Study** the ground effect machines and trim stability and stability analysis.	4	9

Tulsiramji Gaikwad-Patil College of Engineering and Technology
Wardha Road, Nagpur-441 108
NAAC Accredited (A+ Grade)

Third Year (Semester-V) B. Tech. Aeronautical Engineering

BAE3511: Introduction to Cryogenics

Teaching Scheme	
Lectures	03 Hrs/Week
Tutorials	00 Hrs/Week
Total Credits	03

Examination Scheme	
CT-1	15 Marks
CT-2	15 Marks
CA	10 Marks
ESE	60 Marks
Total	100 Marks
Duration of ESE: 03 Hrs	

Course Contents

Unit I	**Introduction** Cryogenic engineering, properties of cryogenic fluids like Oxygen, Nitrogen, Argon, Neon, Florin, Helium, Hydrogen, Properties of material at cryogenic temperature, mechanical, thermal, and electrical, Super conductivity, application of cryogenic systems in space, medical, industries, biological etc.
Unit II	**Cryogenic refrigeration** Principle and Methods of production of low temperature and their analysis: Joule Thomson Expansion, Cascade processes, Ortho and para hydrogen conversion, cold gas refrigerators, Linde- Hampson cycles, Claude and cascaded systems, magnetic cooling, Stirling Cycle Cryocoolers, Philips refrigerators, Gifford single volume refrigerator, Pulse tube refrigerators.
Unit III	**Cryogenic requirement** Cryogenics Heat Exchangers, Compressors, Expanders, Effect of various parameters in performance and system optimization. Various insulations (expanded foams, gas filled, fibrous, vacuum, multi- layer etc.) and Storage equipment for cryogenic fluids, industrial storage and transfer of cryogenic fluids.
Unit IV	**Gas separation and purification** Ideal gas, mixture characteristics composition diagrams, gas separation, principle of rectification, plate calculation, flash calculation rectification column analysis, separation of air, hydrogen and helium.
Unit V	**Cryogenic instrumentation and safety** Properties and characteristics of instrumentation, strain displacement, pressure, flow, liquid level, density and temperature measurement in cryogenic range. Safety in cryogenic fluid handling, storage and use. Safety against cryogen hazards like burns, frostbite, asphyxiation, hypothermia etc. **Application** Super conductive devices such as bearings, motors, cryotrons, magnets, D.C. transformers, tunnel diodes, space technology, space simulation, cryogenics in biology and medicine.

Text Books

1	Randal F. Barron, Cryogenic Systems, Oxford University Press, New York, 1999
2	T.M Flynn, Cryogenic Engineering, Maxwell Dekker, 1997.
3	Scoot, Cryogenic Engineering, Van Nostrand Co. Inc. 1985.

Reference Books

1	R W Yance and WM Duke, Applied Cryogenic Engineering, John Willey.
2	Klaus D. Timmerhaus, Richard Palmer Reed, Cryogenic Engineering: 50 years of progress, Springer, 2007.

Useful Links

1	https://nptel.ac.in/courses/112/101/112101004/
2	http://www.nptelvideos.in/2012/12/cryogenic-engineering.html

	Course Outcomes	CL	Class Sessions
BAE3511.1	**Understand** the basic properties of cryogenic fluids.	2	9
BAE3511.2	**Understand** the basic concepts of refrigeration and liquefaction	2	9
BAE3511.3	**Solve** the problems on basic concepts cryogenic insulation.	3	9
BAE3511.4	**Solve** the problems on the principle of storage and processing of cryogenic liquids.	4	9
BAE3511.5	**Solve** problems on the equipment in cryogenic liquids.	3	9

Tulsiramji Gaikwad-Patil College of Engineering and Technology

Wardha Road, Nagpur-441 108

NAAC Accredited (A+ Grade)

Third Year (Semester-V) B. Tech. Aeronautical Engineering

BAE3512: Civil Aviation Requirements

Teaching Scheme	
Lectures	03 Hrs/Week
Tutorials	00 Hrs/Week
Total Credits	03

Examination Scheme	
CT-1	15 Marks
CT-2	15 Marks
CA	10 Marks
ESE	60 Marks
Total	100 Marks
Duration of ESE: 03 Hrs	

Course Contents

Unit I	**C.A.R Series 'A': Procedure for Civil Air Worthiness:** Responsibilities of operators / owners; Procedure of CAR issue, amendments etc., Objectives and targets of airworthiness directorate; Airworthiness regulations and safety oversight of engineering activities of operators. **C.A.R. Series 'B': Issue approval of cockpit check list:** MEL, CDL -Deficiency list (MEL & CDL); Preparation and use of cockpit check list and emergency list.
Unit II	**C.A.R. Series 'C' - Defect Recording, Monitoring, Investigation and Reporting:** Defect recording, reporting, investigation, rectification and analysis; Flight report; Reporting and rectification of defects observed on aircraft; Analytical study of in-fight readings & recordings; Maintenance control by reliability Method. **C.A.R. Series 'D': Aircraft Maintenance Programmes**: Reliability Programme (Engines); Aircraft maintenance programme & their approval; On condition maintenance of reciprocating engines; TBO, Revision programme, Maintenance of fuel and oil uplift and consumption records, Light aircraft engines; Fixing routine maintenance periods and component TBOs, Initial & revisions.
Unit III	**C.A.R. Series 'E': Approval of Organisations:** Approval of organizations in categories A, B, C, D, E, F, & G; Requirements of infrastructure at stations other than parent base. **C.A.R. Series 'F': Air Worthiness and Continued Air Worthiness**: Procedure relating to registration of aircraft; Procedure for issue / revalidation of Type Certificate of aircraft and its engines / propeller; Issue /revalidation of Certificate of Airworthiness; Requirements for renewal of Certificate of Airworthiness.
Unit IV	**C.A.R. Series 'L' - Aircraft Maintenance Engineer – Licensing:** Issue of AME license, its classification and experience requirements, Complete Series 'L'. C.A.R. Series 'M': Mandatory Modifications and Inspections: Mandatory Modifications / Inspections.
Unit V	**C.A.R. Series 'T' - Flight Testing of Aircraft:** Flight testing of (Series) aircraft for issue of C of A; Fight testing of aircraft for which C or A had been previously issued. **C.A.R. Series 'X': Miscellaneous Requirements**: Registration Markings of aircraft; Weight and balance control of an aircraft; Provision of first aid kits & Physician's kit in an aircraft; Use furnishing materials in an aircraft; Concessions; Aircraft log books; Document to be carried on board on Indian registered aircraft; Procedure for issue of taxy permit; Procedure for issue of type approval of aircraft components and equipment including instruments.

Text Books

1	"Aircraft Manual (India)", Volume - Latest Edition , The English Book Store, 17- 1,Connaught Circus, New Delhi.(Old Edition 2003)
2	"Aeronautical Information Circulars (relating to Airworthiness)", from DGCA, Advisory Circulars.

Useful Links

1	https://nptel.ac.in/content/syllabus_pdf/101104005.pdf

2	https://nptel.ac.in/courses/112/103/112103111/
3	https://nptel.ac.in/courses/112/103/112103112/

	Course Outcomes	CL	Class Sessions
BAE3512.1	**Acquire** knowledge of Airworthiness requirements for transport, military, gliders and micro light aircrafts	1	9
BAE3512.2	**Perform** defect recording, reporting, investigation, rectification and analysis	2	9
BAE3512.3	**Acquire** Knowledge of procedure for holding examinations, proficiency checks etc.	2	9
BAE3512.4	**Perform** procedure relating to registration of aircraft and fulfill the requirements for grant of civil licenses.	2	9
BAE3512.5	**Acquire** Knowledge of Issue/validation and renewal of Certificate of Airworthiness and to determine airworthiness of ageing aircraft.	3	9

Tulsiramji Gaikwad-Patil College of Engineering and Technology

Wardha Road, Nagpur-441 108

NAAC Accredited (A+ Grade)

Third Year (Semester-V) B. Tech. Aeronautical Engineering

BAE3513: Aircraft Systems

Teaching Scheme	
Lectures	**03 Hrs/Week**
Tutorials	**00 Hrs/Week**
Total Credits	**03**

Examination Scheme	
CT-1	15 Marks
CT-2	15 Marks
CA	10 Marks
ESE	60 Marks
Total	100 Marks
Duration of ESE: 03 Hrs	

Course Contents

Unit I	**Airplane Control Systems** Conventional Systems, Power assisted and fully powered flight controls, Power actuated systems, Engine control systems, Push pull rod system, flexible push pull rod system Modern control systems, Digital fly by wire systems, Auto pilot system active control Technology, Communication and Navigation systems Instrument landing systems, VOR - CCV case studies.
Unit II	**Aircraft Hydraulic Systems** Hydraulic systems, Study of typical workable system, components, Hydraulic system controllers, Modes of operation.
Unit III	**Pneumatic and Hybrid Systems** Pneumatic systems, Advantages, Working principles, Typical Air pressure system, Brake system, Typical Pneumatic power system, Components, Landing Gear systems, Classification, Shock absorbers, Retraction mechanism.
Unit IV	**Engine Systems** Fuel systems for Piston and jet engines, Components of multi engines. Lubricating systems for piston and jet engines, Starting and Ignition systems, Typical examples for piston and jet engines.
Unit V	**Auxiliary System** Basic Air cycle systems, Vapour Cycle systems, Boost-Strap air cycle system, Evaporative vapour cycle systems, Evaporative air cycle systems, Oxygen systems, Fire protection systems, Deicing and anti-icing systems. **Aircraft Instruments** Flight Instruments and Navigation Instruments, Gyroscope, Accelerometers, Air speed Indicators, TAS, EAS, Mach Meters, Altimeters, Principles and operation, Study of various types of engine instruments, Tachometers, Temperature gauges, Pressure gauges, Operation and Principles.

Text Books

1	McKinley, J.L., and Bent, R.D., "Aircraft Maintenance & Repair", McGraw-Hill, 1993.
2	"General Hand Books of Airframe and Power plant Mechanics", U.S. Dept. of Transportation, Federal Aviation Administration, The English Book Store, New Delhi1995.

Reference Books

1	Allan G. Seabridge and Ian Moir, "Design and Development of Aircraft Systems: An Introduction ", (AIAA Education Series), 2004.

Useful Links

1	https://nptel.ac.in/courses/101/104/101104071/
2	https://nptel.ac.in/courses/101/104/101104071/

	Course Outcomes	CL	Class Sessions
BAE3513.1	**Describe** the working principles of control systems in an aircraft.	2	9
BAE3513.2	**Summarize** the operations of Hydraulic, Pneumatic and Landing gear systems.	2	9
BAE3513.3	**Illustrate** the concepts of starting, ignition, fuel and lubricating systems of typical aircraft power plants.	3	9
BAE3513.4	**Discuss** the ideas of air cycle systems along with fire protection, deicing and anti-icing systems.	3	9
BAE3513.5	**Explain** the technical aspects of aircraft instruments and their working principle.	2	9

Tulsiramji Gaikwad-Patil College of Engineering and Technology

Wardha Road, Nagpur-441 108

NAAC Accredited (A+ Grade)

Third Year (Semester-V) B. Tech. Aeronautical Engineering

BSH3501: Aviation Laws

Teaching Scheme	
Lectures	03 Hrs/Week
Tutorials	00 Hrs/Week
Total Credits	02

Examination Scheme	
CT-1	15 Marks
CT-2	15 Marks
CA	10 Marks
ESE	60 Marks
Total	100 Marks

Duration of ESE: 03 Hrs

Course Contents

Unit I	**Introduction to Aviation Law:** Evolution of Aviation law: Global Perspective, Need of Aviation law: Its scope and purposes, Evolving aviation industry: global perspective, Origin of Aviation law, Situations where it is applicable (examples), Important international conventions.
Unit II	**Evolution of Aviation law:** Indian Perspective, Its origin in colonial time Development since then: Major amendments, Major incidents which highlighted need of stricter law, like 1999 hijacking Indian Airlines Flight 814, Important aviation legislations in India (names only or brief info., as details will be given later in course)
Unit III	**Aviation Law in India:** The Aircraft Act, 1934, Historical background, Objectives and purposes of the act, Its salient features, Important provisions, The Carriage by Air Act, 1972. Historical background, Objectives and purposes of the act, Its salient features, Important provisions. The Anti-Hijacking Act, 2016, Historical background Objectives and purposes of the act, Its salient features, Important provisions.
Unit IV	**Aviation Law in India: Role of Judiciary:** This module will cover development of case law in India regarding Aviation Law.It will track landmark judgments through the course of time. **Recent developments in Aviation Law:** Recent developments, Problems in application of Air Laws, Airport management, Technological developments and law, Emerging trends in Aviation Law.
Unit V	**Recent developments:** Problems in application of Air Laws, Airport management, Technological developments and law, Emerging trends in Aviation Law, Career options, growing scope of Aviation Law, Opportunities in India, International opportunities, Qualities/qualifications required to be an Aviation Law practitioner.

Text Books

1	A Guide to India's Aviation Law, Vikrant Pandaya Thomson Reuters South Asia Private
2	Law of Carriage, Avtar Singh, Eastern Book Company
3	A Study About Aviation Rishiraj Singh Rathore Notion press

Reference Books

1	Fundamentals of Aviation Law Hardcover – Import, 16 August 2006 Raymond Speciale

Useful Links	
1	https://www.youtube.com/live/iCseLzh5u_o?feature=shared
2	https://youtu.be/fam0MsbwmxM?feature=shared
3	https://youtu.be/70NJaVCCx10?feature=shared

	Course Outcomes	CL	Class Sessions
BSH3501.1	**Understand** Evolution of Aviation law and Origin of Aviation law	2	8
BSH3501.2	**Explanation** Historical background, Objectives and purposes of the act, Its salient features, Important provisions.	2	8
BSH3501.3	**Describe** application of Air Laws, Airport management, Technological developments and law,	2	8
BSH3501.4	**Summarize** Important aviation legislations in India	2	8
BSH3501.5	**Illustrate** Emerging trends in Aviation Law.	2	8

Head Of Department
Aeronautical Engineering
Tulsiramji Gaikwad- Patil
College Of Engineering And
Technology, Nagpur

Dean Academics
Tulsiramji Gaikwad-Patil
College Of Engineering
and Technology, Nagpur

Vice Principal
Tulsiramji Gaikwad-Patil
College Of Engineering &
Technology, Nagpur.

29/08/23

Principal
Tulsiramji Gaikwad Patil College Of
Engineering and Technology, Nagpur