TULSIRAMJI GAIKWAD-PATIL COLLEGE OF ENGINEERING & TECHNOLOGY
Wardha Road, Nagpur - 441108
Accredited with NAAC A+ Grade
Approved by AICTE, New Delhi, Govt. of Maharashtra
(An Autonomous Institution Affiliated to Rashtrasant Tukadoji Maharaj Nagpur University, Nagpur)

DEPARTMENT OF AERONAUTICAL ENGINEERING

Teaching Scheme & Syllabus (As per NEP_2020)

SCHEME OF INSTRUCTION & SYLLABI

Semester -Fourth

Programme: Aeronautical Engineering

From

Academic Year 2024-25

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

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. Undergraduate students will acquire knowledge to investigate and solve Aeronautical Engineering problems using basics of applied science and engineering.
2. Undergraduate 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. Undergraduate 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. Undergraduate students will contribute in the domain specific and interdisciplinary 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.
- Undergraduates will be able to utilize the extensive knowledge of design, manufacturing, testing or maintenance of systems and sub systems to pursue career in aeronautical engineering.

Department of Aeronautical Engineering

Scheme of Instructions: Second Year (IV Sem) B. Tech in Aeronautical Engineering

S N.	Sem	Type	BoS/ Dept	Sub Code	Subject	T/P	Contact Hours			Credits	% Weightage			ESE Duration	Total Marks
							L	P	Hrs		CT/IA	CA	ESE		
1	IV	PCC	AE	BAE32401	Fundamentals of Thermodynamics	T	3	-	3	3	30	10	60	3 Hrs	100
2	IV	PCC	AE	BAE32402	Aerodynamics-I	T	3	-	3	3	30	10	60	3 Hrs	100
3	IV	PCC	AE	BAE32403	Aerospace Materials	T	3	-	3	3	30	10	60	3 Hrs	100
4	IV	PCC	AE	BAE32404	Fundamentals of Thermodynamics Lab	P	-	-	-	1	-	25	25	2 Hrs	50
5	IV	PCC	AE	BAE32405	Aero Modeling Lab	P	-	-	-	1	-	25	25	2 Hrs	50
6	IV	VSEC	AE	BAE32407	Computer Aided Drafting Lab	P	-	-	-	2	-	50	50	2 Hrs	100
7	IV	OEC	-	B$$324XX	Open Elective-II	T	3	-	3	2	14	6	30	3 Hrs	50
8	IV	HSSM	MBA	BBA32401	Industrial Management	T	2	-	2	2	14	6	30	2 Hrs	50
9	IV	AEC	BSH	BSH32404	Leadership and Team Dynamics	T	2		2	2	14	6	30	2 Hrs	50
10	IV	MDM	ME	BME32410	Advance Manufacturing Technology	T	2	-	2	2	14	6	30	2 Hrs	50
Total							**18**	**08**	**26**	**21**	**146**	**154**	**400**	**24 Hrs**	**700**

Course Category	HSSM (Humanities Social Science & Management)	BSC (Basic Science Course)	ESC (Engg. Science Course)	PCC (Programme Core Courses)	PEC (Program Elective Courses)	OEC (Open Elective Courses)	MDM (Multi-disciplinary Courses)	VSEC (Vocational and Skill Course)	ELC/FP/CEP (Experiential Learning Courses)	CC (Liberal Learning Courses)
Credits	4	--	--	11	--	2	2	2	--	--
Cumu. Sum	12	16	13	22	--	6	4	6	2	4

Progressive Total Credits =65+20 = 85

BoS Chairman	Dean Academics	Vice Principal	Principal	Dec, 2024 Date of Release	1.00 Version	Applicable For AY 2024-25 Onwards

24/12/24

Dr. Pragati Patil
Vice-Principal
Tulsiramji Gaikwad Patil College of Engineering and Technology, Nagpur

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

Dean Academics
Tulsiramji Gaikwad Patil College of Engineering & Technology, Nagpur

Programme: B. Tech. Aeronautical Engineering

List of **Program Electives** offered by Department of Aeronautical Engineering

Program Elective- I	Program Elective-II	Program Elective- III	Program Elective- IV
Semester V	**Semester VI**	**Semester VI**	**Semester VII/ VIII**
BAE33504: Boundary Layer Theory	**BAE33604:** High Speed Aerodynamics	**BAE33608:** Control Theory & Systems	**BAE34803:** Unmanned Aerial Vehicles & Systems
BAE33505: Aircraft Systems & Instruments	**BAE33605:** Spacecraft Technology	**BAE33609:** Aviation Management	**BAE34804:** Composite Materials & NDT
BAE33506: Space Flight Mechanics	**BAE33606:** Aircraft Navigation & Communication Systems	**BAE33610:** Helicopter Engineering	**BAE34805:** Vibrations and Aero-elasticity
BAE33507: Industrial Aerodynamics	**BAE33607:** Aircraft Maintenance & Repair	**BAE33611:** Finite Element Methods (FEM)	**BAE34806:** Computational Fluid Dynamics

Program: B. Tech. Aeronautical Engineering

List of **Open Electives** offered by Department of Aeronautical Engineering

Open Elective-I	Open Elective-II	Open Elective-III
Semester-III	**Semester-IV**	**Semester-V**
BAE32310: Introduction to Aerospace Engineering	**BAE32406 :** Avionics	**BAE32511:** Unmanned Aerial Systems

Course Category	HSSM (Humanities Social Science & Manag.)	BSC (Basic Science Course)	ESC (EngineeringScience Course.)	PCC (ProgrammeCore Courses	PEC (Programme Elective Courses)	OEC (Open Elective Courses)	MDM (Multi-disciplinary Course)	SEC (Skill Course)	ELC/FP/CEP Experimential Learning Courses)	CC (Liberal Learning Courses)	Semester Wise Credits
Semester-I	04	08	05	--	--	--	--	02	--	02	**21**
Semester-II	02	08	08	--	--	--	--	02	--	02	**22**
Semester-III	02	--	--	11	--	04	02	--	02	--	**21**
Semester-IV	04	--	--	11	--	02	02	01	--	--	**20**
Semester-V		--	--	12	03	02	03	--	--	--	**20**
Semester-VI		--	--	11	06	--	03	02	--	--	**22**
Semester-VII		--	--	04	04	--	--	--	12	--	**20**
Semester-VIII		--	--	06	04	--	03	--	08	--	**21**
Cumu. Sum	**12**	**16**	**13**	**55**	**17**	**08**	**13**	**07**	**22**	**04**	**167**

Chairperson	Dean Academics	Vice Principal	Principal	June, 2024 Date of Release	1.00 Version	Applicable For AY 2024-25 Onwards

Dr. Prajati Patil
Vice-Principal
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Principal
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Head Of Department
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Dean Academics
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Second Year (Semester-IV) B. Tech. Aeronautical Engineering

BAE32401: Fundamental of Thermodynamics

2nd Year- (4th Semester)

BAE32401: Fundamental of Thermodynamics

Teaching Scheme			**Examination Scheme**	
Lectures	3 Hr / Week		**ESE**	60 Marks
Tutorial	-		**CIE**	40 Marks
Practical	-		**Total**	100 Marks
Theory Credits: 3			**Duration of Exam:** 3 Hours	

Course Objectives

The Objectives of this course are:

1.	To understand the basic concept of thermodynamics.
2.	To understand thermodynamic systems and properties, relationships among the thermos-physical properties, the laws of thermodynamics and applications of these fundamental laws in thermodynamic systems
3.	To present a comprehensive and rigorous treatment of classical thermodynamics while retaining an engineering perspective.
4.	explain the working principle of various power cycles used in thermal systems.

Course Contents

Unit I	**Fundamental Concepts and Definition** Basic concepts: System boundary, surroundings, state, extensive and intensive properties, energy interactions, work and heat transfers, equilibrium, quasi-static and reversible processes, non-equilibrium and irreversible processes. Thermodynamic state, state point, state diagram, path and process, quasi-static process, cyclic and non-cyclic processes; Thermodynamic equilibrium; definition, mechanical equilibrium; diathermic wall, thermal equilibrium, chemical equilibrium. Zeroth law of thermodynamics, Temperature; concepts, scales, fixed points and measurements.
Unit II	**First Law of Thermodynamics** Closed Systems (Control mass system), Work done, change in internal energy, Heat transferred during various thermodynamic processes, P-V diagrams. Open systems (Control volume systems), Thermodynamic analysis of control volumes, Conservation of energy principle, Flow work and enthalpy.
Unit III	**Second Law of Thermodynamics** Introduction (Law of degradation of energy), Thermal energy reservoirs, Kelvin-Plank and Clausius statements, Heat engines, Refrigerator and Heat pump, Perpetual motion machines, Reversible and Irreversible processes, Carnot cycle, Thermodynamic temperature scale. Entropy: The Clausius inequality, Entropy, Principle of increase of entropy, Change in entropy for Closed and Steady flow open systems. Second law analysis of engineering systems: Availability, Reversible work, Irreversibility, Temperature-entropy diagram.
Unit IV	**Properties of steam:** Critical state, Sensible heat, Latent heat, Super heat, Wet steam, Dryness fraction, Internal energy of steam, External work done during evaporation, T-S diagram, Mollier chart, Work and Heat transfer, Simple and Modified Rankine cycle with reheat and regeneration, Conditions for exact differentials. Maxwell relations, Clapeyron equation, Joule-Thompson

	coefficient and Inversion curve. Coefficient of volume expansion, Adiabatic and Isothermal compressibility.
Unit V	**Air Standard and Gas power cycles:** Closed and open systems, polytrophic processes, cyclic processes, Carnot cycle, Otto cycle, Diesel cycle, Stirling and Ericsson cycle, Brayton cycle, ideal and real cycles, design point analysis. Applications i) Nozzles and Diffusers ii) Turbine and Compressors iii) Throttle Valves. Basics of Aero Engines operations, cycles involved types of engines, application in aerospace.

Text Books	
1	Thermodynamics: An engineering approach by Yunus Cengal, M. A. Boles, McGraw Hill Education, 9th Edition, 2019.
2	Thermodynamics by C. P. Arora, Tata Mc-Graw Hill Publication, 1st Edition,2004.
3	Fundamentals of classical Thermodynamics by G. J. V. Wylen, R. E. Sonntag, C. Borgnakke, John Wilev & Sons, 4th Edition, 2014.
Reference Books	
1	Engineering Thermodynamics by P. K. Nag, Tata Mc-Graw Hill Pub1ication,6th Edition,2017.
2	Fundamentals of engineering Thermodynamics by R. K. Rajput, Laxmi Publications, 4th Edition 2016.
Useful Links	
1	https://nptel.ac.in/courses/l12/105/112105123/
2	https://nptel.ac.in/courses/l12/104/112104113/
3	https://nptel.ac.in/courses/101/106/101106082/

BAE32301	**Course Outcomes**	**CL**	**Class Sessions**
CO1	**Explain** thermodynamics concepts, relate laws of the ideal gas, identify various thermodynamic processes and apply the laws to determine the energy transfer in terms of heat and work.	**3**	**9**
CO2	**Explain** the first law of thermodynamics and apply the law to evaluate open, closed systems, thermal components and devices.	**3**	**9**
CO3	**Interpret** the second law of thermodynamics, entropy, and apply the law to evaluate heat engine, heat pump, and refrigerator performance.	**3**	**9**
CO4	**Relate** various steam properties and analyze the different types of processes using steam as working fluid to determine the energy transfer in terms of heat and work.	**4**	**9**
CO5	**Compare** various power cycles and analyze the cycles to determine the energy transfer in terms of heat, work and efficiency.	**2**	**9**

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Second Year (Semester-IV) B.Tech. Aeronautical Engineering

BAE32402: Aerodynamics-I

2nd Year- (4th Semester)

BAE32402: Aerodynamics-I

Teaching Scheme		Examination Scheme	
Theory	3 Hrs/Week	CT-I	15 Marks
Tutorial	0 Hrs/Week	CT-II	15 Marks
Total Credits	3	CA	10 Marks
Duration of ESE: 3 Hrs		ESE	60 Marks

Course Contents

Unit I	**Review of Basic Fluid Mechanics:** Derivation of Continuity, momentum and energy Equation in both Cartesian and polar coordinates, Control volume approach to Continuity, momentum and energy equation, continuum analysis, Euler equation, incompressible Bernoulli's equation from momentum equation, Types of flow, pathlines, streamlines, and streaklines, units and dimensions, inviscid and viscous flows, compressibility, Mach number regimes. Vorticity, Angular velocity, Stream function, velocity potential function, Circulation, Numericals, Mach cone and Mach angle, Speed of sound. Characterizations of Aerodynamic Forces and Moments, Airfoil Geometry Parameters, Wing Geometry Parameters, Aerodynamic Force and Moment Coefficients, Wings of Finite Spans.
Unit II	**Potential Flow Theory:** Uniform flow, Source flow, Sink flow, Combination of a uniform flow with source and sink. Doublet flow. Non-lifting flow over a circular cylinder. Vortex flow. Lifting flow over a circular cylinder. Kutta Joukowski theorem and generation of Lift, D'Alembert's paradox, real flow over smooth and rough cylinder, Numericals.
Unit III	**Incompressible flow Over aerofoil** - Incompressible flow over airfoils: Kelvin's circulation theorem and the starting vortex, vortex sheet, Kutta condition, Cauchy-Riemann relations, complex potential, methodology of conformal transformation, Kutta Joukowski transformation and its applications, Classical thin airfoil theory for symmetric and cambered airfoils. Kutta-Joukowski theorem and generation of Lift, Numericals.
Unit IV	**Incompressible flow over Finite Wing** - Nomenclature of Finite Wing Effect of Aspect ratio and Tapered ratio on Wing Lift , Biot-Savart law and Helmholtz's theorems, Vortex filament: Infinite and semi-infinite vortex filament, Induced velocity. Prandtl's classical lifting line theory: Downwash and induced drag. Elliptical and modified elliptical lift distribution. Lift distribution on wings. Limitations of Prandtl lifting line theory. Extended lifting line theory- lifting surface theory, vortex lattice method for wings. Lift, drag and moment characteristics of complete airplane.

Unit V	**Applications of Finite Wing Theory and High Lift Systems:** Simplified horse-shoe vortex model, formation flight, influence of downwash on tail plane, ground effects. Swept wings: Introduction to sweep effects, swept wings, pressure coefficient, typical aerodynamic characteristics, Subsonic and Supersonic leading edges. Introduction to high-lift systems, flaps, leading-edge slats and typical high, lift characteristics. Critical Mach numbers, Lift and drag divergence, shock induced separation, Effects of thickness, camber and aspect ratio of wings, Transonic area rule, Tip effects. Introduction to Source panel & vortex latice method.

Text Books	
1	Anderson, J.D., "Fundamentals of Aerodynamics", McGraw Hill Book Co., 2nd Ed., 2010.
2	Houghton, E.L., and Caruthers, N.B., "Aerodynamics for Engineering students", Edward Arnold Publishers Ltd., London, 5th Ed., 1989.
3	White, F. M., Fluid Mechanics, McGraw Hill, 7th Ed., Special Indian Edition, 2011.
Reference Books	
1	Panton, R. L., Incompressible Flow, 3rd Ed., Wiley India Edition, 2006.
2	Cengel, Y. A., Cimbala, J. M., Fluid Mechanics: Fundamentals and Applications, McGraw-Hill Higher Education, 6th Ed., 2006.
Useful Links	
1	https://nptel.ac.in/courses/101/105/101105059/
2	https://nptel.ac.in/content/storage2/courses/101105023/Mod1L1.pdf
3	https://nptel.ac.in/courses/101/105/101105023/

BAE32402	Course Outcomes	CL	Class Sessions
CO1	**Determine** aerodynamic forces and moments on aerofoil through the understanding of basic principles and governing equations of fluid mechanics.	3	9
CO2	**Evaluate** typical airfoil characteristics and two-dimensional flows over airfoil	3	9
CO3	**Compute** and analyze the incompressible flow over finite wings	4	9
CO4	**Apply** finite wing theory and design high lift systems from the aerodynamics viewpoint.	4	9
CO5	**Depict** the effect of three-dimensional effect on the aerodynamic forces and related effects on wing.	4	9

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Second Year (Semester-IV) B. Tech. Aeronautical Engineering

BAE32403: Aerospace Materials

2nd Year- (4th Semester)

BAE32403: Aerospace Materials

Teaching Scheme			**Examination Scheme**	
Lectures	3 Hr / Week		**ESE**	60 Marks
Tutorial	-		**CIE**	40 Marks
Practical	-		**Total**	100 Marks
Theory Credits : 3			**Duration of Exam :** 3 Hours	

Course Objectives

The Objectives of this course are:

1.	**Acquire** knowledge of different aerospace materials & their properties.
2.	**Understand** the manufacturing processes of composite materials
3.	**Characteristics** and Applications of various Materials.
4.	**Acquire** knowledge of smart materials

Course Contents

Unit-I	**Introduction to aerospace materials** Classification, composition, properties, heat treatment & application of plain carbon steels, alloy steels. Stainless steels. Classification, composition, properties, heat treatment and application of aluminum and its alloys. Titanium alloys, Special alloys for high temperature.
Unit-II	**Composite Materials** Definition, classification of composite materials, classification of reinforcement, particulate, short fiber, whiskers, long fibers composites. Matrix materials, metals, ceramics, polymers (including thermoplastics and thermosets), Carbon Composites MMC with particulate and short fiber reinforcement, liquid and solid state processing of MMC, stir casting, squeeze casting. Properties of MMCs, Applications of Al, Mg, Ti based MMC.
Unit-III	**Manufacturing of advanced composites** Polymer matrix composites: Preparation of moulding compounds and prepregs, hand layup method Autoclave method, Filament winding method, Compression moulding, Reaction injection moulding. Manufacturing of Metal Matrix Composites: Casting – Solid State diffusion technique, Cladding, Hot isostatic pressing.
Unit-IV	**Mechanical Properties** Tensile test, plastic deformation mechanisms, slip and twinning, role of dislocations in slip strengthening methods, strain hardening, refinement of the grain size, solid solution strengthening precipitation hardening, creep resistance, creep curves, mechanisms of creep, creep-resistant materials, fracture, the Griffith criterion, critical stress intensity factor and its determination, fatigue failure, fatigue tests, methods of increasing fatigue life, hardness, Rockwell and Brinell hardness, Knoop and Vickers micro

	hardness, Fracture and Fatigue, Stress Intensity Factor, Crack Growth Rate Derivation.
Unit-V	**Smart Materials** Ferromagnetism, domain theory, types of energy, hysteresis, hard and soft magnetic materials, ferrites, dielectric materials, types of polarization, Langevin-Debye equation, frequency effects on polarization, dielectric breakdown, insulating materials, Ferroelectric materials, superconducting materials and their properties. Smart materials like Piezoelectric materials, Shape Memory Alloys (SMA), magneto-strictive materials, Electro-rheological Fluids, Magneto Rheological Fluids. etc

Text Books	
1	Material Science and Technology: A comprehensive Treatment by R. W. Cahn, P. Haasen, E. J. Kramer, Tsu-Wei Chou, Wiley-VCH; Volume 13 edition, 1993.
2	Composite Materials by K. K. Chawla, Springer-Verlag, New York, 1st edition, 1987.
3	The Analysis of laminated Composite Structures by Calcote, L. R., Von-Noastrand Reinhold, 1st edition, 1970.
Reference Books	
1	G. Askeland, D. "Materials Science and Engineering", Brooks Cole, 3rd edition, 2010.
2	Smith, W.F., Hashemi, J. and Prakash, R., "Materials Science and Engineering", Tata McGraw Hill, A. 5th edition, 2016.
Useful Links	
1	https://nptel.ac.in/courses/101/104/101104010/
2	https://nptel.ac.in/courses/101/106/101106038/
3.	https://nptel.ac.in/courses/101/105/101105084/

BAE32403	**Course Outcomes**	**CL**	**Class Sessions**
CO1	**Apply** the knowledge of properties and classification of materials inselection of materials for aerospace applications.	**2**	**9**
CO2	**Examine** the uses of composite materials in aircraft structures.	**2**	**9**
CO3	**Apply** the knowledge of different composite materials manufacturing processes for selecting appropriate processes for particular material.	**3**	**9**
CO4	**Apply** the knowledge for selection of appropriate tests for particular application through understanding different mechanical propertiesand testing methods.	**3**	**9**
CO5	**Comprehend** application of advanced materials in the aviation industry.	**4**	**9**

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Second Year (Semester-IV) B. Tech. Aeronautical Engineering

BAE32404: Fundamental of Thermodynamics Lab

2nd Year- (4th Semester)

BAE32404: Fundamental of Thermodynamics 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 Hours	

Course Objectives

The Objectives of this course are:

1	Acquire knowledge on 4-stroke petrol and diesel engine.
2	Study the performance of air compressor.
3	Study the performance of steam turbine.
4	Determine the specific heat.
5	Determine the thermal conductivity of various materials.

Sr. No.	List of Experiment	CO
1	Performance Morse test on 4-stroke petrol engine	**1**
2	Performance evaluation of 4-stroke petrol engine without Morse test	**1**
3	Performance test on single cylinder 4-stroke diesel engine	**1**
4	Performance test of reciprocating air compressor	**2**
5	Study of steam turbine engine	**2**
6	Determination of specific heat of solid	**3**
7	Determination of thermal conductivity of solid (metal rod)	**3**
8	Determination of thermal conductivity of insulating powder	**4**
9	Determination of thermal conductivity of liquid	**4**
10	Determination of thermal resistance of composite wall	**5**

Text Books

1	Thermodynamics: An engineering approach by Yunus Cengal, M. A. Boles, McGraw Hill Education, 9th Edition, 2019.
2	Thermodynamics by C. P. Arora, Tata Mc-Graw Hill Publication, 1st Edition,2004.
3	Fundamentals of classical Thermodynamics by G. J. V. Wylen, R. E. Sonntag, C. Borgnakke, John Wilev & Sons, 4th Edition, 2014.

Reference Books	
1.	Engineering Thermodynamics by P. K. Nag, Tata Mc-Graw Hill Pub1ication,6th Edition,2017.
2.	Fundamentals of engineering Thermodynamics by R. K. Rajput, Laxmi Publications, 4th Edition 2016.
Useful Links	
1	https://nptel.ac.in/courses/l12/105/112105123/
2	https://nptel.ac.in/courses/l12/104/112104113/

BAE32304	**Course Outcomes**	**CL**	**Class Sessions**
CO1	**Demonstrate** 4-stroke petrol and diesel engine performance.	**3**	**9**
CO2	**Estimate** the performance of air compressor.	**3**	**9**
CO3	**Estimate** the performance of steam turbine.	**3**	**9**
CO4	**Evaluate** the specific heat.	**4**	**9**
CO5	**Evaluate** the thermal conductivity of various materials.	**2**	**9**

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Second Year (Semester-IV) B. Tech. Aeronautical Engineering

BAE32405: Aero Modeling Lab

2nd Year- (4th Semester)

BAE32405: Aero Modeling 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 Hours	

Course Objectives

The Objectives of this course is to:

1	Configure different types of aircrafts
2	Develop the unpowered aircraft models
3	Develop the powered aircraft models
4	Understand the flight simulator working
5.	Explore flying using remote controlled aircraft.

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.	**3**
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**

Text Books

1	John D. Anderson, Jr., "Introduction to Flight", Mc-Graw Hill, 3rd edition, 1995.
2.	Lalit Gupta and O P Sharma, Fundamentals of Flight, Vol-I to Vol-IV, Himalayan Books, 1st edition,2006
3.	John D. Anderson, Jr., "The Airplane - History of its Technology", AIAA Series, 1st edition, 2002.

Reference Books

1.	G. P. Sutton, O.Biblarz,"Rocket Propulsion Elements", John Wiley & Sons, 7th edition, 2001.
2.	A. C. Kermode, "Flight without Formulae", Pearson Education, 5th edition, 2004.
3.	S. K. Ojha, "Flight Performance of Aircraft", AIAA Series, 1st edition, 1995.

Useful Links

1	https://nptel.ac.in/courses/101/101/101101079/
2	https://nptel.ac.in/courses/101/105/101105059/

BAE32305	**Course Outcomes**	**CL**	**Class Sessions**
CO1	**Compare** different aircraft configurations	**3**	**9**
CO2	**Develop** different components of aircraft models (unpowered) with given material.	**3**	**9**
CO3	**Develop** different components of aircraft models (powered) with given material.	**3**	**9**
CO4	**Explore** the flight test of aircraft models on flight simulator.	**3**	**9**
CO5	**Explore** the flight test of prepared aircraft models.	**2**	**9**

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Second Year (Semester-IV) B. Tech. Aeronautical Engineering

BAE32407: Computer Aided Drafting Lab

2nd Year- (4th Semester)

BAE32407: Computer Aided Drafting Lab

Teaching Scheme			Examination Scheme	
Practical	**4 Hrs/week**		**CA**	**50 Marks**
Total Credit	**2**		**ESE**	**50 Marks**
			Total	**100 Marks**
			Duration of ESE: 02 Hours	

Course Objectives

The Objectives of this course are:

1	Draw different components using computer aided design software.
2	Develop a procedure to prepare aircraft structures.
3	Explore different tools and workbenches in CAD software required for preparing different components.
4	Implement the basic CAD knowledge in developing complex structures
5	Develop fuselage, Propeller assembly hub and wing assembly

Sr. No.	List of Experiment	CO
1	Preparing application of common introductory tools in CATIA and common introductory tools in CATIA	1,2
2	Preparing fully constraint two dimensional sketches with basic tools following all the dimensioning rules	1,2
3	Preparing fully constraint two dimensional sketches with advanced tools following all the dimensioning rules	1,2
4	Preparing different three dimensional solid models using basic tools.	1,2,3
5	Preparing different three dimensional solid models using advanced tools.	1,2,3
6	Preparing different three dimensional surface/ wireframe models	1,2,3
7	Exploring CAD software library for fasteners & keys and making similar machine elements	1,2,3
8	Designing and modeling of propeller and hub assembly	4, 5
9	Designing and modeling of wing assembly	4, 5
10	Designing and modeling of landing gear assembly	CO4, CO5

Text Books	
1	Principles of CAD/CAM/CAE by Kunwoo Lee, Pearson, 3rd Ed., 2003.
2	CAD/CAM/CAE by Farazdak Haideri, Tech-Neo Publications, LLP, 1st Ed., 2019.
3	
Reference Books	
1.	Computer Aided Design: A Conceptual Approach by Jayanta Sarkar, CRC Press, 4th Ed., 2017.
2.	
Useful Links	
1	https://nptel.ac.in/courses/l12/104/112104113/
2	

BAE32307	Course Outcomes	CL	Class Sessions
CO1	**Prepare** different components and aircraft structures using computer aided design and modeling software	3	9
CO2	**Utilize** the procedure of preparing different components and aircraft structures	3	9
CO3	**Exploit** different tools and workbenches in CAD software required for preparing different components and aircraft structures	3	9
CO4	**Apply** the knowledge of basic CAD to develop hub and wing assembly	4	9
CO5	**Apply** the knowledge of basic CAD to develop fuselage and propeller assembly	2	9

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Second Year (Semester-IV) B. Tech. Aeronautical Engineering

BAE32406: Avionics

2nd Year- (4th Semester)- Open Elective-II

BAE32406: Avionics

Teaching Scheme			**Examination Scheme**	
Lectures	2 Hr / Week		CT-I	7 Marks
			CT-II	7 Marks
			CA	6 Marks
Tutorial	-		ESE	30 Marks
Practical	-		Total	50 Marks
Theory Credits : 2			**Duration of Exam :** 2 Hours	

Course Objectives

The Objectives of this course is:

1.	Understand the aircraft control systems.
2.	Understand the aircraft systems.
3.	Acquire the knowledge of avionics systems.
4.	Analyze analog /digital conversions and use microprocessors.
5.	Understand the functioning of MIL-STD-1553B Data Bus

Course Contents

Unit-I	**Airplane Systems:** Control Surface systems**,** Digital fly by wire systems, Auto pilot system. Basic Hydraulic and Pneumatic systems and its components, Brake system. Basic Fuel systems in Aircraft, lubricating systems - Starting and Ignition systems. Basic Air cycle systems, oxygen & pressurization systems, De-icing and anti-icing systems.
Unit-II	**Aircraft Instruments:** Flight 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.
Unit-III	**Power Distribution System:** Bus Bar, split bus bar system, special purpose cables. Electrical diagram and identification scheme. Circuit controlling devices. Power utilization-typical application to avionics. Need for Avionics in civil and military aircraft. **Flight Deck and Cockpits:** Control and display technologies CRT, LED, LCD, EL and plasma panel, Touch screen, Direct voice input (DVI), MFDS, HUD, MFK, HOTAS. Avionics Systems Integration: Avionics equipment fit. Electrical data bus system. Communication Systems, Navigation systems, Electronic Warfare, and fire control system, Data buses, MIL–STD 1553 B.

Text Books	
1	Ian Moir and Allan Seabridge, 'Aircraft Systems: Mechanical, Electrical and Avionics-Subsystem Integration', Wiley India Pvt Ltd, 3rd edition, 2012, ISBN-13: 978-8126535217.
2	Pallet, E.H.J., "Aircraft Instruments and Integrated Systems", Longman Scientific and Technical, 1996
3	R.P.G. Collinson., "Introduction to Avionics Systems", Springer,3rd edition, 2011, ISBN-13: 978-9400707078
Reference Books	
1	H. Lalit Gupta and OP. Sharma, 'Aircraft Systems (Fundamentals of Flight Vol. IV)', HimalayanBooks;2006.
2	Treager. S, "Gas Turbine Technology", McGraw-Hill, 3rd edition,2013, ISBN-13: 978- 1259064876.
3	R.W. Sloley and W.H. Coulthard, 'The aircraft Engineers Handbook, No 4, Instruments', 6th Edition, 2005, ISBN13: 978-8175980518.
Useful Links	
1	https://nptel.ac.in/courses/101104071
2	https://nptel.ac.in/courses/101/105/101105059/
3.	https://nptel.ac.in/courses/101/105/101105031/

BAE32406	**Course Outcomes**	**CL**	**Class Sessions**
CO1	**Categorize** different types of aircraft systems.	**3**	**9**
CO2	**Identify** the working principle, operational and functions of various instruments in aircraft.	**3**	**9**
CO3	**Perform** analog /digital conversions and use microprocessors and **Handle** functioning of MIL-STD-1553B Data Bus	**4**	**9**

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Second Year (Semester-IV) B. Tech. Information Technology

BSH32404-Leadership and Team Dynamics

2nd Year- (4th Semester)

Leadership and Team Dynamics - BSH32404 (DS/EE/CSE/AE/ECE/ME/BT)

Teaching Scheme		Examination Scheme	
Theory	**2 Hrs/week**	CT-I	7 Marks
Tutorial	**-**	CT-II	7 Marks
Total Credits	**2**	CA	6 Marks
		ESE	30 Marks
		Total	50 Marks
		Duration of ESE: 2Hrs	

Course Objectives:

1.	**To provide** a framework for the students to understand the importance of Leadership and team effectiveness in organizations.
2.	**To develop** an understanding of the interpersonal processes and group dynamics.
3.	**To provide** a theoretical understanding of leadership practices in organizations.

Course Contents

Unit I	**Introduction to Leadership & Team Management:** Leadership Myths; Interactional Framework for analyzing leadership; Leadership Development: The First 90 Days as a Leader; Leader Development- The Action-Observation-Reflection Model, LMX Theory and Normative Decision Model; Situational Leadership Model; Contingency Model and Path Goal Theory; Emotional Approach Charismatic and Transformational Leadership; Leadership for Tomorrow

Unit II	**Leadership Attributes: Personality Traits and Leadership:** Personality Types and Leadership; Intelligence and Leadership; Emotional Intelligence and Leadership, Power and Leadership: The art of influence in leadership: Leadership and "Doing the Right Things: Character-Based Approach to Leadership; Role of Ethics and Values in Organisational Leadership
Unit III	**Leadership Behaviour:** Leadership Pipeline, Assessing Leadership Behaviors: Multi-rater Feedback Instruments: The Dark Side of; Leadership- Destructive Leadership; Managerial Incompetence and Derailment Conflict Management, Negotiation and Leadership, Leadership under a crisis situation: The Situation and the Environment: Culture and Leadership: Global Leadership.

Text Books

T.1	Leadership: Enhancing the lessons of experience by Hughes, R.L., Ginnett, R.C., & Curphy, G.J. (2019), 9th Edition, McGraw Hill Education, Chennai, India.
T.2	Robbins, S.P. Judge, T.A. & Vohra, N., "Organizational Behavior," 18th Ed, Pearson Education. (2019)

Reference Books

R.1	Baron R. A. and Byrne D., "Social Psychology", 10th Ed., Pearson Education, Inc. (2004)
R.2	Luthans F., "Organizational Behavior",10th Ed., McGraw-Hill Companies. (2004)

Useful Links:-

1	https://onlinecourses.nptel.ac.in/noc22_mg39/preview
2	https://nptel.ac.in/courses/110107159

Course Code	Course Outcomes	CL	Class Sessions
BSH32404.1	Explain how global leadership skills contribute to leadership effectiveness.	2	10
BSH32404.2	Understand the leader's role in team-based organizations.	2	10
BSH32404.3	Classify the potential contribution of outdoor training to the development of team leadership.	2	10

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Second Year (Semester-IV) B.Tech. Aeronautical Engineering

BBA32401: Industrial Management

Teaching Scheme			Examination Scheme	
Lectures	2Hrs./week		**CIE**	20 Marks
Tutorial	-		**ESE**	30Marks
TotalCredit	2		**Total**	50Marks
			Duration of ESE:02Hrs. 00Min.	

Course Objective:

1	Student will be able to provide an understanding of fundamental concepts in industrial management.
2	Student will be able to introduce principles of productivity, resource management, and organizational structure.
3	Student will be able to develop decision-making skills for solving industrial problems effectively.

Course Contents		Hours
Unit I	Introduction to Industrial Management: Evolution of Industrial Management, Functions of Management: Planning, Organizing, Staffing, Directing, and Controlling, Role of Industrial Engineers in Management.	**(9)**
UnitII	Productivity and Work Study: Concept and Measurement of Productivity, Techniques for Productivity Improvement, Work Study: Method Study and Time Study	**(9)**
UnitIII	Resource and Operations Management: Resource Planning: Material, Machinery, and Manpower, Inventory Management: EOQ & ABC Analysis, Quality Management: TQM, Six Sigma.	**(9)**

Text Books

1	Koontz, H. & Weihrich, H. – *Essentials of Management*.
2	Bedi, K. – Production and Operations Management.
3	Chase, R. B. & Aquilano, N. J. – Production and Operations Management.

Reference Books

1	Mahajan, M. – Industrial Engineering and Production Management.
2	Buffa, E. S. & Sarin, R. K. – Modern Production and Operations Management.
3	Gopalakrishnan, P. – Materials Management.

Useful Links

https://onlinecourses.nptel.ac.in/noc24_me15/
nptel.ac.in/courses/110/105/110105155/

BBA32401	Course Outcomes	CL
BBA32401.1	**Analyze** the role and significance of industrial management in organizational growth.	**4**
BBA32401.2	**Apply** productivity improvement techniques to enhance industrial efficiency.	**3**
BBA32401.3	**Evaluate** strategies for effective resource utilization and quality control.	**4**

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Second Year (Semester-IV) B.Tech. Mechanical Engineering

BME32410: ADVANCE MANUFACTURING TECHNOLOGY

Teaching Scheme		Examination Scheme	
Lectures	2 Hrs/week	**CT-1**	07Marks
Tutorial	-	**CT-2**	07 Marks
Total Credit	2	**CA**	06 Marks
		ESE	30 Marks
		Total	50 Marks
		Duration of ESE: 02 Hrs.	

Course Objectives

1.	To provide students with an overview of a wide variety of nontraditional machining processes for processing of engineering materials.
2	To learn principles, operations, capabilities, process parameters, economics and application of various nontraditional machining processes.
3	Students will learn principles, operations, capabilities, process parameters, and economic and application of various nontraditional machining processes, various unconventional welding techniques, control parameters & also High Energy Rate Forming Process.
4	Overview of a wide variety of nontraditional machining processes for processing of engineering materials.
5	To learn principles, operations, capabilities, process parameters, economics and application of various nontraditional machining processes.

Course Contents

Unit I	**Non Traditional Machining process**: Need, classification & historical development. Economics &application of Non-Traditional process for machining. High speed grinding. Hot & Cold machining.
Unit II	**Electro-Chemical Machining:** Electrochemistry of ECM. Electrochemical Grinding. Electric Discharge Machining. Electron Beam, Laser Beam and Plasma Arc Machining.
Unit III	**Unconventional welding techniques**: such as Inert Gas (MIG & TIG), Electric Resistance welding, Oxyacetylene pressure welding, Laser Beam welding, Electron Beam welding, Plasma Arc welding, Atomic Hydrogen welding & Submerged Arc welding, Stud welding.

Text Books	
1	A Text Of Book Manufacturing Technology by Chand And Co. Publication.
2	A Text Of Book Manufacturing Technology II by. Chand And Co. Publication.
Reference Books	
R.1	Elements Of Workshop Technology: Vol.I 1 REVISE Manufacturing Process by Choudhury Hajra,S.K; Choudhury Hajra,A.K;Roy,Nirj har
R.2	Elements Of Workshop Technology-II by Choudhary S.K. ;Choudhary A.K. Nirjhar Roy
R.3	Elements Of Workshop Technology: Vol.I 1 REVISE Manufacturing Process by Choudhury Hajra,S.K; Choudhury Hajra,A.K;Roy,Nirj har
R.4	Elements Of Workshop Technology: Vol.I 1 REVISE Manufacturing Process by Choudhury Hajra,S.K; Choudhury Hajra,A.K;Roy,Nirj har
R.5	Elements Of Workshop Technology-II by Choudhary S.K. ;Choudhary A.K. Nirjhar Roy
Useful Links	
1	https://nptel.ac.in/courses/112/103/112103202/
2	https://www.youtube.com/watch?v=44Db1Z59_eo
3	https://nptel.ac.in/courses/112/107/112107089/

BME32410	**Course Outcomes**	**CL**	**Class Sessions**
BME32410.1	**Interpret** the importance of nontraditional machining processes	2	9
BME32410.2	**Illustrate** the concept of Electro-Chemical Machining, Electrochemical Grinding. Electric Discharge Machining	3	9
BME32410.3	**Discuss** about Unconventional welding techniques such as Inert Gas MIG & TIG	2	9

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