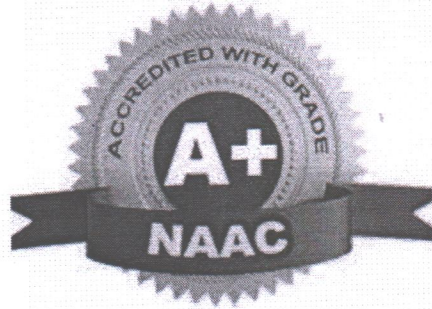


TULSIRAMJI GAIKWAD-PATIL
College of Engineering & Technology
Mohgaon, Wardha Road, Nagpur - 441 108



DEPARTMENT OF AERONAUTICAL ENGINEERING

Structure & Curriculum

From

Academic Year 2021-22



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



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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.
- Solve practical design and analysis problems using advanced tools of aeronautical engineering.
- 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: Second Year B. Tech. in Aeronautical Engineering Semester - IV

Sr. No.	Course Category	Course Code	Course Title	L	T	P	Contact Hrs/Wk	Course Credits	EXAM SCHEME				
									CT-1	CT-2	TA/CA	ESE	TOTAL
1	BSC	BAE2401	Applied Mathematics-IV	3	1	-	4	4	15	15	10	60	100
2	PCC	BAE2402	Design of Machine Elements & Manufacturing Process	3	-	-	3	3	15	15	10	60	100
3	PCC	BAE2403	Aerospace Materials	3	-	-	3	3	15	15	10	60	100
4	ESC	BAE2404	Mechanics of Machines	3	-	-	3	3	15	15	10	60	100
5	PCC	BAE2405	Aerodynamics-I	3	-	-	3	3	15	15	10	60	100
6	PCC	BAE2406	Aerodynamics Lab	-	-	2	2	1	-	-	25	25	50
7	ESC	BAE2407	Computer Aided Drafting Lab	-	-	2	2	1	-	-	25	25	50
8	HSMC	BSH2401	Human Values for Professional Society	3	-	-	3	3	15	15	10	60	100
9	PROJ	BAE2408	Micro Project	-	-	2	2	1	-	-	25	25	50
10	MCC	BAU2404	Group Reading of Classics	2	-	-	2	Audit	-	-	-	-	-
Total				20	1	6	27	22	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	03	04	04	10	--	--	01	Yes
Cumulative Sum	06	26	22	25	--	--	01	--

PROGRESSIVE TOTAL CREDITS: 58+22 = 80


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


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



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

BAE2401: Applied Mathematics-IV

Teaching Scheme		Examination Scheme	
Theory	3 Hrs/Week	CT-I	15 Marks
Tutorial	1 Hr/Week	CT-II	15 Marks
Total Credits	4	CA	10 Marks
Duration of ESE: 3 Hrs		ESE	60 Marks
Course Contents			
Unit I	Numerical Methods: Numerical solution of ordinary differential equations of first order and first degree, Taylor's series method, modified Euler's method. Runge - Kutta method of fourth order, Milne's and Adams-Bashforth predictor and corrector methods (No derivations of formulae-single step computation only), Introduction to the use of numerical methods in computational fluid dynamics, finite element methods and other aerospace applications.		
Unit II	Complex Variables: Review of a function of a complex variable, limits, continuity, differentiability. Analytic functions-Cauchy-Riemann equations in Cartesian and polar forms. Properties and construction of analytic functions. Complex line integrals-Cauchy's theorem and Cauchy's integral formula, Residue, poles, Cauchy's Residue theorem (without proof) and problem.		
Unit III	Probability Distributions: Random variables (discrete and continuous), probability mass/density functions. Binomial distribution, Poisson distribution. Exponential and normal distributions, problems. Joint probability distribution: Joint Probability distribution for two discrete random variables, expectation, covariance, correlation coefficient.		
Unit IV	Sampling Theory: Sampling, Sampling distributions, standard error, test of hypothesis for means and proportions, confidence limits for means, student's t-distribution, Chi-square distribution as test of goodness of fit.		
Unit V	Stochastic process: Stochastic processes, probability vector, stochastic matrices, fixed points, regular stochastic matrices, Markov chains, higher transition probability, simple problems.		
Text Books			
1	B.S. Grewal: Higher Engineering Mathematics, Khanna Publishers, 43rd Ed., 2015.		
2	E. Kreyszig: Advanced Engineering Mathematics, John Wiley & Sons, 10th Ed., 2015.		
Reference Books			
1	N. P. Bali and Manish Goyal: A Text Book of Engineering Mathematics, Laxmi Publishers, 7th Ed., 2010.		
2	B. V. Ramana: "Higher Engineering Mathematics" Tata McGraw-Hill, 5th Ed., 2006.		
3	H. K. Dass and Er. Rajnish Verma: "Higher Engineering Mathematics", S. Chand publishing, 1st edition, 2011.		

Useful Links

1	https://nptel.ac.in/courses/122/107/122107037/
2	https://nptel.ac.in/courses/111/105/111105035/
3	https://nptel.ac.in/courses/111/107/111107119/

	Course Outcomes	CL	Class Sessions
BAE2401.1	Solve first and second order ordinary differential equation arising in flow problems using single step and multi-step numerical methods.	3	9
BAE2401.2	Solve problems on the concepts of analytic functions, residues, poles of complex potentials and conformal and Bilinear transformation arising in field theory and signal processing.	3	9
BAE2401.2	Apply the knowledge of probability distribution of discrete, continuous random variables and joint probability distribution in solving complex problems on digital signal processing, information theory and design engineering.	3	9
BAE2401.4	Analyze testing of hypothesis of sampling distributions by illustrating examples of Markov chains related to discrete parameter stochastic process.	4	9
BAE2401.5	Examine Stochastic processes and matrices for solving simple problems on higher transition probability.	4	9





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

BAE2402: Design of Machine Elements & Manufacturing Process

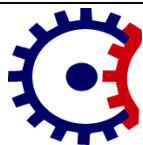
Teaching Scheme		Examination Scheme	
Theory	3 Hrs/Week	CT-I	15 Marks
Tutorial	0 Hrs/Week	CT-II	15 Marks
Total Credits	3	CA	10 Marks
Duration of ESE: 3 Hrs		ESE	60 Marks

Course Contents

Unit I	Design Considerations: Standardization, Preferred numbers, Tolerances and Fits, Ergonomics, System design, Manufacturing considerations. Design of Coupling and Shafts Types of coupling, Rigid flange coupling and Bush pin type flexible coupling, solid, hollow and splined shafts under torsion and bending loads. ASME code for design of shafts. Design of keys. Design of couplings - Flange, Flexible.
Unit II	Design of Bolts, Nuts, Joints and Screws: Design of Cotter and Knuckle joints. Design of power Screws and screw jack. Differential and Compound Screws, Design of riveted and welded joints under direct and eccentric loads.
Unit III	Casting: Introduction to Casting methods, Casting types, procedure to make sand mould, types of core making, moulding tools, machine moulding. Aerospace Welding Techniques: Classification of welding processes, Principles of Oxy-acetylene gas welding, Metal Inert Gas (MIG) Welding, Tungsten Inert Gas (TIG) Welding, A.C. metal arc welding, resistance welding, submerged arc welding, tungsten inert gas welding, metal inert gas welding, plasma arc welding, thermit welding, electron beam welding, laser beam welding, defects in welding, soldering and brazing.
Unit IV	Machining: General principles (with schematic diagrams only) of working and commonly performed operations in the following machines: Lathe, Shaper, Planer, Horizontal milling machine, Universal drilling machine, Cylindrical grinding machine, Capstan and Turret lathe. Basics of CNC machines. General principles and applications of the following processes: Abrasive jet machining, Ultrasonic machining, Electric discharge machining, Electro chemical machining, Plasma arc machining, Electron beam machining and Laser beam machining.
Unit V	Forming Process and powder metallurgy: Types of plastics, Characteristics of forming and shaping processes, Moulding of Thermoplastics, Working principles and applications of Injection moulding, Plunger and screw machines, Blow moulding, Rotational moulding, Film blowing, Extrusion. Thermoforming, Processing of Thermosets, Working principles and applications, Compression moulding, Transfer moulding. Bonding of Thermoplastics, Fusion and solvent methods, Induction and Ultrasonic methods, Introduction to Powder Metallurgy.

Text Books	
1	Mechanical Engineering Design by J.E. Shigley & Charles R. Mischke, 6th ed., Tata McGraw-Hill., 2010.
2	Design of Machine Elements by V. B. Bhandari, 3rd Edn., Tata McGraw- Hill Pub., 2010.
3	Production Technology by R.K. Jain, Khanna Publication, 8th Edn, 2015.
4	Modern Machining Processes by Pandey, Shah, Tata McGraw Hill, 4th Edn, 2017.
5	Production Engineering by P. C. Sharma, S. Chand Publication, 1st Edn, 1982.
6	Aerospace Manufacturing Processes by Pradip K. Saha, Taylor & Francis, 2016.
Reference Books	
1	Design of Machine Elements by M.F. Spotts, 7th edn., Pearson Edu, 2003.
2	A Textbook of Machine Design by P C Sharma and D K Aggarwal, S K Kataria & sons.
3	Work Shop Technology, Vol. I - III by W.A.J. Chapman, Edward Arnold Ltd, 5th Edn, 2006.
4	Manufacturing Processes by M. Begman, John Wiley & Sons Inc, 2nd Edn, 1969.
Useful Links	
1	http://nptel.ac.in/courses/112105124
2	https://nptel.ac.in/courses/112/107/112107144/
3	https://nptel.ac.in/courses/112/107/112107219/
4	https://nptel.ac.in/courses/112/105/112105127/

	Course Outcomes	CL	Class Sessions
BAE2402.1	Estimate the size of machine elements for transmitting torque, bending moment and axial loads.	3	9
BAE2402.2	Perform design calculations for selection of type of nuts, bolts, joints, and fasteners required for particular application.	3	9
BAE2402.3	Solve problems on casting and welding processes required for aerospace applications.	3	9
BAE2402.4	Describe the applications of various machining processes applicable to aerospace components.	2	9
BAE2402.5	Distinguish various powder metallurgy processes and choose proper process for aerospace applications.	3	9



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

BAE2403:Aerospace Materials

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	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	Introduction to 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	Magnetic, Dielectric and Superconducting 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.

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-Nostrand Reinhold, 1st edition, 1970.

Reference Books	
1	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, 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/

	Course Outcomes	CL	Class Sessions
BAE2403.1	Apply the knowledge of properties and classification of materials in selection of materials for aerospace applications.	3	9
BAE2403.2	Examine the uses of composite materials in aircraft structures.	3	9
BAE2403.3	Apply the knowledge of different composite materials manufacturing processes for selecting appropriate process for particular material.	3	9
BAE2403.4	Apply the knowledge for selection of appropriate tests for particular application through understanding of different mechanical properties and testing methods.	3	9
BAE2403.5	Comprehend application of advanced materials in aviation industry.	3	9





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

BAE2404:Mechanics of Machine

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: 03 Hrs		ESE	60 Marks

Course Contents

Unit I	Introduction to Mechanisms: Types of constrained motion, Link and its types, joints and its types, kinematic pair and its types, degrees of freedom, Grubler's criterion, Types of kinematic chains and inversions: Inversions of Four bar chain: Beam engine, coupling rod of a locomotive, Watt's indicator mechanism. Inversions of Single Slider Crank Chain: Pendulum pump or Bull engine, Oscillating cylinder engine, Rotary internal combustion engine, Crank and slotted lever quick return motion mechanism, Whitworth quick return motion mechanism. Inversions of Double Slider Crank Chain: Elliptical trammels, Scotch yoke mechanism, Oldham's coupling. Straight line motion mechanisms: Peaucellier's mechanism and Robert's mechanism.
Unit II	Kinematics of Machine: Velocity, Acceleration and static force analysis of Mechanisms (Graphical Methods): Velocity and acceleration analysis of Four Bar mechanism, slider crank mechanism and Simple Mechanisms by vector polygons, Coriolis component of acceleration, Instantaneous center method, Kennedy's theorem. Static force analysis: Introduction: Static equilibrium, Equilibrium of two and three force members. Members with two forces and torque. Free body diagrams, principle of virtual work. Static force analysis of four bar mechanism and slider-crank mechanism with and without friction.
Unit III	Gears-Spur Gears: Gear terminology, law of gearing, Path of contact, Arc of contact, Contact ratio of spur gear, Interference in involute gears, Methods of avoiding interference. Gear Trains: Simple gear trains, Compound gear trains, Reverted gear trains, Epicyclic gear trains, Analysis of epicyclic gear train (Algebraic and tabular methods), torques in epicyclic trains. Concepts of cam mechanism, comparison of cam mechanism with linkages. Types of cams and followers and applications.
Unit IV	Rigid Body Mechanism: Rigid body motion in space. Euler's equation of motion, Gyroscope, angular velocity, angular acceleration, simple precession & gyroscopic couple. Gyroscopic effect on airplane. Ship, vehicles. Speed governors, centrifugal & inertia type, Watt, Portal, Proell, Hartnell governors, Operating characteristics of governors.
Unit V	Friction: Types of friction, Friction Drives, friction in screw threads, bearings, Friction clutches, Belt drives Rotating machines: Static and Dynamic balancing in rotating machines. Balancing machines and field balancing by vector diagram. Balancing in reciprocating mechanism. Effect of partial balancing in locomotives, secondary balancing. Balancing of inline engine, V-engine, and radial engine.

Text Books	
1	Rattan S.S, "Theory of Machines", Tata McGraw-Hill Publishing Company Ltd., New Delhi,3rd edition, 2009.
2	J.J. Uicker, G.R. Pennock, J.E. Shigley, "Theory of Machines and Mechanisms", OXFORD, 3rd edition, 2009.
3	Ghosh. A, and A.K. Mallick, Theory and Machine, East-West Pvt. Ltd., New Delhi, 4th edition, 1988.
Reference Books	
1	Ramamurthi. V., "Mechanisms of Machine", Narosa Publishing House, 2nd edition, 2005.
2	Rao J. S. and Dukkippatti R.V. —Mechanisms and Machines, Wiley-Eastern Ltd., New Delhi, 1st edition,1998.
3	Robert L. Norton, "Design of Machinery", McGraw-Hill, 2nd edition, 2012.
Useful Links	
1	https://nptel.ac.in/courses/112/105/112105268/
2	https://nptel.ac.in/courses/112/104/112104121/
3	https://nptel.ac.in/courses/112/106/112106270/

	Course Outcomes	CL	Class Sessions
BAE2404.1	Apply the theory of velocity, acceleration and static force analysis to design of mechanisms.	3	9
BAE2404.2	Solve the problems on the velocity, acceleration and force calculations for different mechanisms.	3	9
BAE2404.3	Evaluate the problems on spur gears, gear train, balancing of rotating and reciprocating masses.	4	9
BAE2404.4	Apply the knowledge of governors and gyroscope for understanding rigid body mechanism.	4	9
BAE2404.5	Calculate friction and related losses on drives and different rotating machines.	4	9



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

BAE2405:Aerodynamics-I

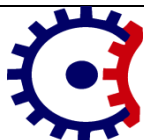
Teaching Scheme		Examination Scheme	
Theory	3 Hrs/Week	CT-I	15 Marks
Tutorial	0 Hrs/Week	CT-II	15 Marks
Total Credits	3	CA	10 Marks
Duration of ESE: 3 Hrs		ESE	60 Marks

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 lattice 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/

	Course Outcomes	CL	Class Sessions
BAE2405.1	Determine aerodynamic forces and moments on aerofoil through the understanding of basic principles and governing equations of fluid mechanics.	3	9
BAE2405.2	Evaluate typical airfoil characteristics and two-dimensional flows over airfoil	3	9
BAE2405.3	Compute and analyze the incompressible flow over finite wings	4	9
BAE2405.4	Apply finite wing theory and design high lift systems from the aerodynamics view point.	4	9
BAE2405.5	Depict the effect of three dimensional effect on the aerodynamic forces and related effects on wing.	4	9



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

BAE2406:Aerodynamics 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 00 Min.		

Course Outcomes (CO)

Students will be able to

BAE2406.1	Determine aerodynamic forces and moments on aerofoil through the understanding of basic principles and governing equations of fluid mechanics.
BAE2406.2	Evaluate typical airfoil characteristics and two-dimensional flows over airfoil
BAE2406.3	Compute and analyze the incompressible flow over finite wings
BAE2406.4	Apply finite wing theory and design high lift systems from the aerodynamics view point.
BAE2406.5	Depict the effect of three dimensional effect on the aerodynamic forces and related effects on wing.

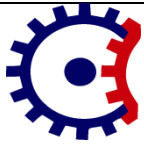
Sr. No.	List of Experiment	CO
1	Calibration of the wind tunnel test section velocity verses the fan RPM	1, 4
2	Estimating the pressure distribution (coefficient of pressure) over a circular cylinder	2, 5
3	Estimating the pressure distribution (coefficient of pressure) over a symmetrical aerofoil	2, 5
4	Estimating the pressure distribution (coefficient of pressure) over a cambered aerofoil	2, 5
5	Estimating the pressure distribution (coefficient of pressure) over a flat plate model	1, 4
6	Evaluating the three components of forces over a cambered aerofoil using 3-component wind tunnel balance	1, 4
7	Evaluating the three components of forces over an aircraft model using 3-component wind tunnel balance	1, 4
8	Estimating the functional area of test section by considering the boundary layer effect	1, 4
9	Smoke flow visualization over different models (Aircraft model, car model, high rise building, circular cylinder, symmetrical aerofoil and cambered aerofoil)	1
10	Tuft flow visualization over different models (Aircraft model, car model, high rise building, circular cylinder, symmetrical aerofoil and cambered aerofoil)	3, 5

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.



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NAAC Accredited (A+ Grade)



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

BAE2407: Computer Aided Drafting 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 00 Min.		

Course Outcomes (CO)

Students will be able to

BAE2407.1	Prepare different components and aircraft structures using computer aided design and modeling software.
BAE2407.2	Utilize the procedure of preparing different components and aircraft structures.
BAE2407.3	Exploit different tools and workbenches in CAD software required for preparing different components and aircraft structures.
BAE2407.4	Apply the knowledge of basic CAD to develop hub and wing assembly
BAE2407.5	Apply the knowledge of basic CAD to develop fuselage and propeller assembly

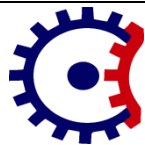
Sr. No.	List of Experiment	CO
1	Preparing fully constraint two dimensional sketches following all the dimensioning rules	1, 2
2	Preparing different three dimensional solid models	1, 2, 3
3	Preparing different three dimensional surface/ wireframe models	1, 2
4	Exploring CAD software library for fasteners & keys and making similar machine elements	1, 2, 3
5	Preparing different metric thread forms on the given solid model	1, 2, 3
6	Exploring CAD software library for rivets and preparing riveted joints for given solid model	1, 2, 3
7	Designing and modeling of propeller and hub assembly	4, 5
8	Designing and modeling of wing assembly	4, 5
9	Designing and modeling of fuselage assembly	4, 5
10	Designing and modeling of landing gear assembly	4, 5

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.

Reference Books

- 1 Computer Aided Design: A Conceptual Approach by Jayanta Sarkar, CRC Press, 4th Ed., 2017.



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(An Autonomous Institute Affiliated to RTM Nagpur University, Nagpur)



Program: B.Tech. IV Semester (All Branches)

Semester IV BSH2401: Human Values for Professional Society

Teaching Scheme

Theory 3 Hrs/week

Tutorial -

Total Credits **3**

Duration of ESE: 3Hrs

Examination Scheme

CT-I 15 Marks

CT-II 15 Marks

CA 10Marks

ESE 60 Marks

Pre- Requisite: Ethical Science & Business Ethics

Total Marks **100 Marks**

Course Contents

Unit I

Introduction to Value Education

Value Education, Definition, Concept and Need for Value Education, The Content and Process of Value Education, Basic Guidelines for Value Education, Self-exploration as a means of Value Education.

Unit II

Harmony in the Human Being, Family, Society and Nature

Human Being is more than just the Body, Understanding Myself as Co-existence of the Self and the Body, Understanding the activities in the Self and the activities in the Body, Family as a basic unit of Human Interaction and Values in Relationships, The Basics for Respect and today's Crisis: Affection, Guidance, Reverence, Glory.

Unit III

Social Ethics

The Basics for Ethical Human Conduct, Defects in Ethical Human Conduct, Holistic Alternative and Universal Order, Universal Human Order and Ethical Conduct.

Unit IV

Basic Theories

Basic Ethical principles, Moral Developments, Deontology, Utilitarianism, Virtue theory, Rights Theory, Casuist Theory, Moral Absolution, Moral Rationalism, Moral Pluralism, Ethical Egoism, Feminist Consequentialism, Moral Issues, Moral Dilemmas, Moral Autonomy.

Unit V

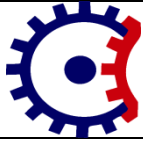
Global Issues in Professional Ethics:

Introduction- Current Scenario, Technology Globalization of MNCs, International Trade, World Summits, Issues, Business Ethics and Corporate Governance, Sustainable Development Ecosystem, Energy Concerns, Ozone Deflection, Pollution, Ethics in Manufacturing and Marketing, Media Ethics; War Ethics; Bio Ethics, Intellectual Property Rights.

Text Books	
T.1	A.N Tripathy, New Age International Publishers, 2003.
T.2	Bajpai. B. L, New Royal Book Co, Lucknow, Reprinted, 2004.
T.3	Bertrand Russell Human Society in Ethics & Politics.
T.4	Professional Ethics: R. Subramanian, Oxford University Press, 2015.
Reference Books	
R.1	Corliss Lamont, Philosophy of Humanism.
R.2	Gaur. R.R, Sangal. R, Bagaria. G.P, A Foundation Course in Value Education, Excel Books, 2009.
R.3	Gaur. R.R, Sangal. R, Bagaria. G.P, Teachers Manual Excel Books, 2009.
R.4	I.C. Sharma. Ethical Philosophy of India Nagin & co Julundhar.
R.5	Mortimer. J. Adler, – Whatman has made of man.
R.6	Engineering Ethics, Concepts Cases: Charles E Harris Jr., Michael S Pritchard, Michael J Rabins, Cengage Learning, 2015.

COs	Course Outcomes	CL	Class Sessions
CO1	Describe value education and its role for self-exploration.	2	9
CO2	Illustrate the harmony in the human being and society.	3	9
CO3	Examine the ethical human conduct along with Universal Order.	3	9
CO4	Use of various theories of basic ethical principles.	3	9
CO5	Predict global issues in professional ethics and sustainable development.	3	10



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

BAE2408:Micro Project

Teaching Scheme

Practical	2 Hrs/week
Total Credit	1

Examination Scheme

CA	25 Marks
ESE	25 Marks
Total	50 Marks

Duration of ESE: 02 Hrs 00 Min.

Course Outcomes (CO)

Students will be able to

BAE2408.1	Work in a team of 4 students to complete the project work.
BAE2408.2	Do the experimentation and/or computational work ethically.
BAE2408.3	Complete the works within the deadline.
BAE2408.4	Prepare neat and neat project report without any errors.
BAE2408.5	Communicate effectively in english during project demonstration, orals and viva-voce.

Instructions:

- The objective of the project work is to enable the students in convenient groups of not more than 4 members on a project involving theoretical and experimental studies related to the branch of study.
- Every project work shall have a guide who is the member of the faculty of the institution.
- Sixteen 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.
- Each student shall finally produce a comprehensive report covering back ground information, literature survey, problem statement, project work details and conclusion.
- This final report shall be typewritten form as specified in the guidelines.
- The continuous assessment shall be made as prescribed by the regulation TGPECT, Nagpur.

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

Dean Academics
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Principal
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