DEPARTMENT OF AERONAUTICAL ENGINEERING

Teaching Scheme & Syllabus (As per NEP_2020)

SCHEME OF INSTRUCTION & SYLLABI

Semester -Third

Programme: Aeronautical Engineering

From

AcademicYear2024-25

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)

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.

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Department of Aeronautical Engineering

Scheme of Instructions: Second Year B. Tech in Aeronautical Engineering
[Semester-III (2nd Year-2024-25)]

S.N.	Sem	Type	BoS/Dept	Sub Code	Subject	T/P	Contact Hours L	Contact Hours P	Contact Hours Hrs	Credits	% Weightage CT/IA	% Weightage CA	% Weightage ESE	ESE Duration	Total Marks
1	III	PCC	AE	BAE32301	Fluid Mechanics & Machinery	T	3	-	3	3	30	10	60	3 Hrs	100
2	III	PCC	AE	BAE32302	Solid Mechanics	T	3	-	3	3	30	10	60	3 Hrs	100
3	III	PCC	AE	BAE32303	Introduction to Aeronautical Engineering	T	3	-	3	3	30	10	60	3 Hrs	100
4	III	OEC	CS/IT/ME/CE	BSS323XX	Open Elective-I	T	4	-	4	4	30	10	60	3 Hrs	100
5	III	VEC	AE	BBA32306	Engineering Economics	T	2	-	2	2	14	6	30	2 Hrs	50
6	III	MDM	BSC	BSH32301	Advance Mathematics	T	2	-	2	2	14	6	30	2 Hrs	50
7	III	PCC	AE	BAE32304	Fluid Mechanics & Machinery Lab	P	-	2	2	1	-	25	25	2 Hrs	50
8	III	PCC	AE	BAE32305	Solid Mechanics Lab	P	-	2	2	1	-	25	25	2 Hrs	50
9	III	CEP	AE	BAE32307	Community Engineering Project	P	-	4	4	2	-	50	-	2 Hrs	50
					Total		17	08	25	21	148	152	350	22 Hrs	650

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)	SEC (Skill Course)	ELC/FP/CEP (Experiential Learning Courses)	CC (Liberal Learning Courses)
Credits	2	–	–	11	–	4	2	-	2	--
Cumr. Sum	8	16	13	11	–	4	2	4	2	4

Progressive Total Credits =43+21 = 64

Chairperson	Dean Academics	Vice Principal	Principal	Date of Release	Version	Applicable
				June, 2024	1.00	For AY2024-25 Onwards

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Second Year (Semester-III) B. Tech. Aeronautical Engineering			
BAE32301: Fluid Mechanics & Machinery			
2nd Year- (3rd Semester)			
BAE32301: Fluid Mechanics & Machinery			
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 is:			
1.	To Understand the basic concept of fluid flows.		
2.	To Understand the application of mass and momentum conservation laws for fluid flows.		
3.	To study the boundary layer thickness in various types of simple flows.		
4.	To Mathematically analyze the flow in channel and pipes.		
5.	To Understand about the functioning of turbines and centrifugal and reciprocating pumps.		
Course Contents			
Unit I	**Introduction to Fluid Mechanics:** Properties of fluids, Newton's law of viscosity and its applications, Pascal's law, Basic equation of fluid statics, Types of fluids. Fluid pressure and its measurement (Manometers and Bourdon's pressure gauge), Pressure variations in compressible and incompressible fluids Incompressible flow. force center of buoyancy, floating body concept met centric height.		
Unit II	**Kinematics and Viscous flow:** Types of fluid flow, Stream line, Path line, Streak line, Stream tube, Continuity equation, One and Two dimensional flow, Velocity and Acceleration at a point, Stream function, Velocity potential functions, Potential lines, Flow net. Boundary layer, displacement, momentum and energy thicknesses, turbulent boundary layer.flow separation and its control, Laminar flow vs. turbulent flow.		
Unit III	**Dynamics of Fluid Flow:** One dimensional method for flow analysis, Euler's equation of motion, Derivation of Bernoulli's equation for incompressible flow and its applications. Equation of motion for laminar flow through pipes resistance to flow, minor losses, pipe in series and parallel, power transmission through a pipe, siphon, water hammer. Dimensional analysis and Buckingham pi theorem, Reynolds number; turbulence and turbulent flows; Frictional losses, losses in a pipe; Flow past cylinder, critical Reynolds numbers.		
Unit IV	**Impulse and Reaction Turbines:** Introduction to hydrodynamic thrust of jet on a fixed and moving surface, Classification of turbines, Impulse turbines, Constructional details, Velocity triangles, Power and efficiency calculations, Governing of Pelton wheel .Francis and Kaplan turbines, Constructional details, Velocity triangles, Power and efficiency Selection of water turbines.		

Unit V	**Classifications of pumps:** Centrifugal pumps, Vector diagram, Work done by impellor, Efficiencies of centrifugal pumps, Specific speed, reciprocating pump theory, Slip, Indicator diagram, Effect of acceleration, air vessels, Comparison of centrifugal and reciprocating pump.

Text Books

1	Introduction to fluid mechanics and Fluid machines by S.K Som, Gautam Biswas, S Chakraborty.
2	Fluid mechanics and machinesby R.K Bansal.
3	F.M. White, Fluid Mechanics, 6thEd., Tata McGraw-Hill, 2008.

Reference Books

1	Fluid Mechanics by Frank M. White, Mcgraw-Hill, 7th Edition, 2011.
2	Mechanics of Fluids by B. S. Massey, PHI, 7th Edition,2015.
3	Fluid Mechanics by A. K. Jain, Khanna Publishers, 12th Edition, 2004

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/101/106/101106082/

BAE32301	Course Outcomes	CL	Class Sessions
CO1	**Comprehend** the basic principles of fluid mechanics and apply the knowledge in solving problems on fluid measurements.	3	9
CO2	**Analyze** types and properties of the fluid flow and solve the problems on potential function, stream function and Bernoulli's principle.	3	9
CO3	**Investigate** the viscous flow and solve the problems on boundary layer theory, laminar and turbulent and flow through pipes.	3	9
CO4	**Estimate** the performance of different Turbines, study their application and classification.	4	9
CO5	**Estimate** the performance of different Pumps, study their application and classification.	2	9

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

BAE32302: Solid Mechanics

2nd Year- (3rd Semester)

BAE32302: Solid Mechanics

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 is:

1.	To get insight into the basic of stress, strain and deformation.
2.	To study principal stresses, strain and compound stresses
3.	To get exposure to shear force and bending moment calculation.
4.	To get knowledge on deflection of beams.
5.	To gain basic knowledge on strain energy and impact loading.

Course Contents

Unit I	**Stress, Strain and Deformation of Solids:** Introduction: Rigid bodies and deformable solids, Types of stresses and strains, Elastic constants and their relationships, Thermal Stresses, Analysis of the state of stress at a point, equations stress-strain relations, generalized Hooke's Law - Isotropy, Orthotropic, Anisotropy. Displacement and force methods of analysis. Concepts of linear and nonlinear problems. Linear elasticity solutions, problems in 2-D (rectangular and polar co-ordinates).
Unit II	**Principal Stresses and Strains:** Definition of principal planes and principal stresses, analytical method of determining stresses on oblique section when member is subjected to direct stresses in one plane in mutually perpendicular two planes, subjected to shear stress and direct **Compound stress system:** Stresses on inclined planes in 2-D and 3-D; magnitudes and planes of principal stresses and maximum shear stress in two mutually perpendicular planes, Mohr's circle for representation of stresses. Derivation of maximum and minimum principle stresses and maximum shear stresses when the member is subjected to different types of stresses simultaneously
Unit III	**Shear force and bending moment:** Types of beams (cantilever beam, simply supported beam, overhung beam etc) Types of loads (Concentrated and UDL), Shear force and bending moment diagrams for different types of beams subjected to different types of loads, Sign. Conventions for bending moment and shear force, shear force and bending moment diagrams for beams subjected to couple, Relation between load.
Unit IV	**Deflection of beams**: Derivation of differential equation of elastic curve with the assumptions made in it. Deflection and slope of cantilever, simply supported, overhung beams subjected to concentrated load, UDL, Relation between slope, deflection and radius of curvature. Macaulay's method, area moment method to determining deflection of beams. **Shear stresses in beams:** Concept, derivation of shear stress distribution formula, shear stress distribution diagram for common symmetrical sections, maximum and average shear stress.

Unit V	**Strain Energy and Impact Loading:** Definition of strain energy stored in a body when it is subjected to gradually applied load, suddenly applied loads and impact loads. Strain energy under uniaxial tension and compression, bending and torsion. Castiglione's theorem. Statically indeterminate beams and frames, Chaperon's three moment equation method, Moment distribution method.

Text Books

1	Strength of Material by S. Ramamurtham and R. Narayanan, Dhanpat Rai Publishing Company Pvt. Ltd., 16th Edition, 2011.
2	Strength of Material by R. K. Rajput, S. Chand Publishing, 7th Edition, 2018.
3	Strength of Material by A. Singer and F. L. Singer, Longman, 4th Edition, 1990.

Reference Books

1	Strength of materials by S. Timoshenko, CBS,3rd Edition, 2002.
2	A Textbook of Strength of Materials by R.K. Bansal, Laxmi Publications, 4th Edition, 2018.
3	Strength of Materials by S. S. Bhavikatti,Vikas Publishing House, 4th Edition, 2013.

Useful Links

1	https://nptel.ac.in/courses/112/102/112102284/
2	https://nptel.ac.in/courses/105/106/105106049/

BAE32302	Course Outcomes	CL	Class Sessions
CO1	**Evaluate** St. Venant's principle by assessing the basic concepts related to stress and strains.	3	9
CO2	**Evaluate** the principle stresses and strains and its effect on different structures.	3	9
CO3	**Calculate** the shear force, bending moment, stresses in a beam under given load conditions.	3	9
CO4	**Analyze** deflection of beams by Macaulay's and area moment methods and evaluate stresses in beams.	4	9
CO5	**Apply** the concept of strain energy and impact loading for various engineering applications.	2	9

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

BAE32303: Introduction to Aeronautical Engineering

2nd Year- (3rd Semester)

BAE32303: Introduction to Aeronautical Engineering

Teaching Scheme			Examination Scheme	
Lectures	3 Hr / Week		**ESE**	30 Marks
Tutorial	-		**CIE**	20 Marks
Practical	-		**Total**	50 Marks
Theory Credits :3			**Duration of Exam :**2 Hours	

Course Objectives

The Objectives of this course is:

1.	To make students aware about the aircraft design process and its purpose.
2.	To make the student configuration of fuselage and wings.
3.	To investigate the performance and stability characteristics of airplanes.
4.	To the study different aircrafts engines and their applications.

Course Contents

Unit-I	**Introduction and developments** Pre Wright-Brothers era, Wright Flyer, history and evaluation of aircraft. Conventional airplane, progress in airplane design and application, Current status. Other kinds of heavier than air vehicle, helicopter, VSTOL machines, space vehicles, reusable space vehicles and space shuttle, Developments in aerodynamics, materials, structures and propulsion over the years.
Unit-II	**Aircraft Configurations and Aircraft Systems** Components of an airplane and their functions, Different parts of airplane. Different types of flight vehicles, classifications. Conventional control, Powered control, Basic instruments for flying, Typical systems for control actuation. **Aircraft Systems:** Elementary studies on hydraulic, pneumatic, pressurizing air- conditioning and oxygen systems. Landing gear and control surface actuating system. Aircraft electrical systems, elementary studies of generation and on-board distribution of electricity.
Unit-III	**Introduction to Aerodynamics** Aerofoil nomenclature; Flow over aerofoil; Lift and generation of lift by Bernoulli's principle; Lift and drag components – generation of lift and drag; lift curve, drag curve, types of drag, factors affecting lift and drag; variation of lift with angle of attack, pressure distribution over aerofoil; centre of pressure and its significance; aerodynamic centre, aspect ratio, velocity of sound, Mach number and supersonic flight effects, wing span, wing area, sweep, tapered ratio, dihedral, anhedral angle.
Unit-IV	**Airplane Structures:** Configuration of fuselage and wings, progress in materials: wooden to all metal airplanes, strength to weight ratio of aircraft materials, importance of weight load factors, factors of safety in aeronautics and aerospace applications. Details of the structural layout of wing, fuselage tail planes. Cockpit and cabin configuration. Different types of materials for airplane and engine application. Materials for space vehicles.

Unit-V	**Introduction to Aircraft Propulsion** Difference between air-breathing and non-air-breathing engines, classification of aircraft based on power plant, location and principle operation, basics of piston engine, classification of aircraft engines, Brayton cycle and its application to the gas turbine engines characteristics of turbofan, turbojet, turbo prop, ramjet and scramjet engines, classification combustion chamber, types of fuel used in commercial aircraft engines, principle operation of aircraft engines.

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/
3.	https://nptel.ac.in/courses/101/105/101105031/

BAE32303	Course Outcomes	CL	Class Sessions
CO1	**Understand** history of aviation and basic concepts of aerospace engineering and implement the knowledge acquired in design and development of aircrafts.	2	9
CO2	**Understand** different components of aircraft, vehicle types and flight instrumentations and develop conceptual design of aircraft systems and subsystems.	2	9
CO3	**Apply** the knowledge of aerodynamic forces and moments acting on airplane for understanding of different flight parameters.	3	9
CO4	**Apply** the knowledge of aircraft structures and configurations in solving the problems on airplane layouts, load factor and factor of safety.	3	9
CO5	**Investigate** the performance and characteristics of the aircraft jet engines and the basic understanding of theirs working principles.	4	9

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Second Year (Semester-III) B. Tech. Aeronautical Engineering
BAE32304:Fluid Mechanics & Machinery Lab
2nd Year- (3rd Semester)

BAE32304: Fluid Mechanics & Machinery 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:

1	Study the performance of venturi meter and orifice meter
2	Known the performance of a discharge in Notch wire and
3	Study the performance of the Bernoulli's Theorem.
4	Study the performance of the meta-centric height of a floating body.
5.	Study the minor losses due to sudden enlargement, sudden contraction and bends.

Sr. No.	List of Experiment	CO
1	To determine the coefficient of impact for vanes.	1
2	To determine coefficient of discharge of an orifice meter.	1
3	To determine the coefficient of discharge of Notch (V and Rectangular types).	1
4	To determine the friction factor for the pipes.	2
5	To determine the coefficient of discharge of venturi meter.	2
6	To determine the coefficient of discharge, contraction & velocity of an orifice.	2
7	To verify the Bernoulli's Theorem.	3
8	To find critical Reynolds number for a pipe flow.	3
9	To determine the meta-centric height of a floating body.	4
10	To determine the minor losses due to sudden enlargement, sudden contraction and bends.	4
11	To show the velocity and pressure variation with radius in a forced vortex flow.	5
12	To determine the coefficient of impact for vanes.	5

Text Books

1	Fluid Mechanics by Frank M. White, Mc graw-Hill, 7th Edition, 2011.
2.	Fluid Mechanics and Fluid Power Engineering by D. S. Kumar, S.K. Kataria & Sons, 9th Edition, 2015.
3.	Fluid Mechanics for Engineers by P.N. Chartterjee, Macmillan Publishers India, 1st Edition,1995.

Reference Books

1.	Fluid Mechanics and hydraulic Machines by R. K. Bansal, Laxmi Publications, 9th Edition,2018.
2.	Mechanics of Fluids by B. S. Massey, PHI, 7th Edition,2015.
3.	Fluid Mechanics by A. K. Jain, Khanna Publishers, 12th Edition, 2004

Useful Links

	https://nptel.ac.in/courses/112/105/112105206/
	https://nptel.ac.in/courses/112/104/112104117/

BAE32304	Course Outcomes		CL	Class Sessions
CO1	**Understand** the principles and performance characteristics of flow and thermal devices.		3	9
CO2	**Analyze** Know about the measurement of the fluid properties		3	9
CO3	Understand and analyze various properties of fluids		3	9
CO4	**Evaluate** the velocity and pressure variations in various types of simple flows.		3	9
CO5	**Estimate** the performance of different fluid machineries, study their application and classification.		2	9

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

BAE32305:Solid Mechanics Lab
2nd Year- (3rd Semester)
BAE32305: Solid Mechanics 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:

1	Understand the on different types load testing.
2	Known the different types of loads on simply supported and cantilever of beam.
3	Understand the hardness of the given material using Brinell hardness test.
4	Study the weight and load of aircraft components such as wings and fuselage.
5	Understand the compressible and tensile loads on beams.

Sr. No.	List of Experiment	CO
1	Performing direct tension test on the given mild steel specimen	1
2	Performing torsion test on given cylindrical/ square/ rectangular specimen	1
3	Determining bending load on simply supported beam	2
4	Determining bending load on cantilever beam	2
5	Determining hardness of the given material using Brinell hardness test	3
6	Determining hardness of the given material using Rockwell hardness test	3
7	Determining stiffness constant of the spring	4
8	Evaluating compression strength of the given aluminum block	4
9	Determining impact load on the given mild steel specimen using I-Zod impact test	5
10	Determining impact load on the given mild steel specimen using Charpy impact test	5
11.	Determining shear strength of the given mild steel specimen using Punch shear test	5

Text Books

1	Strength of Material by S. Ramamurtham and R. Narayanan, Dhanpat Rai Publishing Company Pvt. Ltd., 16th Edition, 2011.
2	Strength of Material by R. K. Rajput, S. Chand Publishing, 7th Edition, 2018.
3	Strength of Material by A. Singer and F. L. Singer, Longman, 4th Edition, 1990.

Reference Books

1.	Strength of materials by S. Timoshenko, CBS,3rd Edition, 2002.
2.	A Textbook of Strength of Materials by R.K. Bansal, Laxmi Publications, 4th Edition, 2018.
3.	Strength of Materials by S. S. Bhavikatti,Vikas Publishing House, 4th Edition, 2013.
	Useful Links

1	https://onlinecourses.nptel.ac.in/noc21_ae04/preview
2	https://archive.nptel.ac.in/courses/101/101/101101083/

BAE32305		Course Outcomes	CL	Class Sessions
CO1		**Evaluate** St. Venant's principle by assessing the basic concepts related to stress and strains.	3	9
CO2		**Calculate** the shear force, bending moment, stresses in a beam under given load conditions	3	9
CO3		**Analyze** deflection of beams by Macaulay's and area moment methods and evaluate stresses in beams.	3	9
CO4		**Investigate** the buckling of column at different end conditions using Rankine's, Johnsons and Energy method.	4	9
CO5		**Investigate** the principle stresses and strains and its effect on different structures.	2	9

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

BAE32306:Community Field Project

2nd Year- (3rd Semester)

BAE32306: Community Field Project

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 Outcomes (CO)

Students will be able to

1	Work in a team of 4 students to complete the project work.
2	Do the experimentation and/or computational work ethically.
3	Complete the works within the deadline.
4	Prepare neat and neat project report without any errors.
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.

BHSE32306	Course Outcomes	CL	Class Sessions
CO1	**Understand** the project managements and team leadership.	3	9
CO2	**Analyze** Know about the concept of the mini project.	3	9
CO3	**Understand and analyze** functioning of projects	3	9
CO4	**Evaluate** the cost and materials of the projects.	4	9
CO5	**Estimate** the performance of the projects, study their application and classification.	2	9

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Technology, Nagpur

Dean Academics
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College Of Engineering
and Technology, Nagpur

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)

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

BBA32301: Engineering Economics

2nd Year- (3rd Semester)

BBA32301: Engineering Economics				
Teaching Scheme			**Examination Scheme**	
Lectures	3 Hr / Week		**ESE**	20 Marks
Tutorial	-		**CIE**	30 Marks
Practical	-		**Total**	50 Marks
Theory Credits :2			**Duration of Exam :**2 Hours	

Course Objectives	
The Objectives of this course is:	
1.	To help students of engineering economics and demand Analysis.
2.	To make the student understand the concept of supply: law of supply, Factors affecting Supply.
3.	To investigate the performance Criteria for good demand Forecasting, demand forecasting of Product.
4.	To known types of Costs, Cost-Output Relationship: Cost Function, Cost-Output Relationships.

	Course Contents
Unit-I	**Introduction of Engineering Economics and Demand Analysis:** Meaning and nature of Economics, Relation between science, engineering, technology and economics; Meaning of Demand, Determinants of Demand, Shifts in demand, Law of Demand, Price Elasticity of Demand &Types, Income Elasticity, Cross price Elasticity, Determinants of Elasticity, uses and importance of elasticity.
Unit-II	**Concept of Supply:** Law of Supply, Factors affecting Supply, Elasticity of supply. **Demand Forecasting:** Introduction, Meaning and Forecasting, Methods or Techniques of Demand Forecasting, Criteria for Good Demand Forecasting, Demand Forecasting for a New Product. Market Structure: Market Structure Perfect Competition, Imperfect competition – Monopolistic, Oligopoly, duopoly sorbent features of price determination and various market conditions.
Unit-III	**Cost Analysis**: Introduction, Types of Costs, Cost-Output Relationship: Cost Function, Cost-Output Relationships in the Short Run, and Cost-Output Relationships in the Long Run; Short run and long run, Break- Even Analysis; Production functions: laws of variable proportions, law of returns; Economies of scale: Internal and external.

Text Books	
1	Premvir Kapoor, Sociology and Economics for Engineers, Khanna Publishing House (Edition 2018)..
2	Salvatore D, "Principles of Microeconomics", Oxford University Press..
3	Koutsoyiannis A, "Modern Microeconomic", Macmillan Education Ltd.

Reference Books	
1.	Dwivedi DN, "Principles of Microeconomics", Pearson Education.

2.	Cowell, FA, "Microeconomic Principles and Analysis", Oxford University Press.
Useful Links	
1	https://nptel.ac.in/courses/101/105/101105030/
2	https://nptel.ac.in/courses/101/105/101105083/

BHSE32301	Course Outcomes	CL	Class Sessions
CO1	**Understand** the Engineering Economics and Relation between science, engineering, technology and economics.	3	9
CO2	**Analyze** Know about theconcept of supply: Law of Supply, Factors affecting Supply.	3	9
CO3	**Understand and analyze** Demand Analysis: Meaning and nature of Economics,	3	9
CO4	**Evaluate** the cost-output relationship: cost Function and Cost-Output Relationships	4	9
CO5	**Estimate** the performance of the Economies of scale for Internal and external economics and Production functions	2	9

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

BSC32301: Advance Mathematics

2nd Year- (3rd Semester)

BSC32301: Advance Mathematics

Teaching Scheme			Examination Scheme	
Lectures	3 Hr / Week		**ESE**	60 Marks
Tutorial	-		**CIE**	40 Marks
Practical	-		**Total**	100 Marks
Theory Credits : 2			**Duration of Exam :** 3 Hours	

Course Objectives	
The Objectives of this course is:	
1.	To help students understand to Numerical solution of ordinary differential equations of first order and first degree.
2.	To the understand the basic concept of Laplace transform and its applications.
3.	To the understand the basic concept of partial differential equation.
4.	To the understand the basic concept of Functions of a Complex Variable.

Course Contents	
Unit-I	**Numerical Methods:** Solution of Algebraic and Transcendental Equation: False position method, Newton –Raphson method, Solution of system of simultaneous linear equations: Gauss elimination method, Gauss Seidel method. **Numerical Methods (Differential Equations)** Numerical solution of ordinary differential equation by Taylor series method, Runge-Kutta method of 4th order, Euler modified methods and other aerospace applications.
Unit-II	**Partial Differential equations**: Partial differential equation of first order first degree i. e. Lagrange's form. the Linear homogeneous PDE of nth order with constant coefficient, method of separation of variables. Simple Applications to solve Partial Differential Equations (Wave Equations) **Laplace Transforms**: Laplace transforms and its properties, Inverse Laplace Transform (Convolution Theorem), Partial fraction Method.
Unit-III	**Functions of a Complex Variable**: Function of a complex variable, Analytic functions, Cauchy-Riemann conditions, Conjugate functions, singularities, Cauchy's integral theorem and integral formula, Taylor's and Laurent's theorem, Residue theorem (without proof), contour integration.

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.
3	H. K. Dass and Er. Rajnish Verma: "Higher Engineering Mathematics", S. Chand publishing, 1st edition, 2011.
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	Mathematics for Engineers by Chandrika Prasad John Wiley & Sons.

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/

BSC32301		Course Outcomes	CL	Class Sessions
CO1		**Analyze** numerical techniques to find the roots of equations different types of equations	3	9
CO2		**Apply** solution of ordinary differential equation by different types iterative methods.	3	9
CO3		**Solve** Partial differential equation arising in flow problems using single step and multi-step numerical methods of nth order with constant coefficient.	3	9
CO4		**Apply** the concept of Laplace Transform for Solving differential equation.	4	9
CO5		**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.	2	9

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