PERIYAR MANIAMMAI INSTITUTE OF SCIENCE & TECHNOLOGY

PERIYAR MANIAMMAI
INSTITUTE OF SCIENCE & TECHNOLOGY
(Deemed to be University)
Established Under Sec. 3 of UGC Act, 1956 • NAAC Accredited
think • innovate • transform

Criterion 1 – Curricular Aspects

Key Indicator	1.1	Curriculum Design and Development
Metric	1.1.3	Average percentage of courses having focus on employability/ entrepreneurship/ skill Development offered by the Department of Aerospace Engineering.

DEPARTMENT OF AEROSPACE ENGINEERING

SYLLABUS COPY OF THE COURSES HIGHLIGHTING THE FOCUS ON EMPLOYABILITY/ ENTREPRENEURSHIP/ SKILL DEVELOPMENT

1. List of courses for the programmes in order of

S. No.	Programme Name
1.	Bachelor of Technology (Aerospace Engineering) (Full Time)

2. Syllabus of the courses as per the list.

Legend : Words highlighted with **Blue Color** - Entrepreneurship

Words highlighted with **Red Color** - Employability

Words highlighted with **Green Color** - Skill Development

1. LIST OF COURSES

Name of the Course	Course Code	Year of Introduction	Activities/Content with direct bearing on Employability/ Entrepreneurship/ Skill development
Calculus and Linear Algebra	XMA101	2018-19	Skill Development- Test, Quiz, Problem solving
Electrical and Electronic Engineering Systems	XBE102	2015-16	Skill development, Employability- Assignment, Class Test, Seminar
Applied Physics for Engineers	XAP103	2018-19	Skill development, Employability- Test, Assignment, Seminar
Engineering Graphics and Design	XEG104	2018-19	Employability, Skill development- Problem solving, Assignment, Seminar
Speech Communication	XGS105	2021-22	Skill develoment- Group Discussion, Oral Presentation, Quiz
Constitution of India	XUM106	2018-19	Skill Develoment- Test, Quiz, Assignment
Electrical and Electronic Engineering Systems Lab	XBE107	2015-16	Skill development, Employability- Record Writing, Observation, Mini project
Applied Physics for Engineers Lab	XAP108	2018-19	Employability- Record Writing, Observation, Mini project
Calculus, Ordinary Differential Equations and Complex Variable	XMA201	2018-19	Skill development- Test, Quiz, Tutorial
Programming for Problem Solving	XCP202	2018-19	Skill development, Employability- Assignment, Class Test, Seminar
Applied Chemistry for Engineers	XAC203	2018-19	Skill development, Employability, Entrepreneurship- Problem solving, Assignment, Quiz, Test
Technical Communication	XGS204	2021-22	Skill development- Group discussion, Presentation, Assignment
Workshop Practices	XWP205	2018-19	Skill development- Record Writing, Observation, Mini project
Engineering Mechanics	XEM206	2015-16	Employability, Skill Development- Assignment, Attendance, Seminar, Case study
Programming for Problem Solving Lab	XCP207	2018-19	Skill development, Employability- Record Writing, Observation, Mini project
Applied Chemistry for Engineers Lab	XAC208	2018-19	Employability- Record Writing, Observation, Mini project

Transforms and Partial Differential Equations	XMA301	2018-19	Skill Development- Assignment, Quiz, Test, Applications
Introduction to Aerospace Engineering	XAS302	2022-23	Employability, Skill Development- Assignment, Seminar, Case study
Strength of Materials	XAS303	2022-23	Employability, Skill Development- Assignment-I,II, Seminar, Case study, Quiz
Fluid Mechanics	XAS304	2022-23	Employability, Skill Development - Assignment- I & II, Seminar, Class work
Aero Engineering Thermodynamics	XAS305	2015-16	Employability, Skill Development- Assignment, Seminar, Slip Test
Entrepreneurship Development	XUM306	2022-23	Employability, Skill Development, Entrepreneurship- Business Plan, Case Study, Assignment, Slip Test
Universal Human Values 2: Understanding Harmony	HSMC (H-102)	2022-23	Skill Development- Group Discussion, Test, Assignment, Seminar, Quiz
Strength of Materials Lab	XAS308	2022-23	Skill development, Employability- Record Writing, Observation, Mini project
Fluid Mechanics Lab	XAS309	2022-23	Skill development, Employability- Record Writing, Observation, Mini project
In-Plant Training-I	XAS310	2015-16	Employability, Skill Development- Work Diary, Report, Presentation, Attendance, Feedback from industry
Probability and Statistics	XPS401	2022-23	Skill Development- Assignment, Test, Quiz
Aerodynamics- I	XAS402	2015-16	Employability, Skill Development- Assignment,Seminar, Slip test, Attendance
Aircraft Structures- I	XUM403	2015-16	Skill Development, Employability - Assignment-1,2, Class work note, Attendance
Air-Breathing Propulsion	XAS404	2015-16	Skill Development, Employability- Assignment, Seminar, Case Study, Attendance
Economics for Engineers	XUM405	2015-16	Skill Development- Assignment, Seminar, Attendance
Disaster Management	XUM406	2015-16	Skill Development- Assignment I & II, Class Test, Seminar, Case Study
Aerodynamics Lab	XAS407	2015-16	Skill development, Employability- Record Writing, Observation, Mini

			project
Thermal and Propulsion Lab	XAS408	2015-16	Skill development, Employability- Record Writing, Observation, Mini project
CAD Lab	XAS409	2022-23	Skill development, Employability- Record Writing, Observation, Mini project
Aerodynamics-II	XAS501	2018-19	Skill Development, Employability- Assignment, Case Study, Seminar, Slip Test
Aircraft Structures- II	XAS502	2018-19	Employability, Skill Development- Assignment, Seminar, Case study, Attendance
Aerospace Propulsion	XAS503	2018-19	Employability, Skill Development- Assignment, Seminar, Slip test
Elements of Satellite Technology	XAS504	2015-16	Employability, Skill Development- Assignment, Seminar, Case study, Attendance
Navigation Systems	XAS505C	2015-16	Skill Development, Employability- Assignment, Test, Seminar, Case study
Open Elective Course – I	X**OE*	2015-16	*****
Aircraft Structures Lab	XAS507	2018-19	Skill development, Employability- Record Writing, Observation, Mini project
Aircraft Design Project	XAS508	2023-24	Skill development, Employability- Record Writing, Observation, PPT, Mini project
In-Plant Training – II	XAS509	2015-16	Employability, Skill Development- Work Diary, Report, Presentation, Attendance, Feedback from industry
Finite Element Analysis	XAS601	2015-16	Employability, Skill Development- Assignment I & II, Seminar, Class work
Flight Dynamics	XAS602	2018-19	Employability, Skill Development- Assignment, Seminar, Poster Presentation, Slip Test
Space Mechanics	XAS603C	2018-19	Employability, Skill Development - Assignment, Online quiz, Seminar, Attendance
Open Elective Course – II	X**OE*	2015-16	*****
Professional Skills	XGS605	2023-24	Employability, Skill Development- Assignment, Seminar, Quiz, Slip

			Test
Cyber Security	XUM606	2015-16	Skill Development- Assignment, Quiz, Seminar
Machine Dynamics Lab	XAS607	2023-24	Skill development, Employability- Record Writing, Observation, Mini project
Aeromodelling Lab	XAS608	2018-19	Skill development, Employability- Record Writing, Observation, Mini project
Computational Fluid Dynamics	XAS701	2015-16	Employability, Skill Development- Assignment, Seminar, Case study, Slip test, Record Writing, Observation, Mini project
Aircraft Engine Maintenance	XASE17	2015-16	Employability, Skill Development- Assignment, Seminar, Case study
Rockets and Missiles	XASE21	2015-16	Employability, Skill Development- Assignment, Seminar, Case study
Open Elective-III	X**OE*	2015-16	*****
Project Phase-I	XAS705	2015-16	Employability, Skill Development, Entrepreneurship- Review, PPT Presentation, Fabrication, Report submission
Cyber Security	XUM706	2015-16	Skill Development, Entrepreneurship- Assignment, Seminar, Test
In-Plant Training-III	XAS707	2015-16	Skill Development -Work Diary, Report, Presentation, Attendance, Feedback from industry
Aero and Space Modeling	XASM03	2018-19	*****
Cryogenics	XASE28	2015-16	Employability, Skill Development- Assignment, Seminar, Casestudy-
Open Elective-IV	X**OE*	2015-16	*****
Open Elective-V	X**OE*	2015-16	*****
Project Phase- II	XAS804	2015-16	Employability, Skill Development, Entrepreneurship- Review, PPT Presentation, Fabrication, Report submission
Elements of UAV	XASH01	2022-23	Employability- Assignment, Seminar, Q&A
UAV Design, Control, & Meteorology	XASH02	2022-23	Employability- Assignment, Seminar, Q&A

UAV Business and Operational Industrial Aspects	XASH03	2023-24	Employability- Assignment, Seminar, Group Discussion, Q&A
Design and Development of UAV	XASH04	2023-24	Employability- Record Writing, Observation, Mini project, Field Training
Remote Pilot Training	XASH05	2023-24	Employability- Record Writing, Observation, Mini project, Field Training
Project Work	XASH06	2023-24	Employability, Skill Development, Entrepreneurship- Review, PPT Presentation, Fabrication, Report submission

SYLLABUS

COURSE CODE	**XMA101**	**L**	**T**	**P**	**C**
COURSE NAME	**CALCULUS AND LINEAR ALGEBRA**	**3**	**1**	**0**	**4**
PREREQUISITES	**NIL**	**L**	**T**	**P**	**H**
C:P:A= 3:0.5:0.5		**3**	**1**	**0**	**4**

COURSE OBJECTIVES

- Understand the application of calculus and linear algebra in engineering.

COURSE OUTCOMES		**DOMAIN**	**LEVEL**
CO1	***Apply*** orthogonal transformation to reduce quadratic form to canonical forms.	Cognitive	Remembering Applying
CO2	***Apply*** power series to tests the convergence of the sequences and series. Half range Fourier sine and cosine series.	Cognitive Psychomotor	Applying Remembering Guided Response
CO3	***Find*** the derivative of composite functions and implicit functions. Euler's theorem and Jacobian.	Cognitive Psychomotor	Remembering Guided Response
CO4	***Explain*** the functions of two variables by Taylor's expansion, by finding maxima and minima with and without constraints using Lagrangian Method. Directional derivatives, Gradient, Curl and Divergence.	Cognitive Affective	Remembering Understanding Receiving
CO5	***Apply*** Differential and Integral calculus to notions of Curvature and to improper integrals.	Cognitive	Applying

UNIT I	**MATRICES**	**12L+3T**

Linear Transformation - Eigen values and Eigen vectors -Properties of Eigen values and Eigen vectors - Cayley-Hamilton Theorem – Diagonalisation of Matrices – Real Matrices: Symmetric - Skew-Symmetric and Orthogonal Quadratic form – canonical form - Nature of Quadratic form and Transformation of Quadratic form to Canonical form (Orthogonal only).

UNIT II	**SEQUENCES AND SERIES**	**12L+3T**

Sequences: Definition and examples-Series: Types and convergence- Series of positive terms – Tests of convergence: comparison test, Integral test and D'Alembert's ratio test-Fourier series: Half range sine and cosine series- Parseval's Theorem.		
UNIT III	**MULTIVARIABLE CALCULUS: PARTIAL DIFFERENTIATION**	**12L+3T**
Limits and continuity –Partial differentiation – Total Derivative – Partial differentiation of Composite Functions: Change of Variables – Differentiation of an Implicit Function - Euler's Theorem- Jacobian.		
UNIT IV	**MULTIVARIABLE CALCULUS: MAXIMA AND MINIMA AND VECTOR CALCULUS**	**12L+3T**
Taylor's theorem for function of Two variables- Maxima, Minima of functions of two variables: with and without constraints - Lagrange's Method of Undetermined Multipliers – Directional Derivatives - Gradient, Divergence and Curl.		
UNIT V	**DIFFERENTIAL AND INTEGRAL CALCULUS**	**12L+3T**
Evolutes and involutes; Evaluation of definite and improper integrals; Beta and Gamma functions and their properties; Applications of definite integrals to evaluate surface areas and volumes of revolutions.		
TEXT BOOKS		
1.	Ramana B.V., "Higher Engineering Mathematics", Tata McGraw Hill New Delhi, 11th Reprint, 2015**. (Unit-1, Unit-3 and Unit-4).**	
2.	N.P. Bali and Manish Goyal, "A text book of Engineering Mathematics", Laxmi Publications, Reprint, 2014. **(Unit-2).**	
3.	B.S. Grewal, "Higher Engineering Mathematics", Khanna Publishers, 40th Edition, 2010. **(Unit-5)**	
REFERENCE BOOKS		
1.	G.B. Thomas and R.L. Finney, "Calculus and Analytic geometry", 9th Edition, Pearson, Reprint, 2002.	
2.	Veerarajan T., "Engineering Mathematics for first year", Tata McGraw-Hill, New Delhi, 2008.	
3.	D. Poole, "Linear Algebra: A Modern Introduction", 2nd Edition, Brooks/Cole, 2005.	
4.	Erwin kreyszig, "Advanced Engineering Mathematics", 9th Edition, John Wiley & Sons, 2006.	
E –REFERENCES		
1.	http://nptel.ac.in/faq/110101010/Prof.IndrajitMukherjee,IIT,Bombay and Prof. TapanP.Bagchi, IIT, Kharagpur.	
LECTURE: 60	**TUTORIAL: 15**	**PRACTICAL: 0**	**TOTAL :75**

XMA101 - Mapping of CO with PO

CO Vs PO	CO1	CO2	CO3	CO4	CO5	Total	Scaled to 0,1,2 and 3
PO_1	3	3	3	3	3	15	3
PO_2	2	1	1	2	2	8	2
PO_3	0	0	0	0	0	0	0

PO_4	0	0	0	0	0	0	0
PO_5	2	0	0	0	1	3	1
PO_6	0	0	0	0	0	0	0
PO_7	0	0	0	0	0	0	0
PO_8	0	0	0	0	0	0	0
PO_9	0	0	0	0	0	0	0
PO_{10}	1	1	1	1	1	5	1
PO_{11}	0	0	0	0	0	0	0
PO_{12}	2	1	1	1	2	7	2
PSO_1	0	0	0	0	0	0	0
PSO_2	1	1	1	1	1	5	1
TOTAL	11	7	7	8	10	-	-

1-6 → 1, 7-12 → 2, 13-18 → 3

0 – No Relation, 1 – Low Relation, 2 – Medium Relation, 3 – High Relation

COURSE CODE	**XBE102**	**L**	**T**	**P**	**C**
COURSE NAME	**ELECTRICAL AND ELECTRONIC ENGINEERING SYSTEMS**	**3**	**1**	**0**	**4**
PREREQUISITES	**NIL**	**L**	**T**	**P**	**H**
C:P:A= 3:0:0		**3**	**1**	**0**	**4**

COURSE OUTCOMES		**DOMAIN**	**LEVEL**
CO1	***Define and Relate*** the fundamentals of electrical parameters and ***build*** and ***explain*** AC, DC circuits by Using measuring devices	Cognitive	Understand
CO2	***Define and Explain*** the operation of DC and AC machines.	Cognitive	Understand
CO3	***Recall and Illustrate*** various semiconductor devices and their applications and displays the input output characteristics of basic semiconductor devices.	Cognitive	Understand
CO4	***Relate and Explain*** t he number systems and logic gates. **Construc**t the different digital circuit.	Cognitive	Understand
CO5	***Label and Outline*** the different types of	Cognitive	Understand

	microprocessors and their applications.		
UNIT I	**FUNDAMENTALS OF DC AND AC CIRCUITS, MEASUREMENTS**		**9+3**
Fundamentals of DC– Ohm's Law – Kirchhoff's Laws - Sources - Voltage and Current Relations –Star/Delta Transformation - Fundamentals of AC– Average Value, RMS Value, Form Factor - AC power and Power Factor, Phasor Representation of sinusoidal quantities, Simple Series, Parallel, Series Parallel Circuit- Operating Principles of Moving coil and Moving Iron Instruments (Ammeter, Voltmeter) and Dynamometer type meters (Watt meter and Energy meter).			
UNIT II	**ELECTRICAL MACHINES**		**9+3**
Construction, Principle of Operation, Basic Equations, Types and Application of DC Generators, DC motors- Basics of Single-Phase Induction Motor and Three Phase Induction Motor- Construction, Principle of Operation of Single-Phase Transformer, Three phase transformers, Auto transformer.			
UNIT III	**SEMICONDUCTOR DEVICES**		**9+3**
Classification of Semiconductors, Construction, Operation and Characteristics: PN Junction Diode – Zener Diode, PNP, NPN Transistors, Field Effect Transistors and Silicon Controlled Rectifier – Applications			
UNIT IV	**DIGITAL ELECTRONICS**		**9+3**
Basic of Concepts of Number Systems, Logic Gates, Boolean Algebra, Adders, Subtractors, multiplexer, demultiplexer, encoder, decoder, Flipflops, Up/Down counters, Shift Registers.			
UNIT V	**MICROPROCESSORS**		**9+3**
Architecture, 8085, pin diagram of 8085, ALU timing and control unit, registers, data and address bus, timing and control signals, Instruction types, classification of instructions, addressing modes, Interfacing Basics: Data transfer concepts – Simple Programming concepts.			
LECTURE: 45	**TUTORIAL: 15**	**PRACTICAL:0**	**TOTAL: 60**

TEXT BOOK

1.	Metha V.K, Rohit Mehta, 2020. Principles of Electronics,12th ed, S Chand Publishing.
2.	Albert Malvino, David J.Bates., 2017. Electronics Principles. 7th ed, Tata McGraw-Hill. New Delhi.
3.	Rajakamal, 2014. Digital System-Principle & Design. 2nd ed. Pearson education.
4.	Morris Mano, 2015. Digital Design. Prentice Hall of India.
5.	Ramesh, S. Gaonkar, 2013, Microprocessor Architecture, Programming and its Applications with the 8085, 6thed , India: Penram International Publications.

REFERENCE BOOKS:

1.	Cotton, H.,2005 Electrical Technology. CBS Publishers & Distributors Pvt Ltd.
2.	Syed, A. Nasar, 1998, Electrical Circuits. Schaum Series.
3.	Jacob Millman and Christos, C. Halkias, 1967, Electronics Devices, New Delhi: Tata McGraw-Hill.
4.	Millman, J. and Halkias, C. C., 1972. Integrated Electronics: Analog and Digital Circuits and Systems, Tokyo: McGraw-Hill, Kogakusha Ltd.
5.	Mohammed Rafiquzzaman, 1999. Microprocessors - Theory and Applications: Intel and Motorola. Prentice Hall International.

E-REFERENCES:	
1.	NTPEL, Basic Electrical Technology (Web Course), Prof. N. K. De, Prof. T. K. Bhattacharya and Prof. G.D. Roy, IIT Kharagpur.
2.	Prof.L.Umanand,http://freevideolectures.com/Course/2335/Basic-Electrical-Technology#, IISc Bangalore.
3.	http://nptel.ac.in/Onlinecourses/Nagendra/, Dr. Nagendra Krishnapura, IIT Madras.
4.	Dr.L.Umanand, http://www.nptelvideos.in/2012/11/basic-electrical-technology.html, IISC Bangalore.

XBE102- Mapping of COs with GAs

CO/GA	GA 1	GA 2	GA 3	GA 4	GA 5	GA 6	GA 7	GA 8	GA 9	GA 10	GA 11	GA 12
CO 1	3	3	1	1	1	1			1	1	1	
CO 2	3	3	1	1	1	1			1	1	1	
CO 3	2	2	2	1	2	2	1	1	1	1	1	
CO 4	2	2	1	1	1	1	1	1	1	1	1	
CO 5	2	2	1	1	1	1	1	1	1	1	1	
Total	12	12	6	5	6	6	3	3	5	5	5	
Scaled	3	3	2	1	2	2	1	1	1	1	1	

1-5 → 1, 6-10 → 2, 11-15 → 3

0 – No Relation, 1 – Low Relation, 2 – Medium Relation, 3 – High Relation

COURSE CODE	XAP103	L	T	P	C
COURSE NAME	APPLIED PHYSICS FOR ENGINEERS	3	1	0	4
C:P:A	2.8:0.8:0.4	L	T	P	H
PREREQUISITE	BASIC PHYSICS IN HSC LEVEL	3	1	0	4

COURSE OUTCOMES		Domain	Level
CO1	***Identify*** the basics of mechanics, ***explain*** the principles of elasticity and ***determine*** its significance in engineering systems and technological advances.	Cognitive: Psychomotor:	Remember, Understand Mechanism
CO2	***Illustrate*** the laws of electrostatics, magneto-statics and electromagnetic induction; ***use*** and ***locate*** basic applications of electromagnetic induction to technology.	Cognitive: Psychomotor: Affective:	Remember, Analyze, Mechanism Respond
CO3	***Understand*** the fundamental phenomena in optics by measurement and ***describe*** the working principle and	Cognitive:	Understand, Apply

	application of various lasers and fibre optics.	Psychomotor: Affective:	Mechanism Receive
CO4	***Analyse*** energy bands in solids, ***discuss*** and ***use*** physics principles of latest technology using semiconductor devices.	Cognitive: Psychomotor: Affective:	Understand, Analyze Mechanism Receive
CO5	***Develop*** Knowledge on particle duality and ***solve***Schrodinger equation for simple potential.	Cognitive:	Understand, Apply

UNIT - I MECHANICS OF SOLIDS	**9+3**

Mechanics: Force - Newton's laws of motion - work and energy - impulse and momentum - torque - law of conservation of energy and momentum- Friction.

Elasticity: Stress - Strain - Hooke's law - Stress strain diagram - Classification of elastic modulus - Moment, couple and torque - Torsion pendulum - Applications of torsion pendulum - Bending of beams - Experimental determination of Young's modulus: Uniform bending and non-uniform bending.

UNIT -II ELECTROMAGNETIC THEORY	**9+3**

Laws of electrostatics - Electrostatic field and potential of a dipole; Dielectric Polarisation, Dielectric constant, internal field - Clausius Mossotti Equation - Laws of magnetism - Ampere's Faraday's law; Lenz's law - Maxwell's equation - Plane electromagnetic waves; their transverse nature- expression for plane, circularly and elliptically polarized light - quarter and half wave plates - production and detection of plane, circularly and elliptically polarized light.

UNIT –III OPTICS, LASERS AND FIBRE OPTICS	**9+3**

Optics: Dispersion- Optical instrument: Spectrometer - Determination of refractive index and dispersive power of a prism- Interference of light in thin films: air wedge - Diffraction: grating.

LASER: Introduction - Population inversion -Pumping - Laser action - Nd-YAG laser - CO_2 laser - Applications

FibreOptics: Principle and propagation of light in optical fibre- Numerical aperture and acceptance angle - Types of optical fibre - Fibre optic communication system (Block diagram).

UNIT –IV SEMICONDUCTOR PHYSICS	**9+3**

Semiconductors: Energy bands in solids - Energy band diagram of good conductors, insulators and semiconductors - Concept of Fermi level - Intrinsic semiconductors- Concept of holes - doping - Extrinsic semiconductors- P type and N type semiconductors - Hall effect.

Diodes and Transistors: P-N junction diode- Forward bias and reverse bias - Rectification action of diode - Working of full wave rectifier using P N junction diodes - PNP and NPN transistors - Three different configurations - Advantages of common emitter configuration - working of NPN transistor as an amplifier in common emitter configuration.

UNIT –V QUANTUM PHYSICS	**9+3**

Introduction to quantum physics, black body radiation, Compton effect, de Broglie hypothesis, wave – particle duality, uncertainty principle, Schrodinger wave equation(Time dependent and Time independent), particle in a box, Extension to three dimension - Degeneracy.

TEXT BOOKS				
	LECTURE	TUTORIAL	PRACTICAL	TOTAL
Hours	45	15		60

TEXT BOOKS	
1.	Gaur R. K. and Gupta S. L., "Engineering Physics", Dhanpat Rai Publications, 2009.
2.	Avadhanulu M. N. "Engineering Physics" (Volume I and II), S. Chand & Company Ltd., New Delhi, 2010.
REFERENCE BOOKS	
1.	Palanisamy P. K., "Engineering Physics", Scitech Publications (India) Pvt. Ltd, Chennai.
2.	Arumugam M., "Engineering Physics" (Volume I and II), Anuradha Publishers, 2010.
3.	Senthil Kumar G., " Engineering Physics", 2nd Enlarged Revised Edition, VRB Publishers, Chennai, 2011.
4.	Mani P., "Engineering Physics", Dhanam Publications, Chennai, 2007.
E RESOURCES	
1.	NPTEL , Engineering Physics, Prof. M. K. Srivastava, Department of Physics, IIT, Roorkee.

XAP103 Mapping of CO's with PO

CO Vs PO	CO1	CO2	CO3	CO4	CO5	Total	Scaled to 0,1,2 and 3
PO_1	3	3	3	3	3	15	3
PO_2	2	0	2	2	0	6	2
PO_3	2	1	2	2	2	9	2
PO_4	2		2	2	0	6	2
PO_5	1	1	1	1	0	4	1
PO_6	0	0	0	0	0	0	
PO_7	0	0	0	0	0	0	
PO_8	0	0	0	0	0	0	
PO_9	1		1	1	0	3	1
PO_{10}	0	0	0	0	0	0	
PO_{11}	0	0	0	0	0	0	
PO_{12}	1	1	1	1	1	5	1
PSO_1	0	0	0	0	0	0	
PSO_2	0	0	0	0	0	0	
TOTAL	12	6	12	12	6	-	-

1-5 → 1, 6-10 → 2, 11-15 → 3

0 – No Relation, 1 – Low Relation, 2 – Medium Relation, 3 – High Relation

COURSE CODE	XEG104	L	T	P	C
COURSE NAME	ENGINEERING GRAPHICS AND DESIGN	1	0	2	3
PREREQUISITES	NIL	L	T	P	H
C:P:A= 3:0:0		1	0	2	5

COURSE OBJECTIVES

- To prepare the student to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability
- To prepare the student to communicate effectively
- To prepare the student to use the techniques, skills, and modern engineering tools necessary for engineering practice

COURSE OUTCOMES		DOMAIN	LEVEL
CO1	***Apply*** the national and international standards, ***construct***and***practice*** various curves	Cognitive Psychomotor Affective	Apply Guided response Respond
CO2	***Interpret, construct*** **and** ***practice*** orthographic projections of points, straight lines and planes.	Cognitive Psychomotor Affective	Understand Mechanism Respond
CO3	***Construct Sketch*** **and** ***Practice*** projection of solids in various positions and true shape of sectioned solids.	Cognitive Psychomotor Affective	Apply overt response Respond
CO4	***Interpret, Sketch*** **and** ***Practice*** the development of lateral surfaces of simple and truncated solids, intersection of solids.	Cognitive Psychomotor Affective	Understand Overt response Respond
CO5	***Construct sketch*** **and** ***practice*** isometric and perspective views of simple and truncated solids.	Cognitive Psychomotor Affective	Apply Overt response Respond

UNIT I	INTRODUCTION, FREE HAND SKETCHING OF ENGG OBJECTS AND CONSTRUCTION OF PLANE CURVE	6L+12P

Importance of graphics in engineering applications – use of drafting instruments – BIS specifications and conventions as per SP 46-2003.

Pictorial representation of engineering objects – representation of three dimensional objects in two dimensional media – need for multiple views– developing visualization skills through free hand sketching of three dimensional objects.

Polygons & curves used in engineering practice – methods of construction – construction of ellipse, parabola and hyperbola by eccentricity method – cycloidal and involute curves – construction– drawing of tangents to the above curves. Practice on basic tools of CAD.

UNIT II	PROJECTION OF POINTS, LINES AND PLANE SURFACES	6L+12P

General principles of orthographic projection – first angle projection– layout of views – projections of points, straight lines located in the first quadrant –determination of true lengths of lines and their inclinations to the planes of projection– traces – projection of polygonal surfaces and circular lamina inclined to both the planes of projection-CAD practice on points and lines

UNIT III	PROJECTION OF SOLIDS AND SECTIONS OF SOLIDS	6L+12P

Projection of simple solids like prism, pyramid, cylinder and cone when the axis is inclined to one plane of projection– change of position & auxiliary projection methods – sectioning of above solids in simple vertical positions by cutting plane inclined to one reference plane and perpendicular to the other and above solids in inclined position with cutting planes parallel to one reference plane – true shapes of sections-CAD practice on solid models.		
UNIT IV	**DEVELOPMENT OF SURFACES AND INTERSECTION OF SOLIDS**	**6L+12P**
Need for development of surfaces – development of lateral surfaces of simple and truncated solids – prisms, pyramids, cylinders and cones– development of lateral surfaces of the above solids with square and circular cutouts perpendicular to their axes – intersection of solids and curves of intersection –prism with cylinder, cylinder & cylinder, cone & cylinder with normal intersection of axes and with no offset-CAD practice on intersection of solids.		
UNIT V	**ISOMETRIC AND PERSPECTIVE PROJECTIONS**	**6L+12P**
Principles of isometric projection – isometric scale – isometric projections of simple solids, truncated prisms, pyramids, cylinders and cones– principles of perspective projections – projection of prisms, pyramids and cylinders by visual ray and vanishing point methods-CAD practice on isometric view.		
TEXT BOOKS		
1.	Natarajan,K.V, " A Textbook of Engineering Graphics", Dhanalakshmi Publishers, Chennai, 2006.	
2.	Dr. P.K. Srividhya, P. Pandiyaraj, "Engineering Graphics", PMU Publications, Vallam, 2013.	
REFERENCE BOOKS		
1.	Luzadder and Duff, "Fundamentals of Engineering Drawing" Prentice Hall of India PvtLtd, XI Edition- 2001.	
2.	Venugopal,K. and Prabhu Raja, V., "Engineering Graphics", New Age International(P) Ltd., 2008	
3.	Gopalakrishnan K.R. "Engineering Drawing I & II" Subhas Publications, 1998.	
4.	Shah. M.B and Rana B.C "Engineering Drawing" Pearson Education, 2005.	
E-REFERENCES		
1.	http:// periyarnet/e-content	
2.	Http://nptel.ac.in/courses/112103019/	
LECTURE: 15	**TUTORIAL: 0**	**PRACTICAL: 30**	**TOTAL:45**

XEG104 - Mapping of CO with PO

CO Vs PO	CO1	CO2	CO3	CO4	CO5	Total	Scaled to 0,1,2 and 3
PO_1	3	3	3	3	3	15	3
PO_2	3	3	3	3	3	15	3
PO_3	3	3	3	3	3	15	3

PO_4	2	1	1	1	1	6	2
PO_5	3	3	3	3	3	15	3
PO_6	2	1	1	1	1	6	2
PO_7	3	3	3	3	3	15	3
PO_8	1	1	1	1	1	5	1
PO_9	1	1	1	1	1	5	1
PO_{10}	2	1	1	1	1	6	2
PO_{11}	3	2	2	2	2	11	3
PO_{12}	3	3	3	3	3	15	3
PSO_1	0	0	0	0	0	0	0
PSO_2	1	1	1	1	1	5	1
TOTAL	30	26	26	26	26	-	-

1-6 → 1, 7-12 → 2, 13-18 → 3

0 – No Relation, 1 – Low Relation, 2 – Medium Relation, 3 – High Relation

COURSE CODE	**XGS105**	**L**	**T**	**P**	**SS**	**C**
COURSE NAME	**SPEECH COMMUNICATION**	**0**	**1**	**2**	**0**	**3**
PRE-REQUISITES	**NIL**	**L**	**T**	**P**	**SS**	**H**
C:2.6 P:0.4 A:0	**-**	**0**	**1**	**4**	**0**	**5**

COURSE OUTCOMES		**DOMAIN**	**LEVEL**
CO1	***Ability*** to recall the types of speeches	Cognitive	Remember
CO2	***Apply*** the techniques in public speaking	Cognitive	Apply
CO3	***Identify***the common patterns in organizing a speech	Cognitive	Remember
CO4	***Construct*** the nature and style of speaking	Cognitive	Create
CO5	***Practicing***thespeaking skills	Psychomotor	Guided Response

UNIT I	**TYPES OF SPEECHES**	**9**

1.1 – Four types of speeches

1.2 – Analyzing the audience

1.3 - Developing ideas and supporting materials

UNIT II	PUBLIC SPEAKING	9
2.1 - Introduction to Public Speaking 2.2 - Competencies Needed for successful speech making 2.3 – Speaking about everyday life situations		
UNIT III	**ORGANIZATION OF SPEECH**	**9**
3.1 – Developing a speech out line 3.2 - Organizing the speech 3.3 – Introduction - development – conclusion		
UNIT IV	**PRESENTATION**	**9**
4.1 - Tips for preparing the draft speech 4.2 – Presentation techniques using ICT tools 4.3 – Using examples from different sources		
UNIT V	**ACTIVITIES**	**9**
5.1 – Reading activities 5.2 – Creative presentations 5.3 – Media presentation techniques		

SUGGESTED READINGS

1.	Sanjay Kumar and Pushp Lata. *Communication Skills*. Oxford University Press. 2011
2.	Michael Swan. *Practical English Usage.* OUP. 1995

XGS105 - Mapping of CO with PO

CO Vs PO	CO1	CO2	CO3	CO4	CO5	Total	Scaled to 0,1,2 and 3
PO_1	0	0	0	0	0	0	0
PO_2	0	0	0	0	0	0	0
PO_3	0	0	0	0	0	0	0
PO_4	0	0	0	0	0	0	0
PO_5	0	0	0	0	0	0	0
PO_6	0	0	0	0	0	0	0
PO_7	0	0	0	0	0	0	0
PO_8	1	1	1	1	1	5	1
PO_9	3	3	2	2	2	12	2
PO_{10}	3	3	3	3	3	15	3
PO_{11}	0	0	0	0	0	0	0

PO_{12}	2	2	2	2	2	10	2
PSO_1	0	0	0	0	0	0	0
PSO_2	0	0	0	0	0	0	0

1-6 → 1, 7-12 → 2, 13-18 → 3

0 – No Relation, 1 – Low Relation, 2 – Medium Relation, 3 – High Relation

COURSE CODE	**XUM106**	**L**	**T**	**P**	**C**
COURSE NAME	**CONSTITUTION OF INDIA**	**0**	**0**	**0**	**0**
PREREQUISITE:	**NIL**	**L**	**T**	**P**	**H**
C:P:A	**3:0:0**	**0**	**0**	**0**	**3**

COURSE OUTCOMES		**DOMAIN**	**LEVEL**
CO1	***Understand*** the Constitutional History	Cognitive	Understanding
CO2	***Understand*** the Powers and Functions	Cognitive	Understanding
CO3	***Understand*** the Legislature	Affective	Remembering
CO4	***Understand*** the Judiciary	Affective	Remembering
CO5	***Understand*** the Centre State relations	Cognitive	Understanding

UNIT I	**08**
Constitutional History- The Constitutional Rights- Preamble- Fundamental Rights- Fundamental Duties- Directive principles of State Policy.	
UNIT II	**09**
The Union Executive- The President of India (powers and functions)- Vice-President of India- The Council of Ministers-Prime Minister- Powers and Functions.	
UNIT III	**10**
Union Legislature- Structure and Functions of Lok Sabha- Structure and Functions of Rajya Sabha- Legislative Procedure in India- Important Committes of Lok Sabha- Speaker of the Lok Sabha.	
UNIT IV	**09**
The Union Judiciary- Powers of the Supreme Court- Original Jurisdiction- Appelete jurisdictions- Advisory Jurisdiction- Judicial review.	
UNIT V	**09**
Centre State relations- Political Parties- Role of governor, powers and functions of Chief Minister-Legislative Assembly- State Judiciary- Powers and Functions of the High Courts.	

LECTURE	**TUTORIAL**	**PRACTICAL**	**TOTAL**
45	**0**	**0**	**45**

REFERENCES

1.	W.H.Morris Shores- Government and politics of India, NewDelhi,B.1.Publishers,1974.
2.	M.V.Pylee- Constitutional Government in India, Bombay, Asia Publishing House, 1977.
3.	R.Thanker- The Government and politics of India, London:Macmillon, 1995.
4.	A.C.Kapur- Select Constitutions S,Chand& Co.,NewDelhi, 1995
5.	V.D.Mahajan- Select Modern Governments,S,Chand&Co, NewDelhi,1995.
6.	B.C.Rout- Democractic Constitution of India.
7.	Gopal K.Puri- Constitution of India, India 2005.

XUM106- Mapping of COs with POs

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9
CO 1	2			1					
CO 2	2			1					
CO 3	2			1					1
CO 4	2			1				1	1
CO 5	2	2		1				1	1
Total	10	2		5				2	3
Scaled to 0,1,2,3	2	1		1				1	1

1-5 →1, 6-10 →2, 11-15 →3

0 – No Relation, 1- Low Relation, 2- Medium Relation, 3- High Relation

COURSE CODE	**XBE107**	**L**	**T**	**P**	**C**
COURSE NAME	**ELECTRICAL AND ELECTRONIC ENGINEERING SYSTEMS LAB**	**0**	**0**	**1**	**1**
C:P:A	**1.5:1:0.5**	**L**	**T**	**P**	**H**
PREREQUISITE:	**BASIC PHYSICS IN HSC LEVEL**	**0**	**0**	**1**	**2**

COURSE OUTCOMES		**Domain**	**Level**
CO1	***Apply***the fundamental electrical concepts and ***differentiate*** the various electronic components.	Cognitive Psychomotor Affective	Understand Set Valuing
CO2	***Implement*** and ***execute*** the different types of wiring connections.	Cognitive Psychomotor Affective	Understand Set Valuing
CO3	***Demonstrate*** the Fluorescent lamp connection with choke.	Cognitive	Understand

		Psychomotor Affective	Set Valuing
CO4	***Characterize*** and ***display*** the basic knowledge on the working of PN junction and Zener diode.	Cognitive Psychomotor Affective	Understand Set Valuing
CO5	***Implement*** and ***execute***the various digital electronic circuits such as Adders and Subtractors.	Cognitive Psychomotor Affective	Understand Set Valuing

OBJECTIVES

The course helpsto

a. Learn the basic concepts of electrical and electronics components.
b. Understand the basic wiring methods and connection.
c. Study the characteristics of diodes, Zener diodes, NPN transistors.
d. Verify the working of simple logic gates, adders and subtractors.

LIST OF EXPERIMENTS

Ex. No	Experiments	COs
1.	Study of Electrical Symbols, Tools and Safety Precautions, Power Supplies.	-
2.	Study of Active and Passive elements – Resistors, Inductors and Capacitors, Bread Board.	-
3.	Testing of DC Voltage and Current in series and parallel resistors which are connected in breadboard by using Voltmeter, Ammeter and Multimeter.	-
4.	Fluorescent lamp connection with choke.	-
5.	Staircase Wiring	-
6.	Forward and Reverse bias characteristics of PN junction diode.	-
7.	Forward and Reverse bias characteristics of zener diode.	-
8.	Input and Output Characteristics of NPN transistor.	-
9.	Construction and verification of simple logic gates.	-
10.	Construction and verification of adders and subtractors.	-
LECURE:0	**TUTORIAL: 0** **PRACTICAL: 30**	**TOTAL:30**
TEXT BOOKS		
1.	Laboratory Manual "Electrical and Electronic Engineering SystemsLab", Department of Electrical and Electronics Engineering, PMIST, Thanjavur.	

XBE107- Mapping of COs with GAs

CO/GA	GA 1	GA 2	GA 3	GA 4	GA 5	GA 6	GA 7	GA 8	GA 9	GA 10	GA 11	GA 12
CO 1	3	3	1	1	1	1			1	1	1	
CO 2	3	3	1	1	1	1			1	1	1	
CO 3	2	2	2	1	2	2	1	1	1	1	1	
CO 4	2	2	1	1	1	1	1	1	1	1	1	
CO 5	2	2	1	1	1	1	1	1	1	1	1	
Total	12	12	6	5	6	6	3	3	5	5	5	

Scaled Value	3	3	2	1	2	2	1	1	1	1	1	

1-5 → 1, 6-10 → 2, 11-15 → 3

0 – No Relation, 1 – Low Relation, 2 – Medium Relation, 3 – High Relation

COURSE CODE	**XAP108**	**L**	**T**	**P**	**C**
COURSE NAME	**APPLIED PHYSICS FOR ENGINEERS LAB**	**0**	**0**	**1**	**1**
C:P:A	**0:1.5:0.5**	**L**	**T**	**P**	**H**
PREREQUISITE:	**BASIC PHYSICS IN HSC LEVEL**	**0**	**0**	**1**	**2**

COURSE OUTCOMES		**Domain**	**Level**
CO1	***Identify*** the basics of mechanics, and ***determine*** its significance in engineering systems and technological advances.	Psychomotor:	Mechanism
CO2	***use*** and ***locate*** basic applications of electromagnetic induction to technology.	Psychomotor: Affective:	Analyze, Mechanism Respond
CO3	***describe*** the working principle and application of various lasers and fibre optics.	Psychomotor: Affective:	Apply Mechanism Receive
CO4	***Analyse*** energy bands in solids, ***discuss*** and ***use*** physics principles of latest technology using semiconductor devices.	Psychomotor: Affective:	Analyze Mechanism Receive

LIST OF EXPERIMENTS

Ex. No	**Experiments**	**COs**
1.	Torsional Pendulum - determination of moment of inertia and rigidity modulus of the given material of the wire.	
2.	Uniform Bending - Determination of the Young's Modulus of the material of the beam.	
3.	Non-Uniform Bending - Determination of the Young's Modulus of the material of the beam.	
4.	Meter Bridge - Determination of specific resistance of the material of the wire.	
5.	Spectrometer - Determination of dispersive power of the give prism.	
6.	Spectrometer - Determination of wavelength of various colours in Hg source using grating.	
7.	Air wedge - Determination of thickness of a given thin wire.	
8.	Laser - Determination of wavelength of given laser source and size of the given micro particle using Laser grating.	
9.	Post office Box - Determination of band gap of a given semiconductor.	
10.	PN Junction Diode - Determination of V-I characteristics of the given diode.	
LECURE:0	**TUTORIAL: 0** **PRACTICAL: 30**	**TOTAL:30**
TEXT BOOKS		
1.	Laboratory Manual "PhysicsLab", Department of Physics, PMIST, Thanjavur.	

REFERENCE BOOKS	
1.	Samir Kumar Ghosh, "A text book of Advanced Practical Physics", New Central Agency (P) Ltd, 2008.
2.	Arora C.L., "Practical Physics", S. Chand & Company Ltd., New Delhi, 2013.
3.	UmayalSundari AR., "Applied Physics Laboratory Manual", PMU Press, Thanjavur, 2012.

XAP108 - Mapping of CO with PO

CO Vs PO	CO1	CO2	CO3	CO4	CO5	Total	Scaled to 0,1,2 and 3
PO_1	3	3	3	3	3	15	3
PO_2	2		2	2	0	6	2
PO_3	2	1	2	2	2	9	2
PO_4	2		2	2	0	6	2
PO_5	1	1	1	1	0	4	1
PO_6	0	0	0	0	0	0	0
PO_7	0	0	0	0	0	0	0
PO_8	0	0	0	0	0	0	0
PO_9	1		1	1	0	3	1
PO_{10}	0	0	0	0	0	0	0
PO_{11}	0	0	0	0	0	0	0
PO_{12}	1	1	1	1	1	5	1
PSO_1	0	0	0	0	0	0	0
PSO_2	0	0	0	0	0	0	0
TOTAL	12	6	12	12	6	-	-

1-5 → 1, 6-10 → 2, 11-15 → 3

0 – No Relation, 1 – Low Relation, 2 – Medium Relation, 3 – High Relation

COURSE CODE	XMA201	L	T	P	C
COURSE NAME	CALCULUS, ORDINARY DIFFERENTIAL EQUATIONS AND COMPLEX VARIABLE	3	1	0	4
PREREQUISITES	NIL	L	T	P	H
C:P:A= 3:0.5:0.5		3	1	0	4

COURSE OBJECTIVES

- Understand the application of Calculus, Ordinary Differential Equations and Complex Variable in engineering.

COURSE OUTCOMES		DOMAIN	LEVEL
CO1	**Find** double and triple integrals and to find line, surface and volume of an integral by **Applying** Greens, Gauss divergence and Stokes theorem.	Cognitive	Remember, Apply
CO2	**Solve** first order differential equations of different types which are solvable for p, y, x and Clairaut's type.	Cognitive	Apply
CO3	**Solve** Second order ordinary differential equations with variable coefficients using various methods.	Cognitive	Apply
CO4	**Use** CR equations to verify analytic functions and to find harmonic functions and harmonic conjugate. Conformal mapping of translation and rotation. Mobius transformation.	Cognitive Psychomotor	Remember, Apply Guided Response
CO5	**Apply** Cauchy residue theorem to evaluate contour integrals involving sine and cosine function and to state Cauchy integral formula, Liouvilles theorem. Taylor's series, zeros of analytic functions, singularities, Laurent's series.	Cognitive Affective	Apply Receiving

UNIT I	MULTIVARIABLE CALCULUS (INTEGRATION)	9L+3T

Multiple Integration: Double integrals (Cartesian) - change of order of integration in double integrals - Change of variables (Cartesian to polar) - Triple integrals (Cartesian), Scalar line integrals - vector line integrals - scalar surface integrals - vector surface integrals - Theorems of Green, Gauss and Stokes.

UNIT II	FIRST ORDER ORDINARY DIFFERENTIAL EQUATIONS	9L+3T

Exact - linear and Bernoulli's equations - Euler's equations - Equations not of first degree: equationssolvable for p - equations solvable for y- equations solvable for x and Clairaut's type.

UNIT III	ORDINARY DIFFERENTIAL EQUATIONS OF HIGHER ORDERS	9L+3T

Second order linear differential equations with variable coefficients- method of variation of parameters- Cauchy-Euler equation- Power series solutions- Legendre polynomials- Bessel functions of the first kind and their properties.

UNIT IV	COMPLEX VARIABLE – DIFFERENTIATION	9L+3T

Differentiation-Cauchy-Riemann equations- analytic functions-harmonic functions-finding harmonic conjugate- elementary analytic functions (exponential, trigonometric, logarithm) and their properties- Conformal mappings- Mobius transformations and their properties.

UNIT V	COMPLEX VARIABLE – INTEGRATION	9L+3T

Contour integrals- Cauchy-Goursat theorem (without proof) - Cauchy Integral formula (without

proof)-Liouville's theorem (without proof)- Taylor's series- zeros of analytic functions- singularities- Laurent's series– Residues- Cauchy Residue theorem (without proof)- Evaluation of definite integral involving sine and cosine- Evaluation of certain improper integrals using the Bromwich contour.			
TEXT BOOKS			
1.	B.S. Grewal, "Higher Engineering Mathematics", Khanna Publishers, 40thth Edition, 2008.		
REFERENCE BOOKS			
	-		
LECTURE: 45	**TUTORIAL: 15**	**PRACTICAL: 0**	**TOTAL :60**

XMA201 - Mapping of CO with PO

CO Vs PO	CO1	CO2	CO3	CO4	CO5	Total	Scaled to 0,1,2 and 3
PO_1	3	3	3	3	3	15	3
PO_2	2	1	1	2	2	8	2
PO_3	0	0	0	0	0	0	0
PO_4	0	0	0	0	0	0	0
PO_5	2	0	0	0	1	3	1
PO_6	0	0	0	0	0	0	0
PO_7	0	0	0	0	0	0	0
PO_8	0	0	0	0	0	0	0
PO_9	0	0	0	0	0	0	0
PO_{10}	1	1	1	1	1	5	1
PO_{11}	0	0	0	0	0	0	0
PO_{12}	2	1	1	1	2	7	2
PSO_1	0	0	0	0	0	0	0
PSO_2	0	0	0	0	0	0	0
TOTAL	10	6	6	7	9	-	-

1-6 → 1, 7-12 → 2, 13-18 → 3

0 – No Relation, 1 – Low Relation, 2 – Medium Relation, 3 – High Relation

COURSE CODE	XCP202	L	T	P	C

COURSE NAME	PROGRAMMING FOR PROBLEM SOLVING	3	0	0	3
PREREQUISITES	BASIC UNDERSTANDING SKILLS	L	T	P	H
C:P:A= 3:0:0		3	0	0	3

COURSE OBJECTIVES

- To learn programming language basics and syntax
- To ignite logical thinking
- To understand structured programming approach
- To deal with user defined data types
- To know about data storage in secondary memory

COURSE OUTCOMES		DOMAIN	LEVEL
CO1	***Define*** programming fundamentals and ***Solve*** simple programs using I/O statements	Cognitive	Remember Understand Apply
CO2	***Define*** syntax and ***write simple programs*** using control structures and arrays	Cognitive	Remember Understand Apply
CO3	***Explain*** and ***write simple programs*** using functions and pointers	Cognitive	Remember Understand Apply
CO4	***Explain*** and ***write simple programs*** using structures and unions	Cognitive	Remember Understand Apply
CO5	***Explain*** and ***write simple programs*** using files and ***Build*** simple projects	Cognitive	Remember Understand Apply

UNIT I	PROGRAMMING FUNDAMENTALS AND I/O STATEMENTS	9

Introduction to components of a computer system, Program – Flowchart – Pseudo code – Software – Introduction to C language – Character set – Tokens: Identifiers, Keywords, Constants, and Operators – sample program structure-Header files – Data Types- Variables - Output statements – Input statements.

UNIT II	CONTROL STRUCTURES AND ARRAYS	9

Control Structures – Conditional Control statements: Branching, Looping - Unconditional control structures: switch, break, continue, goto statements – Arrays: One Dimensional Array – Declaration – Initialization – Accessing Array Elements – Searching – Sorting – Two Dimensional arrays - Declaration – Initialization – Matrix Operations – Multi Dimensional Arrays - Declaration – Initialization. Storage classes: auto – extern – static. Strings: Basic operations on strings.

UNIT III	FUNCTIONS AND POINTERS	9

Functions: Built in functions –User Defined Functions- Parameter passing methods - Passing arrays to functions – Recursion - Programs using arrays and functions. Pointers - Pointer declaration - Address operator - Pointer expressions & pointer arithmetic - Pointers and function - Call by value - Call by Reference - Pointer to arrays - Use of Pointers in self-referential structures- Notion of linked list.

UNIT IV	STRUCTURES AND UNIONS	9

Structures and Unions - Giving values to members - Initializing structure- Functions and structures - Passing structure to elements to functions - Passing entire function to functions - Arrays of structure - Structure within a structure and Union.		
UNIT V	**FILES**	**9**
File management in C - File operation functions in C- Defining and opening a file - Closing a file - The getw and putw functions - The fprintf&fscanf functions - fseek function – Files and Structures.		
TEXT BOOKS		
1.	Byron Gottfried, "Programming with C", III Edition, (Indian Adapted Edition), TMH publications, 2010	
2.	YeshwantKanethker, “Let us C”, BPB Publications, 2008	
REFERENCE BOOKS		
1.	E. Balaguruswamy, Programming in ANSI C, Tata McGraw-Hill, 7th edition 2017.	
2.	Brian W. Kernighan and Dennis M. Ritchie, "The C Programming Language", Pearson Education Inc. 2005	
3.	Johnson baugh R. and Kalin M., “Applications Programming in ANSI C”, III Edition, Pearson Education India, 2003	
E –REFERENCES		
1.	https://www.indiabix.com/c-programming/questions-and-answers/	
2.	https://www.javatpoint.com/c-programming-language-tutorial	
3.	https://www.w3schools.in/c-tutorial/	
LECTURE: 45	**TUTORIAL: 0**	**PRACTICAL: 0**	**TOTAL :45**

XCP202 - Mapping of CO with PO

CO Vs PO	CO1	CO2	CO3	CO4	CO5	Total	Scaled to 0,1,2 and 3
PO_1	3	3	2	2	2	12	3
PO_2	2	2	2	2	2	10	2
PO_3	0	0	1	1	1	3	1
PO_4	0	0	2	2	0	4	1
PO_5	3	2	2	2	2	11	3
PO_6	0	0	0	0	0	0	0
PO_7	0	0	0	0	0	0	0
PO_8	0	0	0	0	1	1	1
PO_9	0	0	0	0	0	0	0
PO_{10}	0	0	0	0	2	2	1

PO_{11}	2	2	2	2	2	10	2
PO_{12}	3	3	2	2	2	12	3
PSO_1	2	2	2	2	2	10	2
PSO_2	0	0	0	0	0	0	0
TOTAL	15	14	15	15	16	-	-

1-6 → 1, 7-12 → 2, 13-18 → 3

0 – No Relation, 1 – Low Relation, 2 – Medium Relation, 3 – High Relation

COURSE CODE	**XAC203**	**L**	**T**	**P**	**C**
COURSE NAME	**APPLIED CHEMISTRY FOR ENGINEERS**	**3**	**1**	**0**	**4**
PREREQUISITES	**NIL**	**L**	**T**	**P**	**H**
C:P:A= 2.5:1:0.5		**3**	**1**	**0**	**4**

COURSE OBJECTIVES

- Understand the application of chemistry in engineering.

COURSE OUTCOMES		**DOMAIN**	**LEVEL**
CO1	***Identify*** the periodic properties such as ionization energy, electron affinity, oxidation states and electro negativity. ***Describe*** the various water quality parameters like hardness and alkalinity.	Cognitive Psychomotor	Remembering Perception
CO2	***Explain*** *and* ***Measure*** microscopic chemistry in terms of atomic, molecular orbitals and intermolecular forces.	Cognitive Psychomotor	Understanding Set
CO3	***Interpret*** bulk properties and processes using thermodynamic and kinetic considerations.	Cognitive Psychomotor Affective	Applying Mechanism Receive
CO4	***Describe, Illustrate*** *and* ***Discuss*** the chemical reactions that are used in the synthesis of molecules.	Cognitive Psychomotor Affective	Remembering Analyzing Perception Responding
CO5	***Apply, Measure*** and ***Distinguish*** the ranges of the electromagnetic spectrum used for exciting different molecular energy levels in various spectroscopic techniques	Cognitive Psychomotor	Remembering, Applying Mechanism

UNIT I	**PERIODIC PROPERTIES AND WATER CHEMISTRY**	**8L+3T**

Effective nuclear charge, penetration of orbitals, variations of s, p, d and f orbital energies of atoms in the periodic table, electronic configurations, atomic and ionic sizes, ionization energies, electron affinity and electronegativity, polarizability, oxidation states, coordination numbers and geometries, hard soft acids and bases, molecular geometries. **Water Chemistry**-Water quality parameters-Definition and explanation of hardness, determination of hardness by EDTA method-Introduction to alkalinity.

UNIT II	**USE OF FREE ENERGY IN CHEMICAL EQUILIBRIA**	**12L+3T**

Thermodynamic functions: energy, entropy and free energy. Estimations of entropy and free energies. Free energy and emf. Cell potentials, the Nernst equation and applications. Acid base, oxidation reduction and solubility equilibria. Corrosion-Types, factors affecting corrosion rate and Control methods. Use of free energy considerations in metallurgy through Ellingham diagrams. Advantages of electroless plating, electroless plating of nickel and copper on Printed Circuit Board (PCB).

UNIT III	**ATOMIC AND MOLECULAR STRUCTURE**	**10L+3T**

Schrodinger equation. Particle in a box solution and their applications for conjugated molecules and nanoparticles.. Molecular orbitals of diatomic molecules and plots of the multicenter orbitals. Equations for atomic and molecular orbitals. Energy level diagrams of diatomic molecules. Crystal field theory and the energy level diagrams for transition metal ions and their magnetic properties. Band structure of solids and the role of doping on band structures.

Intermolecular forces and potential energy surfaces

Ionic, dipolar and Vander waals interactions. Equations of state of real gases and critical phenomena. Potential energy surfaces of H_3, H_2F and HCN and trajectories on these surfaces.

UNIT IV	**SPECTROSCOPIC TECHNIQUES AND APPLICATIONS**	**7L+3T**

Principles of spectroscopy and selection rules. Electronic spectroscopy-chromophore, auxochromes, types of electronic transition and application. Fluorescence and its applications in medicine. Vibrational spectroscopy-types of vibrations, Instrumentation and applications. Rotational spectroscopy of diatomic molecules. Nuclear magnetic resonance spectroscopy-concept of chemical shift and applications-magnetic resonance imaging. Diffraction and scattering.

UNIT V	**STEREOCHEMISTRY AND ORGANIC REACTIONS**	**8L+3T**

Representations of 3 dimensional structures, structural isomers and stereoisomers, configurations and symmetry and chirality, enantiomers, diastereomers, optical activity, absolute configurations and conformational analysis. Isomerism in transitional metal compounds

Organic reactions and synthesis of a drug molecule

Introduction to reactions involving substitution, addition, elimination, oxidation, reduction, cyclization reactions and ring opening reactions. Synthesis of a commonly used drug molecule-Aspirin and paracetamol.

TEXT BOOKS

1.	Puri B.R. Sharma, L.R., Kalia K.K. Principles of Inorganic Chemistry, (23rd edition), New Delhi, Shoban Lal Nagin Chand & Co., 1993.
2.	Lee. J.D. Concise Inorganic Chemistry, UK, Black well science, 2006.
3.	Trapp. C, Cady, M. Giunta. C, Atkins's Physical Chemistry, 10th Edition, Oxford publishers, 2014.
4.	Glasstone S., Lewis D., Elements of Physical Chemistry, London, Mac Millan & Co. Ltd, 1983.
5.	Morrison R.T. and Boyd R.N. Organic Chemistry (6th edition), New York, Allyn

	& Bacon Ltd., 1976.
6.	Banwell. C.N, Fundamentals of Molecular Spectroscopy, (3th Edition), McGraw-Hill Book Company, Europe 1983.
7.	Bahl B.S. and Arun Bahl, Advanced Organic Chemistry, (4th edition), S./ Chand & Company Ltd. New Delhi, 1977.
8.	P. S. Kalsi, Stereochemistry: Conformation and mechanism, (9th Edition), New Age International Publishers, 2017.
REFERENCES	
1.	Puri B R Sharma L R and Madan S Pathania, "Principles of Physical Chemistry", Vishalpublishing Co., Edition 2004.
2.	Kuriocose, J C and Rajaram, J, "Engineering Chemistry", Volume I/II, Tata McGraw-Hill Publishing Co. Ltd. New Delhi, 2000.
E- REFERENCES	
1.	http://www.mooc-list.com/course/chemistry-minor-saylororg
2.	https://www.canvas.net/courses/exploring-chemistry
3.	http://freevideolectures.com/Course/2263/Engineering-Chemistry-I
4.	http://freevideolectures.com/Course/3001/Chemistry-I
5.	http://freevideolectures.com/Course/3167/Chemistry-II
6.	http://ocw.mit.edu/courses/chemistry/

LECTURE:45	**TUTORIAL:15**	**PRACTICAL:0**	**TOTAL:60**

XAC203 - Mapping of CO with PO

CO Vs PO	CO1	CO2	CO3	CO4	CO5	Total	Scaled to 0,1,2 and 3
PO_1	3	2	3	3	3	13	3
PO_2	0	0	0	0	0	0	0
PO_3	0	0	0	0	0	0	0
PO_4	0	0	0	0	0	0	0
PO_5	0	0	0	0	0	0	0
PO_6	0	0	0	0	0	0	0
PO_7	2	1	2	3	2	10	2
PO_8	3	2	3	3	2	13	3
PO_9	3	2	3	3	3	14	3
PO_{10}	0	0	0	0	0	0	0
PO_{11}	0	0	0	0	0	0	0

PO_{12}	0	0	0	0	0	0	0
PSO_1	0	0	0	0	0	0	0
PSO_2	0	0	0	0	0	0	0

1-6 → 1, 7-12 → 2, 13-18 → 3

0 – No Relation, 1 – Low Relation, 2 – Medium Relation, 3 – High Relation

COURSE CODE	**XGS204**	**L**	**T**	**P**	**SS**	**C**
COURSE NAME	**TECHNICAL COMMUNICATION**	**2**	**0**	**0**	**0**	**2**
PRE-REQUISITES	**NIL**	**L**	**T**	**P**	**SS**	**H**
C:3 P:0 A:0	**-**	**2**	**0**	**0**	**0**	**2**

COURSE OUTCOMES		**DOMAIN**	**LEVEL**
CO1	***Ability*** to understand the basic principles	Cognitive	Remember
CO2	***Apply*** the techniques in writing	Cognitive	Apply
CO3	***Identify***communicative styles	Cognitive	Remember
CO4	***Construct*** the nature of writing	Cognitive	Create

UNIT I – Basic Principles	**9**
1.1 – Basic Principles of Technical Writing 1.2 – Styles used in Technical Writing 1.3 – Language and Tone	
UNIT II – Techniques	**9**
2.1 – Special Techniques used in writing 2.2 – Definition & Description of mechanism 2.3 – Description- Classification-Interpretation	
UNIT III – Communication	**9**
3.1 – Modern development in style of writing 3.2 - New letter writing formats	
UNIT IV – Report Writing	**9**
4.1 – Types of Report writing 4.2 – Project writing formats	

SUGGESTED READINGS	
1.	John Sealy, Writing and Speaking Author; Oxford University Press, New Delhi, 2009
2.	Williams K.S, Communicating Business. Engage Learning India Pvt Ltd, 2012

XGS204 - Mapping of CO with PO

CO Vs PO	**CO1**	**CO2**	**CO3**	**CO4**	**CO5**	**Total**	**Scaled to 0,1,2 and 3**

PO_1	0	0	0	0	0	0	0
PO_2	0	0	0	0	0	0	0
PO_3	0	0	0	0	0	0	0
PO_4	0	0	0	0	0	0	0
PO_5	0	0	0	0	0	0	0
PO_6	0	0	0	0	0	0	0
PO_7	0	0	0	0	0	0	0
PO_8	1	1	1	1	1	5	1
PO_9	3	3	2	2	2	12	2
PO_{10}	3	3	3	3	3	15	3
PO_{11}	0	0	0	0	0	0	0
PO_{12}	2	2	2	2	2	10	2
PSO_1	0	0	0	0	0	0	0
PSO_2	0	0	0	0	0	0	0
TOTAL							

1-6 → 1, 7-12 → 2, 13-18 → 3

0 – No Relation, 1 – Low Relation, 2 – Medium Relation, 3 – High Relation

COURSE CODE	**XWP205**	**L**	**T**	**P**	**C**
COURSE NAME	**WORKSHOP PRACTICES**	**1**	**0**	**2**	**3**
PREREQUISITES	**NIL**	**L**	**T**	**P**	**H**
C:P:A= 1:3:0		**1**	**0**	**2**	**5**

COURSE OBJECTIVES

- To obtain skills in machining methods, casting process, moulding methods and welding etc.

COURSE OUTCOMES		**DOMAIN**	**LEVEL**
CO1	***Summarize*** the machining methods and ***Practice*** machining operation.	Cognitive Psychomotor	UnderstandGuided Response
CO2	***Defining***metal casting process,moulding methods and **relates**Casting and Smithy applications.	Cognitive Psychomotor	Remember Perception
CO3	***Plan*** basic carpentry and fitting operation and ***Practice*** carpentry and fitting operations.	Cognitive Psychomotor	Apply Guided Response
CO4	***Summarize*** metal joining operation and ***Practice*** welding operation.	Cognitive Psychomotor	UnderstandGuided Response

CO5	***Illustrate*** the, electrical and electronics basics and ***Makes*** appropriate connections**.**	Cognitive Psychomotor	Understand Origination

COURSE CONTENT		
EXP.NO	**TITLE**	**COs**
1	Introduction to machining process	CO1
2	Plain turning using lathe operation	CO1
3	Introduction to CNC	CO1
4	Demonstration of plain turning using CNC	CO1
5	Study of metal casting operation	CO2
6	Demonstration of moulding process	CO2
7	Study of smithy operation	CO2
8	Study of carpentry tools	CO3
9	Half lap joint – Carpentry	CO3
10	Mortise and Tenon joint – Carpentry	CO3
11	Study of fitting tools	CO3
12	Square fitting	CO3
13	Triangular fitting	CO3
14	Study of welding tools	CO4
15	Square butt joint – welding	CO4
16	Tee joint – Welding	CO4
17	Introduction to house wiring	CO5
18	One lamp controlled by one switch	CO5
19	Two lamps controlled by single switch	CO5
20	Staircase wiring	CO5

THEORY: 15	**TUTORIAL:0**	**PRACTICAL:30**	**TOTAL:45**

TEXT BOOKS	
1.	Workshop Technology I,II,III, by S K Hajra, Choudhary and A K Chaoudhary. Media Promoters and Publishers Pvt. Ltd., Bombay
2.	Workshop Technology by Manchanda Vol. I,II,III India Publishing House, Jalandhar.

REFERENCES	
1.	Manual on Workshop Practice by K Venkata Reddy, KL Narayana etal; MacMillan India Ltd.
2.	Basic Workshop Practice Manual by T Jeyapoovan; Vikas Publishing House (P) Ltd.,New Delhi
3.	Workshop Technology by B.S. Raghuwanshi, Dhanpat Rai and Co., New Delhi.
4.	Workshop Technology by HS Bawa, Tata McGraw Hill Publishers, New Delhi.

E RESOURCES	
1.	http://nptel.ac.in/courses/112107145/

XWP205 - Mapping of CO with PO

CO Vs PO	CO1	CO2	CO3	CO4	CO5	Total	Scaled to 0,1,2 and 3
PO_1	2	2	2	2	2	10	2
PO_2	1	1	1	1	1	5	1
PO_3	2	2	2	2	2	10	2
PO_4	2	2	2	2	2	10	2
PO_5	1	1	1	1	1	5	1
PO_6	0	0	0	0	0	0	0
PO_7	0	0	0	0	0	0	0
PO_8	1	1	1	1	1	5	1
PO_9	1	1	1	1	1	5	1
PO_{10}	0	0	0	0	0	0	0
PO_{11}	1	1	1	1	1	5	1
PO_{12}	2	2	2	2	2	10	1
PSO_1	0	0	0	0	0	0	0
PSO_2	0	0	0	0	0	0	0
TOTAL	13	13	13	13	13	-	-

1-6 → 1, 7-12 → 2, 13-18 → 3

0 – No Relation, 1 – Low Relation, 2 – Medium Relation, 3 – High Relation

COURSE CODE	XEM206	L	T	P	C
COURSE NAME	ENGINEERING MECHANICS	0	0	3	3
PREREQUISITES	NIL	L	T	P	H
C:P:A= 3.5:0.25:0.25		0	0	3	3

COURSE OBJECTIVES

Upon successful completion of the course, student will have:

- Ability to apply mathematics, science, andengineering.
- Ability to design and conduct experiments, as well as to analyze and interpretdata.
- Ability to identify, formulate, and solve engineeringproblems.
- Ability to apply modern engineering tools, techniques and resources to solve complex mechanical engineering activities with an understanding of thelimitations.
- Ability to comprehend the thermodynamics and their corresponding processes that influence the behavior and response of structural components.
- Ability to apply principles of engineering, basic science, and mathematics (including multivariate calculus and differential equations) and thermodynamics to model, analyze, design, and realize physical systems, components, orprocesses.

COURSE OUTCOMES		DOMAIN	LEVEL
CO1	***Explain*** the principles forces, laws and theirapplications.	Cognitive	Understanding, Apply
CO2	***Classification***of friction, and ***apply*** the forces in Trusses and beams.	Cognitive	Understanding, Apply
CO3	***Explain*** and ***Apply*** moment of Inertia and Virtual work	Cognitive	Understanding, Apply
CO4	***Outline*** and ***Examine*** Dynamics	Cognitive	Understanding, Apply
CO5	***Explain*** free and forced vibration	Cognitive	Remember, Understanding

UNIT I	INTRODUCTION TO ENGINEERING MECHANICS	9L+3T

Force Systems Basic concepts, Particle equilibrium in 2-D & 3-D; Rigid Body equilibrium; System of Forces, Coplanar Concurrent Forces, Components in Space– Resultant- Moment of Forces and its Application; Couples and Resultant of Force System, Equilibrium of System of Forces, Free body diagrams, Equations of Equilibrium of Coplanar Systems and Spatial Systems; Static indeterminacy.

UNIT II	FRICTION AND BASIC STRUCTURAL ANALYSIS	9L+3T

Types of friction, Limiting friction, Laws of Friction, Static and Dynamic Friction; Motion of Bodies, wedge friction, screw jack & differential screw jack; Equilibrium in three dimensions; Method of Sections; Method of Joints; How to determine if a member is in tension or compression; Simple Trusses; Zero force members; Beams & types of beams; Frames & Machines.

UNIT III	CENTROID , CENTRE OF GRAVITY AND VIRTUAL WORK	9L+3T

	AND ENERGY METHOD	
Centroid of simple figures from first principle, centroid of composite sections; Centre of Gravity and its implications; Area moment of inertia- Definition, Moment of inertia of plane sections from first principles, Theorems of moment of inertia, Moment of inertia of standard sections and composite sections; Mass moment inertia of circular plate, Cylinder, Cone, Sphere, Hook. Virtual displacements, principle of virtual work for particle and ideal system of rigid bodies, degrees of freedom. Active force diagram, systems with friction, mechanical efficiency. Conservative forces and potential energy (elastic and gravitational), energy equation for equilibrium. Applications of energy method for equilibrium. Stability ofequilibrium.		
UNIT IV	**REVIEW OF PARTICLE DYNAMICS AND INTRODUCTION TO KINETICS OF RIGID BODIES**	**9L+3T**
Rectilinear motion; Plane curvilinear motion (rectangular, path, and polar coordinates). 3-D curvilinear motion; Relative and constrained motion; Newton's 2nd law (rectangular, path, and polar coordinates). Work-kinetic energy, power, potential energy. Impulse-momentum (linear, angular); Impact (Direct and oblique). Types of motion, Instantaneous centre of rotation in plane motion and simple problems; D'Alembert's principle and its applications in plane motion and connected bodies; Work energy principle and its application in plane motion of connected bodies; Kinetics of rigid bodyrotation.		
UNIT V	**MECHANICAL VIBRATIONS**	**9L+3T**
Basic terminology, free and forced vibrations, resonance and its effects; Degree of freedom; Derivation for frequency and amplitude of free vibrations without damping and single degree of freedom system, simple problems, types of pendulum, use of simple, compound and torsion pendulums.		

TEXT BOOKS

1.	Hisrich, 2016, Entrepreneurship, Tata McGraw Hill, New Delhi.
2.	S.S.Khanka, 2013, Entrepreneurial Development, S.Chand and Company Limited, New Delhi.

REFERENCE BOOKS

1.	Mathew Manimala, 2005, Entrepreneurship Theory at the Crossroads, Paradigms & Praxis, Biztrantra ,2nd Edition.
2.	Prasanna Chandra, 2009, Projects – Planning, Analysis, Selection, Implementation and Reviews, Tata McGraw-Hill.
3.	P.Saravanavel, 1997, Entrepreneurial Development, Ess Pee kay Publishing House, Chennai.
4.	Arya Kumar,2012, Entrepreneurship: Creating and Leading an Entrepreneurial organisation, Pearson Education India.
5.	Donald F Kuratko, T.V Rao, 2012, Entrepreneurship: A South Asian perspective, Cengage Learning India.
6.	Dinesh Awasthi, Raman Jaggi, V.Padmanand, Suggested Reading / Reference Material for Entrepreneurship Development Programmes (EDP/WEDP/TEDP), EDI Publication, Entrepreneurship Development Institute of India, Ahmedabad.

E-REFERENCES

1.	Jeff Hawkins, "Characteristics of a successful entrepreneur", ALISON Online entrepreneurship courses, "https://alison.com/learn/entrepreneurial-skills

2.	Jeff Cornwall, "Entrepreneurship -- From Idea to Launch", Udemy online Education, https://www.udemy.com/entrepreneurship-from-idea-to-launch/

LECTURE: 45	**TUTORIAL: 15**	**PRACTICAL: 0**	**TOTAL:60**

XEM206 - Mapping of CO with PO

CO Vs PO	CO1	CO2	CO3	CO4	CO5	Total	Scaled to 0,1,2 and 3
PO_1	1	1	1	1	1	5	1
PO_2	2	2	2	2	3	11	3
PO_3	3	3	3	3	3	15	3
PO_4	1	1	1	1	1	5	1
PO_5	0	0	0	0	0	0	0
PO_6	3	3	3	3	3	15	3
PO_7	1	1	1	1	1	5	1
PO_8	0	3	0	1	3	7	2
PO_9	3	3	3	3	3	15	3
PO_{10}	1	1	1	3	3	9	2
PO_{11}	2	2	2	3	3	12	3
PO_{12}	2	2	2	3	3	12	3
PSO_1	2	2	2	3	3	12	3
PSO_2	2	2	2	3	3	12	3
TOTAL	23	26	23	30	33	-	-

1-6 → 1, 7-12 → 2, 13-18 → 3

0 – No Relation, 1 – Low Relation, 2 – Medium Relation, 3 – High Relation

COURSE CODE	XCP207	L	T	P	C
COURSE NAME	PROGRAMMING FOR PROBLEM SOLVING LAB	0	0	1	1
PREREQUISITES	BASIC UNDERSTANDING SKILLS	L	T	P	H
C:P:A	0.75:0.25:0	0	0	2	2

LEARNING OBJECTIVES

- To learn programming language basics and syntax
- To ignite logical thinking
- To understand structured programming approach
- To deal with user defined data types
- To know about data storage in secondary memory

COURSE OUTCOMES		DOMAIN	LEVEL
CO1	***Solve*** simple programs using I/O statements	Cognitive Psycomotor	Apply Responding
CO2	***Solve*** programs using control structures and arrays	Cognitive Psycomotor	Apply Responding
CO3	***Solve*** programs using functions and pointers	Cognitive Psycomotor	Apply Responding
CO4	***Solve*** programs using structures	Cognitive Psycomotor	Apply Responding
CO5	***Solve*** programs using files	Cognitive Psycomotor	Apply Responding

LIST OF EXPERIMENTS

Ex. No	Experiments	COs
1.	Program to display a Leave Letter as per proper format	CO1
2.	i. Program for addition of two numbers ii. Program to solve any mathematical formula.	CO1
3.	Program to find greatest of 3 numbers using Branching Statements	CO2
4.	Program to display divisible numbers between n1 and n2 using looping Statement	CO2
5.	Program to search an array element in an array.	CO2
6.	Program to find largest / smallest element in an array.	CO2
7.	Program to perform string operations.	CO3
8.	Program to find area of a rectangle of a given number use four function types.	CO3
9.	Programs to pass and receive array and pointers using four function types	CO3
10.	Programs using Recursion for finding factorial of a number	CO3
11.	Program to read and display student mark sheet of a student structures with variables	CO4
12.	Program to read and display student marks of a class using structures with arrays	CO4
13.	Program to create linked list using structures with pointers	CO4

14.	Program for copying contents of one file to another file.	CO5
15.	Program using files to store and display student mark list of a class using structures with array	CO5
TUTORIAL:0	**PRACTICAL:30**	**TOTAL:30**

XCP207 - Mapping of CO with PO

CO Vs PO	CO1	CO2	CO3	CO4	CO5	Total	Scaled to 0,1,2 and 3
PO_1	3	3	2	2	2	12	3
PO_2	2	2	2	2	2	10	2
PO_3	0	0	1	1	1	3	1
PO_4	0	0	2	2	0	4	1
PO_5	3	2	2	2	2	11	3
PO_6	0	0	0	0	0	0	0
PO_7	0	0	0	0	0	0	0
PO_8	0	0	0	0	1	1	1
PO_9	0	0	0	0	0	0	0
PO_{10}	0	0	0	0	2	2	1
PO_{11}	2	2	2	2	2	10	2
PO_{12}	3	3	2	2	2	12	3
PSO_1	2	2	2	2	2	10	2
PSO_2	0	0	0	0	0	0	0
TOTAL	15	14	15	15	16	-	-

1-5 → 1, 6-10 → 2, 11-15 → 3

0 – No Relation, 1 – Low Relation, 2 – Medium Relation, 3 – High Relation

COURSE CODE	XAC208	L	T	P	C
COURSE NAME	APPLIED CHEMISTRY FOR ENGINEERS LAB	0	0	1	1
PREREQUISITES	NIL	L	T	P	H
C:P:A= 0:2:0		0	0	1	2

COURSE OBJECTIVES

COURSE OUTCOMES		DOMAIN	LEVEL
CO1	***Ability*** to Identify the principles of chemistryrelevant to the study of science and engineering	Cognitive Psychomotor	Remember Perception
CO2	***Analyze***and***Measure*** molecular/system propertiessuch as surface tension, viscosity, conductance ofsolutions, redox potentials, extent of hardness, chloride content ofwater, etc.	Cognitive Psychomotor Affective	Understand Analyze Perception Receive
CO3	***Analyze*** the synthetic procedure and rate constants of reactions from concentration of reactants/products as afunction of time	Cognitive	Apply

LIST OF EXPERIMENTS

Ex. No	Experiments	COs
1.	Determination of chloride ion present in the water sample by Argentometric method.	CO1
2.	Determination of total, temporary and permanent hardness of water sample by EDTA method.	CO1
3.	Determination of cell constant and conductance of solutions.	CO2
4.	Potentiometry - determination of redox potentials and emfs.	CO2
5.	Determination of surface tension and viscosity.	CO3
6.	Adsorption of acetic acid by charcoal.	CO3
7.	Determination of the rate constant of a reaction.	CO3
8.	Estimation of iron by colorimetric method.	CO3
9.	Synthesis of a polymer/drug.	CO3
10.	Saponification/acid value of oil.	CO3

LECURE:0	TUTORIAL: 0	PRACTICAL: 30	TOTAL:30

TEXT BOOKS

1.	Laboratory Manual "ChemistryLab", Department of Chemistry, PMIST, Thanjavur.

REFERENCE BOOKS

1.	Mendham, Denney R.C,. Barnes J.D and Thomas N.J.K., "Vogel's Textbook of Quantitative Chemical Analysis", 6th Edition, Pearson Education, 2004.
2.	Garland, C. W.; Nibler, J. W.; Shoemaker, D. P. "Experiments in Physical Chemistry", 8th Ed.; McGraw-Hill: New York, 2003.

E-RESOURCES- MOOC's

1.	http://freevideolectures.com/Course/2380/Chemistry-Laboratory-Techniques
2.	http://ocw.mit.edu/courses/chemistry/5-301-chemistry-laboratory-techniques
3.	http://freevideolectures.com/Course/2941/Chemistry-1A-General-Chemistry-Fall-2011

XAC208 - Mapping of CO with PO

CO Vs PO	CO1	CO2	CO3	Total	Scaled to 0,1,2 and 3
PO_1	3	2	2	7	2
PO_2	3	2	2	7	2
PO_3	3	2	2	7	2
PO_4	3	2	2	7	2
PO_5	2	1	1	4	1
PO_6	3	2	2	7	2
PO_7	3	2	2	7	2
PO_8	0	1	0	1	0
PO_9	1	1	1	3	1
PO_{10}	1	1	1	3	1
PO_{11}	1	1	0	2	1
PO_{12}	0	1	0	1	0
PSO_1	0	1	0	1	0
PSO_2	0	1	0	1	0

1-5 → 1, 6-10 → 2, 11-15 → 3

0 – No Relation, 1 – Low Relation, 2 – Medium Relation, 3 – High Relation

COURSE CODE	XMA301	L	T	P	C
COURSE NAME	TRANSFORMS AND PARTIAL DIFFERENTIAL EQUATIONS	3	3	0	3
PREREQUISITES	CALCULUS AND LINEAR ALGEBRA	L	T	P	H
C:P:A= 3:0:0		3	0	0	3

COURSE OBJECTIVES

- Understand the application of transforms and partial differential equations in engineering.

COURSE OUTCOMES		DOMAIN	LEVEL
CO1	***Solve***standard types of first order differential equation and to solve linear partial differential equations of second order with constant coefficients. Elimination of arbitrary constants and functions.	Cognitive Psychomotor	Apply Imitation
CO2	***State*** Dirichlet's condition. ***Explain***general Fourier series of the curve y = f(x) in the interval (0,2π) (-π, π), (0, 2 ℓ), (-ℓ,ℓ) and (0, π). Perform harmonic analysis	Cognitive Psychomotor	Remember, Understand, Imitation
CO3	***Solve*** the standard Partial Differential Equations, arising in engineering Problems, like one dimensional Wave equation and Heat flow equation by Fourier series method in Cartesian coordinates. Classify second order quasi PDE.	Cognitive Affective	Apply Receiving
CO4	***Find***the Fourier transform and Fourier sine and cosine transforms of simple functions using definition and its properties.	Cognitive	Remember, Apply
CO5	***Apply*** the properties of Z transform to ***Find*** the Z transform and inverse Z transform of sequence and functions, and to solve the difference equation using them.	Cognitive	Remember, Apply

UNIT I	PARTIAL DIFFERENTIAL EQUATIONS	9

Formation of partial differential equations by elimination of arbitrary constants and arbitrary functions – Solution of standard types of first order partial differential equations – Lagrange's linear equation – Linear partial differential equations of second and higher order with constant coefficients.

UNIT II	FOURIER SERIES	9

Dirichlet's conditions – General Fourier series – Odd and even functions – Half range sine series – Half range cosine series –Parseval's identity – Harmonic Analysis.

UNIT III	APPLICATIONS OF BOUNDARY VALUE PROBLEMS	9

Classification of second order quasi linear partial differential equations – Solutions of one dimensional wave equation – One dimensional heat equation – Steady state solution of two dimensional heat equation (Insulated edges excluded) – Fourier series solutions in Cartesian coordinates.

UNIT IV	FOURIER TRANSFORM	9

Fourier integral theorem (without proof) – Fourier transform pairs – Fourier Sine and Cosine transforms – properties – Transforms of simple functions – Convolution theorem – Parseval's

identity.		
UNIT V	**TRANSFORM AND DIFFERENCE EQUATIONS**	**9**
Z-transform – Elementary properties – Inverse Z – transform – Convolution theorem – Initial and Final value theorems - Formation of difference equations – Solution of difference equations using Z-transform.		
TEXT BOOKS		
1.	Grewal, B.S., "Higher Engineering Mathematics", 42nd Edition, Khanna Publishers, New Delhi (2012).	
2.	Narayanan, S., ManicavachagomPillay, T.K. and Ramaniah, G., "Advanced Mathematics for Engineering Students", Volumes II and III, S.Viswanathan (Printers and Publishers) Pvt. Ltd., Chennai (2002).	
3.	Veerarajan. T., "Transforms and Partial Differential Equations", Second reprint, Tata McGraw Hill Education Pvt. Ltd., New Delhi, 2012.	
REFERENCE BOOKS		
1.	Churchill, R.V. and Brown, J.W., "Fourier Series and Boundary Value Problems", Fourth Edition, McGraw Hill Book Co., Singapore (1987).	
2.	Kandasamy, P., Thilagavathy, K., and Gunavathy, K., "Engineering Mathematics Volume III", S. Chand & Company Ltd., New Delhi (1996).	
3.	Bali N.P. and Manish Goyal, "A Text Book of Engineering Mathematics" 7th Edition Lakshmi Publications (P) Limited, New Delhi (2007).	
4.	Erwin Kreyszig, "Advanced Engineering Mathematics", 8 th Edition, Wiley India, 2007.	
5.	Ray Wylie. C and Barrett.L.C, "Advanced Engineering Mathematics" Tata McGraw Hill Education Pvt Ltd, Sixth Edition, New Delhi, 2012.	
LECTURE: 45	**TUTORIAL: 0**	**PRACTICAL: 0**	**TOTAL:45**

XMA301 - Mapping of CO with PO

CO Vs PO	CO1	CO2	CO3	CO4	CO5	Total	Scaled to 0,1,2 and 3
PO_1	3	3	3	3	3	15	3
PO_2	0	0	2	2	2	6	2
PO_3	0	0	0	0	0	0	0
PO_4	0	0	0	0	0	0	0
PO_5	0	0	0	1	1	2	1
PO_6	0	0	0	0	0	0	0
PO_7	0	0	0	0	0	0	0

PO_8	0	0	0	0	0	0	0
PO_9	0	0	0	0	0	0	0
PO_{10}	1	1	1	1	1	5	1
PO_{11}	0	0	1	1	1	3	1
PO_{12}	1	1	2	1	1	6	2
PSO_1	0	0	0	0	0	0	0
PSO_2	1	1	1	1	1	5	1
TOTAL	6	6	10	10	10	-	-

1-6 → 1, 7-12 → 2, 13-18 → 3

0 – No Relation, 1 – Low Relation, 2 – Medium Relation, 3 – High Relation

COURSE CODE	**XAS302**	**L**	**T**	**P**	**C**
COURSE NAME	**INTRODUCTION TO AEROSPACE ENGINEERING**	**3**	**0**	**0**	**3**
PREREQUISITES	**NIL**	**L**	**T**	**P**	**H**
C:P:A= 3:0:0	**-**	**3**	**0**	**0**	**3**

COURSE OBJECTIVES

- To understand the history and basics of aircraft structures, propulsion, aerodynamics, performance, controls and various aircraft systems.

COURSE OUTCOMES		**DOMAIN**	**LEVEL**
CO1	Understand the historical background of air vehicles and ***Discuss*** about forces and moments acting in an airplane.	Cognitive	Understand
CO2	***Explain*** important physical properties of atmosphere and Evolution of Lift and Drag.	Cognitive	Understand
CO3	***Discuss*** the various Fuselage constructions and materials used in air vehicles.	Cognitive	Apply
CO4	***Classify*** the types of power plants used in aircraft and aerospace vehicles.	Cognitive	Understand
CO5	Be able to ***apply*** basic principles of aircraft systems.	Cognitive	Apply
CO6	***Discuss*** the performance of aircraft.	Cognitive	Understand

UNIT I	**HISTORICAL EVOLUTION**	**9**

History of aviation– Aviation and Aerospace milestone - Components of an airplane - Different types of air vehicles – Forces and Moments acting in an airplane- Types of Aerial Vehicles.

UNIT II	**PRINCIPLES OF ATMOSPHERIC FLIGHT**	**9**

Physical properties and structure of the atmosphere – Temperature, pressure and altitude relationships - Evolution of lift and drag –Mach number – Airfoil and Wings- Basic flying Instruments.		
UNIT III	**STRUCTURES AND MATERIALS**	**9**
General types of fuselage construction - Typical wing structure - Metallic and non-metallic materials - Composite materials.		
UNIT IV	**POWER PLANTS**	**9**
Basic ideas about piston and jet engines – Piston engine -Turbofan engine – Turboprop engine – Turbojet engine – Ramjet engine – Scramjet engine- Types of Propulsion-Types of propellants.		
UNIT V	**AIRCRAFT SYSTEMS & PERFORMANCE**	**9**
Types of systems- Hydraulics, Pneumatics, Landing Gear, Anti icing- Deicing- Fuel systems- Absolute Ceiling – Service Ceiling, Basics of –Climbing, Gliding, Range & Endurance.		
LECTURE: 45	**TUTORIAL: 0**	**PRACTICAL:0**	**TOTAL: 45**
TEXT BOOK		
1. Anderson, J.D., "Introduction to Flight", 7th Edition, McGraw-HILL, 2011.		
2. Kermode, A.C., "Flight without Formulae", 5th edition, Pearson Education, 2008.		
3.Shevell.R.S "Fundamentals of Flights", Pearson education 2004		

XAS302 -Mapping of CO with PO

CO Vs PO	CO1	CO2	CO3	CO4	CO5	CO6	Total	Scaled to 0,1,2 and 3
PO_1	3	3	3	3	3	3	18	3
PO_2	1	1	1	1	1	1	6	1
PO_3	2	2	2	2	2	2	12	2
PO_4	0	0	0	0	2	2	4	1
PO_5	2	2	2	2	2	2	12	2
PO_6	0	1	2	3	3	2	11	2
PO_7	1	1	1	1	2	2	8	2
PO_8	0	0	0	0	0	0	0	0
PO_9	1	1	1	1	2	3	9	2
PO_{10}	0	0	0	0	0	0	0	0
PO_{11}	0	0	0	0	2	3	5	1
PO_{12}	2	2	2	2	3	3	14	3
PSO_1	3	2	3	2	3	3	16	3

PSO_2	0	0	0	0	0	0	0	0
TOTAL	15	15	17	17	25	26	-	-

1-6 → 1, 7-12 → 2, 13-18 → 3

0 – No Relation, 1 – Low Relation, 2 – Medium Relation, 3 – High Relation

COURSE CODE	**XAS303**	**L**	**T**	**P**	**C**
COURSE NAME	**STRENGTH OF MATERIALS**	**3**	**0**	**0**	**3**
PREREQUISITES	**ENGINEERING MECHANICS**	**L**	**T**	**P**	**H**
C:P:A= 3:0:0		**3**	**0**	**0**	**3**

COURSE OBJECTIVES

- To give brief descriptions on the behaviour of materials due to axial, bending and torsional and combined loads.

COURSE OUTCOMES		**DOMAIN**	**LEVEL**
CO1	***Describe*** the concepts of stress and strain at a point and ***express*** the stress-strain relationship for homogenous, isotropic materials.	Cognitive	Remember, Understand
CO2	***Explain*** shear force and bending moment diagrams for cantilever, simply supported beams. ***Calculate*** bending stress and shear stress in beams**.**	Cognitive	Understand, Apply
CO3	***Calculate*** deflection for beams.	Cognitive	Apply
CO4	***Measure*** rotation of rod due to torsion.	Cognitive	Remember, Understand
CO5	***Explain*** the stresses, strains associated with thin-wall spherical and cylindrical pressure vessels.	Cognitive	Understand
CO6	***Explain***about the Mohr's circle and principal stresses.	Cognitive	Understand

UNIT I	**BASICS OF STRESS AND STRAIN OF SOLIDS**	**9**

Rigid and deformable bodies - Stress and Strain – Hooke's Law – Stress-Strain relationship –Bars with varying cross sections - Elastic constants and their relationship –Composite bar - Thermal Stresses – Stresses due to freely falling weight.

UNIT II	**STRESSES IN BEAMS**	**9**

Shear force and bending moment in beams – Cantilever, Simply supported and Overhanging beams-Bending stresses in straight beams-Shear stresses in bending of beams with rectangular, I & T cross sections.

UNIT III	DEFLECTION OF BEAMS	9
Double integration method – McCauley's method - Area moment method – Conjugate beam method-Principle of super position-Castigliano's theorem.		
UNIT IV	**TORSION**	**9**
Torsion of circular shafts - Shear stresses and twist in solid and hollow circular shafts – Closely coiled helical springs.		
UNIT V	**BI AXIAL STRESSES AND APPLICATIONS OF THIN SHELLS**	**9**
Biaxial state of stresses - Stresses in thin circular cylinder and spherical shell under internal pressure and its applications – Volumetric Strain - Combined loading and its applications – Principal planes and Stresses – Mohr's circle.		

LECTURE:45	TUTORIAL:0	PRACTICAL:0	TOTAL:45

TEXT BOOKS

1.	Rajput R K, Edition -VI "Strength of Materials" Publisher, S Chand, 2015.
2.	Beer F. P. and Johnston R, "Mechanics of Materials" McGraw – Hill Book Co, Third Edition, 2002.
3.	Ray Hulse, Keith Sherwin & Jack Cain, "Solid Mechanics", Palgrave ANE Books, 2004.

REFERENCE BOOKS

1.	Timoshenko, S. P, "Elements of Strength of Materials", Tata McGraw – Hill, New Delhi, 1997.
2.	Nash W. A, "Theory and problems in Strength of Materials", Schaum Outline Series, McGraw – Hill Book Co, New York, 1995.

XAS303 - Mapping of CO with PO

CO Vs PO	CO1	CO2	CO3	CO4	CO5	CO6	Total	Scaled to 0,1,2 and 3
PO_1	3	2	1	1	3	2	12	2
PO_2	2	1	3	3	2	2	13	2
PO_3	1	2	2	2	2	2	11	2
PO_4	0	1	2	2	2	2	9	2
PO_5	0	1	2	2	3	1	9	2
PO_6	0	0	1	1	1	1	4	1

PO_7	0	0	0	0	0	0	0	0
PO_8	0	0	0	0	0	0	0	0
PO_9	0	0	0	0	0	1	1	0
PO_{10}	0	0	0	0	0	0	0	0
PO_{11}	0	0	0	0	1	1	2	1
PO_{12}	0	0	0	0	0	1	1	0
PSO_1	0	0	0	2	2	2	6	1
PSO_2	0	0	0	0	0	0	0	0
TOTAL	6	7	11	13	16	15	-	-

1-6 → 1, 7-12 → 2, 13-18 → 3

0 – No Relation, 1 – Low Relation, 2 – Medium Relation, 3 – High Relation

COURSE CODE	**XAS304**	**L**	**T**	**P**	**C**
COURSE NAME	**FLUID MECHANICS**	**3**	**1**	**0**	**4**
PREREQUISITES	**NIL**	**L**	**T**	**P**	**H**
C:P:A= 3:1:0		**3**	**1**	**0**	**4**

COURSE OBJECTIVES

- To introduce and explain fundamentals of Fluid Mechanics, which is used in the applications of Aerodynamics.

COURSE OUTCOMES		**DOMAIN**	**LEVEL**
CO1	***Describe*** fluid properties.	Cognitive	Remember
CO2	***Express*** the ideas of fluid statics and kinematics.	Cognitive	Understand
CO3	***Explain*** about the fluid dynamics.	Cognitive	Understand
CO4	***Explain*** about boundary layer.	Cognitive	Understand
CO5	***Analyze*** flow through pipes.	Cognitive	Analyze
CO6	***Compare*** *and* ***describe*** the performance of centrifugal and reciprocating pump.	Cognitive	Evaluate, Remember

UNIT I	**DEFINITIONS AND FLUID PROPERTIES**	**9+3**

Introduction to fluid - distinction between solid and fluid - basic definition - classification of fluids - dimensions and units - system of units - fluid properties - continuum concept of system and control volume.

UNIT II	**FLUID STATICS AND KINEMATICS**	**9+3**

Pascal's law - centre of pressure - forces on curved surfaces - buoyance and floatation - pressure measurement by manometers - fluid kinematics - flow visualization - lines of flow - types of fluid flow - flow net - velocity measurements.		
UNIT III	**FLUID DYNAMICS**	**9+3**
Euler's equation - Bernoulli's equation - venturimeter - orifice meter - pitot tubes – Coefficient of discharge - mouth piece - Hagen poiseulli's equation - Darcy's equation for loss of head due to friction in pipe.		
UNIT IV	**BOUNDARY LAYER AND FLOW THROUGH PIPES**	**9+3**
Laminar boundary layer - turbulent boundary layer - boundary layer separation - development of laminar and turbulent flows in circular pipes - hydraulic grade line - losses in pipes - pipes in series and parallel - equivalent pipes - pipes in network - power transmission through pipes.		
UNIT V	**HYDRAULIC MACHINES**	**9+3**
Centrifugal pumps - components - heads and efficiencies of centrifugal pump - reciprocating pump - single acting - double acting - slip - discharge and power requirement - delivery - performance of pumps - non conventional pumping system – Introduction to water turbines.		

LECTURE:45	**TUTORIAL:15**	**PRACTICAL:0**	**TOTAL: 60**

TEXT BOOKS

1.	Bansal, R.K., "Fluid Mechanics and Hydraulics Machines", Laxmi Publications (P) Ltd., New Delhi, 2013.
2.	Domkundwar.V.M., "Fluid mechanics & Hydraulic machines: with Introduction to fluidics", Dhanpat Rai & Co. Pvt.Limited, Educational and Technical publishers,India, 2012.

REFERENCE BOOKS

1.	Rathakrishnan. E, “Fluid Mechanics”, Prentice Hall of India (II Ed.), 2007.
2.	Kumar. K.L., “Engineering Fluid Mechanics” (VII Ed.) Eurasia Publishing House(P) Ltd., New Delhi, 1995.

XAS304- Mapping of CO with PO

CO Vs PO	CO1	CO2	CO3	CO4	CO5	CO6	Total	Scaled to 0,1,2 and 3
PO_1	3	2	1	1	3	2	12	2
PO_2	2	1	3	3	2	2	13	2
PO_3	1	2	2	2	2	2	11	2
PO_4	0	1	2	2	2	2	9	2
PO_5	0	1	2	2	3	1	9	2
PO_6	0	0	1	1	1	1	4	1
PO_7	0	0	0	0	0	0	0	0
PO_8	0	0	0	0	0	0	0	0
PO_9	0	0	0	0	0	1	1	0
PO_{10}	0	0	0	0	0	0	0	0
PO_{11}	0	0	0	0	1	1	2	1
PO_{12}	0	0	0	0	0	1	1	0
PSO_1	0	0	0	0	0	0	0	0
PSO_2	0	0	2	1	1	1	5	1
TOTAL	6	7	13	12	15	14	-	-

1-6 → 1, 7-12 → 2, 13-18 → 3

0 – No Relation, 1 – Low Relation, 2 – Medium Relation, 3 – High Relation

COURSE CODE	XAS305	L	T	P	C
COURSE NAME	AEROENGINEERING THERMODYNAMICS	3	1	0	4
PREREQUISITES	NIL	L	T	P	H
C:P:A= 3:1:0		3	1	0	4

COURSE OBJECTIVES

- To give a brief background of application of various laws of thermodynamics and its application in heat transfer, refrigeration and air-conditioning, jet propulsion system.

COURSE OUTCOMES		DOMAIN	LEVEL
CO1	***Describe*** the laws of thermodynamics and their application to a wide range of systems.	Cognitive	Remember
CO2	***Analyze*** the work and heat interactions associated with a prescribed process path and to perform thermodynamic analysis of a flow system. An ability to evaluate entropy changes and familiarity with calculations of the efficiencies of heat engines and other related engineering devices.	Cognitive	Analyze
CO3	***Assess*** the efficiency and mean effective pressure of different thermodynamic air standard cycles.	Cognitive	Evaluate
CO4	***Describe*** the pure substance (an ideal gas) and its applications in various flow and non flow process, and ability to evaluate the efficiencies.	Cognitive	Remember
CO5	***Describe*** the construction and working principle of different types of compressors.	Cognitive	Remember
CO6	***Compare*** the different refrigeration and air-conditioning systems and able to calculate the COP /cooling load for various applications.	Cognitive	Evaluate

UNIT I	BASIC THERMODYNAMICS	9+3
Systems, Zeroth, First and Second laws - concept of entropy change in non-flow processes - SFEE equations [steady flow energy equation] – Heat engines – Refrigerators and heat pumps - Basic thermodynamic relations.		
UNIT II	**AIR STANDARD CYCLES AND IC ENGINES**	**9+3**
Otto, Diesel, Dual and Brayton cycles – Air standard efficiency -Mean effective pressure –Two and four stroke IC Engines – P-V & T-S diagrams.		
UNIT III	**GAS TURBINES**	**9+3**
Introduction to aero-engine cycles: ramjets, turbojets, turbofans and turboprops/turboshafts, Velocity diagram - Application of gas turbines in aviation.		
UNIT IV	**AIR COMPRESSORS**	**9+3**
Positive displacement compressors – Construction and working principle of centrifugal, diagonal (mixed flow) and axial compressors.		
UNIT V	**REFRIGERATION AND AIR CONDITIONING**	**9+3**
Principles of refrigeration, Air conditioning - Heat pumps - Vapour compression – Vapour absorption types - Coefficient of performance, Properties of refrigerants - Basic functional difference between refrigeration and air conditioning – Various methods of producing refrigerating effects (RE).		

LECTURE:45	TUTORIAL:15	PRACTICAL:0	TOTAL:60

TEXT BOOKS

1.	Nag P K, "Basic and Applied Engineering Thermodynamics". Tata McGraw Hill, New Delhi, 2012.
2.	Cengel&Boles, "Thermodynamics – An Engineering Approach" ,, 7th Ed., McGraw Hill, 2011.
REFERENCE BOOKS	
1.	Rogers and Mayhew, „Engineering Thermodynamics – Work and Heat Transfer", Addision Wesley, New Delhi, 1999.
2.	Eastop and McConkey, „Applied Thermodynamics", Addision Wesley, New Delhi, 1999.
3.	Sankaar B K, „Thermal Engineering", Tata McGraw Hill, New Delhi, 1998.
E – References	
1.	https://nptel.ac.in/courses/101104069/21

XAS305 - Mapping of CO with PO

CO Vs PO	CO1	CO2	CO3	CO4	CO5	CO6	Total	Scaled to 0,1,2 and 3
PO_1	3	3	3	3	3	3	18	3
PO_2	3	3	3	3	3	3	18	3
PO_3	0	2	0	0	2	2	6	1
PO_4	1	1	1	1	1	1	6	1
PO_5	0	0	0	0	0	0	0	0
PO_6	1	1	1	1	1	1	6	1
PO_7	2	2	2	2	2	2	12	2
PO_8	0	0	0	0	0	0	0	0
PO_9	2	2	2	2	2	2	12	2
PO_{10}	0	0	0	0	0	0	0	0
PO_{11}	0	0	0	0	0	0	0	0
PO_{12}	1	1	1	1	1	1	6	1
PSO_1	1	1	1	1	1	1	6	1

PSO_2	0	0	0	0	0	0	0	0
TOTAL	14	16	14	14	16	16	-	-

1-5 → 1, 6-10 → 2, 11-15 → 3

0 – No Relation, 1 – Low Relation, 2 – Medium Relation, 3 – High Relation

COURSE CODE	**XUM306**	**L**	**T**	**P**	**C**
COURSE NAME	**ENTREPRENEURSHIP DEVELOPMENT**	**2**	**0**	**0**	**2**
PREREQUISITES	**NIL**	**L**	**T**	**SS**	**H**
C:P:A= 2.7:0:0.3		**2**	**0**	**1**	**3**

COURSE OUTCOMES		**DOMAIN**	**LEVEL**
CO1	***Recognise*** and ***describe*** the role of innovation and motivation for an entrepreneur.	Cognitive	Understanding
CO2	***Self-assess*** and ***appraise*** your entrepreneurship interest with your chosen entrepreneur.	Cognitive/ Affective	Evaluate/ Verify
CO3	***Outline*** the importance of generation of new ideas for entrepreneurship and ***illustrate*** market assessment.	Cognitive	Analyzing
CO4	***Explain*** the competition in business and ***sketch/demonstrate/comply*** business model for dealing with competition.	Cognitive/ Affective	Understanding, Apply/ Value, Response
CO5	***Describe*** and ***Explain*** venture creation and launching of small business and its management.	Cognitive	Remembering, Understanding
CO6	***Describe*** and ***Discuss*** various government policies and global opportunities for Entrepreneurship Development	Cognitive/ Affective	Remembering, Understanding/ Integrating

UNIT I	**INNOVATION AND ENTREPRENEURSHIP**	**5**
Definition of Innovation, Creativity and Entrepreneurship; role of innovation in entrepreneurship development (2)- Entrepreneurial motivation (1)-Competencies and traits of an entrepreneur (1)-Role of Family and Society; Entrepreneurship as a career and its role in national development (1)		
UNIT II	**SELF ASSESSMENT OF ENTREPRENEURIAL INCLININATION**	**4**
Self-assessment of entrepreneurial inclination (1)-Presentation by students on their entrepreneurial inclination rating (2)-Case study of successful entrepreneurs (1)		
UNIT III	**NEW IDEA GENERATION TO MARKET ASSESSMENT**	**9**
Importance of Idea generation-filtering-refinement (1)-opportunity recognition (1)- Description of chosen idea - value proposition, customer-problem-Solution statement) (1)-benefits; development status; IP ownership (1)-Market Validation- Technology/ user/decision makers/ partners (1)-market need; segmentation (1)-market TAM,SAM and SOM (1)-case study on market segmentation by popular companies (1)		
UNIT IV	**CUSTOMER – COMPETITION- BUSINESS MODEL**	**9**

Customer-Target primary customer research, Decision making unit/ process-Beach head market; Cost of Customer Acquisition (2)-Competition- comparative analysis, competitive advantages-; (2)-Business model (1) -Financial planning (1)-Pitch documentation and presentation (3)		
UNIT V	**VENTURE CREATION AND LAUNCHING OF SMALL BUSINESS AND ITS MANAGEMENT**	**9**
New enterprise creation - organizational and legal matters (1)-Operational plan (1)-Sales and distribution plan (1)-Accounting (1)-Team recruitment and management (1)-Fund raising and management (1)-Profile of a startup – case studies (2)		
UNIT VI	**GOVERNMENT INITIATIVES AND GLOBAL OPPORTUNITIES**	**9**
Incubators and accelerators- capacity building (2)-Startup policies- Startup India (2)-Support for MSME; GeMPortal(2) Funding–national and international sources(2)-Bilateral programmes by Govt. of India -Global reach for promoting cross-cultural entrepreneurship (1)		

LECTURE: 45	**TUTORIAL: 0**	**PRACTICAL:0**	**TOTAL: 45**

REFERENCE

1.	A.P.Aruna, " Lecture Notes on Entrepreneurship Development" , available as softcopy @ www.brain.net
2.	Thomas W. Zimmerer, Norman M. Scarborough, "Essentials of Entrepreneurship and Small Business Management", Pearson; 3rd edition, 2001.
3.	John Burnett, "Introducing Marketing", Open Text Book available at http://solr.bccampus.ca:8001/bcc/file/ddbe3343-9796-4801-a0cb-7af7b02e3191/1/Core%20Concepts%20of%20Marketing.pdf
4.	Toubia, Olivier. "Idea Generation, Creativity, and Incentives", Marketing Science. Vol. 25. pp.411-425. 10.1287/mksc.1050.0166, 2006.
5.	Alexander Osterwalder and Yves Pigneur, "Business Model Generation: A Handbook for Visionaries, Game Changers, and Challengers", Wiley; 1st edition, 2010.
6.	Gerardus Blokdyk,"3C's model The Ultimate Step-By-Step Guide"5starcooks, 2018.

XUM306 - Mapping of CO with PO

CO Vs PO	CO1	CO2	CO3	CO4	CO5	CO6	Total	Scaled to 0,1,2 and 3
PO_1	0	0	0	0	0	0	0	0
PO_2	1	1	1	1	1	1	6	1
PO_3	0	0	1	1	1	1	4	1
PO_4	0	0	0	0	0	0	0	0
PO_5	1	1	1	1	1	1	6	1
PO_6	0	0	0	0	0	0	0	0

PO_7	1	1	1	1	1	1	6	1
PO_8	1	1	1	1	1	1	6	1
PO_9	2	2	2	2	2	2	12	3
PO_{10}	1	1	1	1	1	1	6	1
PO_{11}	2	2	2	2	2	2	12	2
PO_{12}	2	2	2	2	2	2	12	2
PSO_1	0	0	0	0	0	0	0	0
PSO_2	0	0	0	0	0	0	0	0
TOTAL	11	11	12	12	12	12	70	13

1-5 → 1, 6-10 → 2, 11-15 → 3

0 – No Relation, 1 – Low Relation, 2 – Medium Relation, 3 – High Relation

COURSE CODE	**XAS308**	**L**	**T**	**P**	**C**
COURSE NAME	**STRENGTH OF MATERIALS LAB**	**0**	**0**	**1**	**1**
PREREQUISITES	**NIL**	**L**	**T**	**P**	**H**
C:P:A= 0:1:0		**0**	**0**	**1**	**2**

COURSE OBJECTIVES

- The objective of the lab is to perform experiments which are related to Solid Mechanics course in order to understand the practical's related to theories of the course.

COURSE OUTCOMES		**DOMAIN**	**LEVEL**
CO1	***Explain*** the procedure about the hardness test	Psychomotor	Set
CO2	***Measure*** stress limits of specimen using tension test	Psychomotor	Guided Response
CO3	***Measure*** the deflection of specimen	Psychomotor	Mechanism
CO4	***Choose*** the specimen and conduct impact test	Psychomotor	Perception
CO5	***Measure*** stresses of specimen using torsion and compression test	Psychomotor	Complex
CO6	***Measure*** stresses of specimen using block compression test	Psychomotor	Mechanism

LIST OF EXPERIMENTS

Ex. No	**Experiments**	**COs**

1.	Brinell Hardness Test	CO1
2.	Rockwell Hardness Test	CO1
3.	Tension Test	CO2
4.	Beam Deflection Test	CO3
5.	Izod Impact Test	CO4
6.	Charpy Impact Test	CO4
7.	Torsion Test	CO5
8.	Block Compression Test	CO6
LECURE:0	**TUTORIAL: 0**	**PRACTICAL: 30**	**TOTAL:30**
TEXT BOOKS			
1.	Laboratory Manual, "Strength of Materials"., Dept. of Aerospace Engineering, PMIST.		

XAS308- Mapping of CO with PO

CO Vs PO	CO1	CO2	CO3	CO4	CO5	CO6	Total	Scaled to 0,1,2 and 3
PO_1	2	2	2	2	2	2	10	2
PO_2	1	1	1	1	1	1	5	1
PO_3	2	2	2	2	2	2	10	2
PO_4	2	2	2	2	2	2	10	2
PO_5	1	1	1	1	1	1	5	1
PO_6	1	1	1	1	1	1	5	1
PO_7	0	0	0	0	0	0	0	0
PO_8	0	0	0	0	0	0	0	0
PO_9	0	0	0	0	0	0	0	0
PO_{10}	0	0	0	0	0	0	0	0
PO_{11}	0	0	0	0	0	0	0	0
PO_{12}	0	0	0	0	0	0	0	0
PSO_1	1	1	1	1	1	1	5	1

PSO_2	0	0	0	0	0	0	0	0
TOTAL	10	10	10	10	10	10	-	-

1-5→ 1, 6-10→2, 11-15→ 3

0 – No Relation, 1 – Low Relation, 2 – Medium Relation, 3 – High Relation

COURSE CODE	**XAS309**	**L**	**T**	**P**	**C**
COURSE NAME	**FLUID MECHANICS LAB**	**0**	**0**	**1**	**1**
PREREQUISITES	**NIL**	**P**	**T**	**P**	**H**
C:P:A= 0:1:0		**0**	**0**	**1**	**2**

COURSE OBJECTIVES

- To determine the various parameters related to fluid flow in pipes and in open channels.

COURSE OUTCOMES		**DOMAIN**	**LEVEL**
CO1	***Calibrate*** the venturimeter.	Psychomotor	Complex
CO2	***Measure*** the pressure using pitot static tube.	Psychomotor	Guided Response
CO3	***Explain*** the pipe flow losses and Bernoulli's theorem.	Psychomotor	Set
CO4	***Differentiate*** the performances between reciprocating pump and centrifugal pump.	Psychomotor	Perception
CO5	***Measure*** viscosity of fluid.	Psychomotor	Guided Response
CO6	***Measure*** viscosity of fluid.	Psychomotor	Guided Response

LIST OF EXPERIMENTS

Ex. No	**Experiments**	**COs**
1.	Calibration of venturimeter	CO1
2.	Pressure measurement with pitot static tube	CO2
3.	Determination of pipe flow losses	CO3
4.	Verification of Bernoulli's theorem	CO3
5.	Flow visualization by Hele-Shaw apparatus	CO4
6.	Performance test on centrifugal pumps	CO5
7.	Performance test on reciprocating pumps	CO5
8.	Determination of Viscosity of a fluid	CO6
LECURE:0	**TUTORIAL: 0** **PRACTICAL: 30**	**TOTAL:30**
TEXT BOOKS		
1.	Laboratory Manual, "Fluid Mechanics"., Dept. of Aerospace Engineering, PMIST.	

XAS309- Mapping of CO with PO

CO Vs PO	CO1	CO2	CO3	CO4	CO5	CO6	Total	Scaled to 0,1,2 and 3
PO_1	2	2	2	2	2	2	10	2
PO_2	1	1	1	1	1	1	5	1
PO_3	2	2	2	2	2	2	10	2
PO_4	2	2	2	2	2	2	10	2
PO_5	1	1	1	1	1	1	5	1
PO_6	1	1	1	1	1	1	5	1
PO_7	0	0	0	0	0	0	0	0
PO_8	0	0	0	0	0	0	0	0
PO_9	0	0	0	0	0	0	0	0
PO_{10}	0	0	0	0	0	0	0	0
PO_{11}	0	0	0	0	0	0	0	0
PO_{12}	0	0	0	0	0	0	0	0
PSO_1	0	0	0	0	0	0	0	0
PSO_2	1	1	1	1	1	0	5	1
TOTAL	10	10	10	10	10	9	-	-

1-5→ 1, 6-10→2, 11-15→ 3

0 – No Relation, 1 – Low Relation, 2 – Medium Relation, 3 – High Relation

COURSE CODE	XAS310	L	T	P	C
COURSE NAME	IN PLANT TRAINING – I	0	0	0	1
PREREQUISITES	NIL	L	T	P	H
C:P:A= 0.25:0.25:0.5		0	0	0	0

COURSE OBJECTIVES

- To enable students to learn the basic concepts of Project & Production Management.
- To enable students to implement Project Planning in their Industrial In-plant Training Project work.

COURSE OUTCOMES		DOMAIN	LEVEL
CO1	***Relate*** classroom theory with workplace practice	Cognitive	Understand
CO2	***Comply*** with factory discipline, management and business practices.	Affective	Response
CO3	***Demonstrates*** teamwork and time management.	Affective	Value
CO4	***Describe*** and ***display*** hands-on experience on practical skills obtained during the programme.	Psychometer	Perception, Set
CO5	***Summarize*** the tasks and activities done by technical documents and oral presentations.	Cognitive	Evaluate

LECTURE: 0	TUTORIAL: 0	PRACTICAL: 30	TOTAL :30

XAS310 - Mapping of CO with PO

CO Vs PO	CO1	CO2	CO3	CO4	CO5	CO6	CO7	Total	Scaled to 0,1,2 and 3
PO_1	3	2	1	2	1	0	1	10	2
PO_2	3	2	1	2	1	0	1	10	2
PO_3	0	0	1	3	1	0	0	5	1
PO_4	0	1	2	3	1	2	2	11	3
PO_5	0	0	2	3	1	0	0	6	2
PO_6	1	0	1	1	0	3	3	10	2
PO_7	1		1	1	0	1	0	4	1
PO_8	1	0	1	1	0	3	0	6	2
PO_9	0	0	0	0	2	3	1	6	2

PO_{10}	0	0	0	0	3	3	3	9	2
PO_{11}	0	0	0	0	2	2	2	6	2
PO_{12}	1	0	0	0	3	3	1	8	2
PSO_1	1	1	1	1	1	0	1	1	1
PSO_2	2	2	2	3	2	3	2	16	2
TOTAL	13	8	13	20	18	23	17	-	-

1-6 → 1, 7-12 → 2, 13-18 → 3

0 – No Relation, 1 – Low Relation, 2 – Medium Relation, 3 – High Relation

COURSE CODE	**XPS401**	**L**	**T**	**P**	**C**
COURSE NAME	**PROBABILITY AND STATISTICS**	**3**	**0**	**0**	**3**
PREREQUISITE	**NIL**	**L**	**T**	**P**	**H**
C:3.5P:0.25A:0.25		**3**	**0**	**0**	**3**

LEARNING OBJECTIVES

- Appreciate the importance of probability and statistics in computing and research.
- Develop skills in presenting quantitative data using appropriate diagrams, tabulations and summaries and to use appropriate statistical method in the analysis of simple datasets.
- Interpret and clearly present output from statistical analyses in a clear concise and understandable manner.
- The main objective of this course is to provide students with the foundations of probabilities and statistical analysis mostly used in varied applications in engineering and science like disease modeling, climate prediction and computer networks etc.

COURSE OUTCOMES

-		**DOMAIN**	**LEVEL**
CO1	***Explain***conditional probability, independent events; ***find*** expected values and Moments of Discrete random variables with properties.	Cognitive	Understanding Remembering
CO2	***Find***distribution function, Marginal density function, conditional density function, ***Define*** density function of conditional distribution functions normal, exponential and gamma distributions.	Cognitive	Remembering
CO3	***Find*** measures of central tendency, statistical parameters of Binomial, Poisson and Normal, correlation, regression. Rank Correlation coefficient of two variables.	Cognitive Psychomotor	Remembering Guided Response

CO4	***Explain*** large sample test for single proportion difference of proportion, single mean, difference of means and difference of standard deviations with simple problems.	Cognitive	Understanding
CO5	***Explain***small sample test for single mean, difference of mean and correlation coefficients, variance test, chi-square test with simple Problems.	Cognitive Affective	Understanding Receiving

UNIT I BASIC PROBABILITY	**9**
Probability spaces, conditional probability, independence, Discrete random variables, Independent random variables, the multinomial distribution, Poisson approximation to the binomial distribution, infinite sequences of Bernoulli trials, sums of independent random variables; Expectation of Discrete Random Variables, Moments, Variance of a sum, Chebyshev's Inequality.	
UNIT II CONTINUOUS PROBABILITY DISTRIBUTIONS & BIVARIATE DISTRIBUTIONS	**9**
Continuous random variables and their properties, distribution functions and densities, normal, exponential and gamma densities. Bivariate distributions and their properties, distribution of sums and quotients, conditional densities.	
UNIT III BASIC STATISTICS	**9**
Measures of Central tendency: Moments, Skewness and Kurtosis - Probability distributions: Binomial, Poisson and normal - evaluation of statistical parameters for these three distributions, Correlation and regression – Rank correlation.	
UNIT IV APPLIED STATISTICS	**9**
Curve fitting by the method of least squares- fitting of straight lines, second degree parabolas and more general curves. Test of significance: Large sample test for single proportion, difference of proportions, single mean, difference of means, and difference of standard deviations.	
UNIT V SMALL SAMPLES	**9**
Test for single mean, difference of means and correlation coefficients, test for ratio of variances - Chi-square test for goodness of fit and independence of attributes.	

LECTURE:45	**TUTORIAL:0**	**TOTAL:45**

TEXT BOOKS

1.	Veerarajan T., "Probability, Statistics and Random Processes", Tata McGraw-Hill, New Delhi, 2010.
2.	B.S. Grewal, "Higher Engineering Mathematics", Khanna Publishers, 43rd Edition, 2015.

REFERENCES

1.	Erwin Kreyszig, "Advanced Engineering Mathematics", 9th Edition, John Wiley & Sons, 2006.
2.	P. G. Hoel, S. C. Port and C. J. Stone, "Introduction to Probability Theory", Universal Book Stall, 2003 (Reprint).
3.	S. Ross, A First Course in Probability", 6th Ed., Pearson Education India, 2002.
4.	N.P. Bali and Manish Goyal, "A text book of Engineering Mathematics", Laxmi

	Publications, Reprint, 2010.
5.	W. Feller, "An Introduction to Probability Theory and its Applications", Vol. 1, 3rd Ed., Wiley, 1968.
E – REFERENCE	
1.	**NPTEL** Probability and Statistics by Prof. Someshkumar, Department of Mathematics, IIT Kharagpur.(http://nptel.ac.in/noc/noc_courselist.php)

XPS401- Mapping of CO with PO

CO Vs PO	CO1	CO2	CO3	CO4	CO5	Total	Scaled to 0,1,2 and 3
PO_1	3	3	3	3	3	15	3
PO_2	3	3	3	3	3	15	3
PO_3	2	2	2	2	2	10	2
PO_4	2	2	2	2	2	10	2
PO_5	0	0	0	0	0	0	0
PO_6	0	0	0	0	0	0	0
PO_7	0	0	0	0	0	0	0
PO_8	0	0	0	0	0	0	0
PO_9	1	1	1	1	1	5	1
PO_{10}	0	0	0	0	0	0	0
PO_{11}	0	0	0	0	0	0	0
PO_{12}	1	1	1	1	1	5	1
PSO_1	0	0	0	0	0	0	0
PSO_2	0	0	0	0	0	0	0
TOTAL	12	12	12	12	12	60	12

1-6 → 1, 7-12 → 2, 13-18 → 3

0 – No Relation, 1 – Low Relation, 2 – Medium Relation, 3 – High Relation

COURSE CODE	**XAS402**	**L**	**T**	**P**	**C**
COURSE NAME	**AERODYNAMICS –I**	**3**	**0**	**0**	**3**
PREREQUISITES	**FLUID MECHANICS, INTRODUCTION TO AEROSPACE ENGINEERING**	**L**	**T**	**P**	**H**
C:P:A= 3:0:0		**3**	**0**	**0**	**3**

COURSE OBJECTIVES			
• To understand the behavior of airflow over bodies with particular emphasis on airfoil sections in the incompressible flow regime.			
COURSE OUTCOMES		**DOMAIN**	**LEVEL**
CO1	***Study*** of basicof aerodynamics and airfoil.	Cognitive	Remember Understand
CO2	***Explain*** various flows	Cognitive	Understand Analyze
CO3	***Express*** combinational stream functions for various flows	Cognitive	Understand Analyze
CO4	***Explain*** about transformations of various shapes	Cognitive	Understand Analyze
CO5	***Explain*** Lifting line theory and Present solution to real time problems.	Cognitive	Understand Analyze
CO6	***Display*** the Boundary Layer Flow over models and Discuss Navier stokes's Equation.	Cognitive	Remember Understand

UNIT I	**BASICS OF AERODYNAMICS**	**9**
Review of governing equations- Bernoulli's- Euler's- Continuity – Momentum- Energy, Aerodynamic Forces and Moments- Characteristics of Airfoil.		
UNIT II	**TWO DIMENSIONAL INCOMPRESSIBLE FLOWS**	**9**
Elementary flows – uniform flow, source, sink, vortex and their combinations, Pressure and velocity distributions on bodies with and without circulation in ideal and real fluid flows.		
UNIT III	**CONFORMAL MAPPING**	**9**
Aerofoil terminologies - Classification of aerofoil - Transformation from circle to various shapes - Karman – Trefftz profiles – ideal and real flow – Magnus effect – D' Alembert paradox.		
UNIT IV	**AIRFOIL AND WING THEORY**	**9**
Thin aerofoil theory and its applications- concept of vortex flow - Vortex line, Horse shoe vortex, Biot Savart law, Lifting line theory and its limitations.		
UNIT V	**VISCOUS FLOWS**	**9**
Concepts of boundary Layer- Effect of pressure gradient- displacement, Momentum thickness - Flow over a flat plate-Navier Stokes's Equation.		

TEXT BOOKS	
1.	Anderson, J.D., "Fundamentals of Aerodynamics", McGraw-Hill Book Co., New York, 1998.
2.	Clancey, L.J., "Aerodynamics", Pitman, 1986.
REFERENCE BOOKS	
1.	Houghton, E.L., and Carruthers, N.B., "Aerodynamics for Engineering students", Edward Arnold Publishers Ltd., London, 1989.
2.	Milne Thomson, L.H., "Theoretical aerodynamics", Macmillan, 1985.
E – References	
1.	https://nptel.ac.in/courses/101105059/

LECTURE:45	**TUTORIAL:0**	**PRACTICAL:0**	**TOTAL:45**

XAS402 - Mapping of CO with PO

CO Vs PO	CO1	CO2	CO3	CO4	CO5	CO6	Total	Scaled to 0,1,2 and 3
PO_1	3	3	3	3	3	3	15	2
PO_2	2	3	3	3	3	3	16	3
PO_3	1	2	2	3	3	3	11	2
PO_4	3	3	3	3	3	3	15	2
PO_5	0	2	2	2	3	3	9	1
PO_6	0	3	3	3	2	2	13	2
PO_7	1	2	2	2	2	2	9	1
PO_8	0	2	2	0	0	0	4	1
PO_9	0	3	3	0	0	0	6	1
PO_{10}	0	0	0	0	0	0	0	0
PO_{11}	0	0	0	0	0	0	0	0
PO_{12}	3	3	3	3	2	2	16	3
PSO_1	0	0	0	0	0	0	0	0
PSO_2	2	2	2	2	1	1	10	2
TOTAL	15	28	28	24	22	22	-	-

1-5→ 1, 6-10→2, 11-15→ 3

0 – No Relation, 1 – Low Relation, 2 – Medium Relation, 3 – High Relation

COURSE CODE	**XAS403**	**L**	**T**	**P**	**C**
COURSE NAME	**AIRCRAFT STRUCTURES-I**	**3**	**1**	**0**	**4**
PREREQUISITES	**STRENGT OF MATERIALS**	**L**	**T**	**P**	**H**
C:P:A= 4:0:0		**3**	**1**	**0**	**4**

COURSE OBJECTIVES

- To study the behaviour of various aircraft structural components under different types of loads.

COURSE OUTCOMES		**DOMAIN**	**LEVEL**
CO1	***Recall*** engineering mechanics and ***explain*** stresses and wing structures.	Cognitive	Remember, Understand

CO2	***Draw*** and ***explain*** statically determinate and indeterminate structures.	Cognitive	Remember, Understand
CO3	***Discuss*** and ***analyze*** the behavior of elastic structures subjected to combined loads, including bending, torsion and axial loads.	Cognitive	Understand , Analyze
CO4	***Explain*** and ***Use*** Euler's formula for various columns to find out critical load. ***Distinguish*** Euler's formula and Rankine's formula.	Cognitive	Understand , Apply
CO5	***Explain*** the real time application of columns.	Cognitive	Understand
CO6	***List*** the theories of failure and ***explain***themand then ***utilize*** the failure theories to investigate the engineering structures. ***Uses*** of failure theories in Aircraft structures.	Cognitive	Understand

UNIT I	**BASICS OF STRESSES AND STRAIN**	**8**
Classification of loads and beams- Stress, Strain and types- Three-dimensional Hook's Law- Principal stresses- Mohr's Circle.		
UNIT II	**STATICALLY DETERMINATE AND INDETERMINATE STRUCTURES**	**10+4**
Analysis of plane truss using method of joints - Propped Cantilever- Fixed-Fixed beams - Clapeyron's Three Moment Equation.		
UNIT III	**ENERGY METHODS**	**8+3**
Strain Energy due to axial, bending and Torsional loads – Castigliano's theorems- Maxwell's Reciprocal theorem - Unit load method.		
UNIT IV	**COULMNS**	**11+4**
Columns with various end conditions – Euler's Column curve – Rankine's formula - Column with initial curvature - Eccentric loading – South well plot – Beam column – application of columns.		
UNIT V	**FAILURE THEORIES**	**8+3**
Types of failure theories – Principal stress theory – Principal strain theory – Shear stress theory – Shear strain energy theory – Strain energy theory –Fatigue and Creep Failure analysis.		

LECTURE: 45	**PRACTICAL:0**	**TUTORIAL: 15**	**TOTAL: 60**

TEXT BOOKS

1.	Rajput R K., Sixth Edition "Strength of Materials" Publisher, S Chand Publications, 2015.
2.	Donaldson, B.K., "Analysis of Aircraft Structures – An Introduction", McGraw- Hill, 1993.
3.	Megson T.M.G, "Aircraft Structures for Engineering Students", Edward Arnold, 1995.

REFERENCE BOOKS	
1.	Bruhn.E.F. "Analysis and design of flight vehicle structures" Tri set of offset company, USA, 1973.
2.	Timoshenko S.,"Strength of Materials", Vol. I and II,Princeton D. Von Nostrand Co, 1990.
E – References	
1.	https://nptel.ac.in/courses/101104069/21

XAS403 - Mapping of CO with PO

CO Vs PO	CO1	CO2	CO3	CO4	CO5	CO6	Total	Scaled to 0,1,2 and 3
PO_1	3	3	2	3	3	2	16	3
PO_2	2	1	1	2	2	3	11	2
PO_3	2	1	1	2	2	3	11	2
PO_4	2	1	1	3	3	3	13	3
PO_5	3	0	0	3	3	3	12	2
PO_6	0	0	0	0	0	3	3	1
PO_7	0	0	0	0	0	0	0	0
PO_8	0	0	0	0	0	0	0	0
PO_9	0	0	0	0	0	2	2	1
PO_{10}	0	0	0	0	0	0	0	0
PO_{11}	0	0	0	1	1	2	4	1
PO_{12}	0	0	0	0	0	1	1	0
PSO_1	0	0	0	0	0	0	0	0
PSO_2	0	0	0	0	0	1	1	0
TOTAL	12	6	5	14	14	23	-	-

1-5 → 1, 6-10 → 2, 11-15 → 3
0 – No Relation, 1 – Low Relation, 2 – Medium Relation, 3 – High Relation

COURSE CODE	XAS404	L	T	P	C
COURSE NAME	AIR-BREATHING PROPULSION	3	0	0	3
PREREQUISITES	AERO ENGINEERING THERMODYNAMICS	L	T	P	H
C:P:A= 3:0:0		3	0	0	3

COURSE OBJECTIVES

- Understand the working principles of gas turbine and ramjet propulsion systems, the design principles of inlets, combustion chambers, nozzles used in them.
- Learn the operation of compressors and turbines in gas turbine propulsion systems.

COURSE OUTCOMES		DOMAIN	LEVEL
CO1	***Describe*** the concepts of piston engine and Jet engine	Cognitive	Remember
CO2	***Predict*** the performance of Inlets, diffusersand nozzles	Cognitive	Understand
CO3	***Classify*** the Combustion chamber and ***Analyze*** the performance of combustion chamber design	Cognitive	Understand Analyze
CO4	***Assess***the shape and efficiency of compressor and turbine	Cognitive	Evaluate
CO5	***Compare*** the operations of ramjet, scramjet engine with turbo jet engine	Cognitive	Remember
CO6	***Explain*** the necessity of thrust reverser and thrust vector	Cognitive	Understand

UNIT I	INTRODUCTION TO AIRCRAFT PROPULSION	9

Classification of power plants-Piston prop -turbojet engine - turboprop engine -turbofan engine – turboshaft engine – Thrust equation- Factors affecting Thrust and Power.

UNIT II	INLETS, DIFFUSERS AND NOZZLES	9

Subsonic and supersonic inlets –Modes of inlet operation - internal and external compression intakes- mixed compression intakes - stability of intake operation- Convergent- Divergent- C-D Nozzle- Over expanded, under and optimum expansion in nozzles - fixed geometry nozzle - variable geometry nozzle - nozzle cooling.

UNIT III	COMBUSTION CHAMBER	9

Classification of Combustion chambers - combustion mechanism - factors affecting combustion chamber performance and design – Afterburner- Flame tube cooling – Flame stabilization - fuel injection.

UNIT IV	COMPRESSOR AND TURBINE	9

Compressor and Turbine blade shapes- Cascade theory- Radial equilibrium theory- Axial compressor - centrifugal compressor - Axial flow turbine - radial flow turbine - mixed flow turbine -turbine blade cooling techniques - lubrication systems.

UNIT V	JET PROPULSION	9

Ramjet engine- scramjet engine-Pulse jet engines- attachment of jet pipe- types of thrust reverser - types of thrust vectoring.			
LECTURE: 45	**TUTORIAL: 0**	**PRACTICAL: 0**	**TOTAL: 45**

TEXT BOOKS

1.	Hill, P.G. and Peterson, C.R. "Mechanics and Thermodynamics of Propulsion" Addison – Wesley Longman INC, 1999.
2.	Saravanamuttoo, H.I.H, Rogers, G. F. C.,et al. "Gas Turbine Theory", ISBN 978-0130158475, 5th Ed, Prentice Hall, 2001
3.	Oates, G.C., "Aero thermodynamics of Aircraft Engine Components", AIAAEducation Series, New York, 1985
4.	Mathur, M.L. and Sharma, R.P., "Gas Turbine, Jet and Rocket Propulsion", Standard Publishers & Distributors, Delhi, 1999.

REFERENCE BOOKS

1.	"Rolls Royce Jet Engine" – Third Edition – 1983.
2.	Roy, B., Aircraft Propulsion: "Science of Making Thrust to Fly", 1st Ed., Elsevier India, 2011

XAS404 - Mapping of CO with PO

CO Vs PO	CO1	CO2	CO3	CO4	CO5	CO6	Total	Scaled to 0,1,2 and 3
PO_1	3	3	3	3	3	3	18	3
PO_2	1	1	1	1	1	1	6	1
PO_3	1	2	2	1	2	1	9	1
PO_4	1	1	1	1	1	1	6	1
PO_5	1	3	3	1	0	0	8	1
PO_6	1	1	1	1	1	1	6	1
PO_7	1	2	2	2	2	2	11	2
PO_8	0	0	0	0	0	0	0	0
PO_9	2	2	2	3	3	2	14	2
PO_{10}	0	0	0	0	0	0	0	0
PO_{11}	0	1	1	1	1	1	5	1
PO_{12}	1	1	1	1	1	1	6	1
PSO_1	0	0	0	0	0	0	0	0
PSO_2	3	3	3	3	3	3	3	3
TOTAL	15	20	20	18	18	16	-	-

1-5 → 1, 6-10 → 2, 11-15 → 3

0 – No Relation, 1 – Low Relation, 2 – Medium Relation, 3 – High Relation

COURSE CODE	XUM405	L	T	P	C
COURSE NAME	ECONOMICS FOR ENGINEERS	3	0	0	3
PREREQUISITES	NIL	L	T	P	H
C:P:A	2.64:0.24:0.12	3	0	0	3

COURSE OUTCOMES		DOMAIN	LEVEL
CO1	***Explain*** the concepts of economics in engineering and ***identify*** element of cost to prepare cost sheet	Cognitive Psychomotor	Understand Perception
CO2	***Calculate and Explain*** the Break-even point and marginal costing	Cognitive Psychomotor	Understand &Apply Perception
CO3	***Summarize*** and ***Use*** value engineering procedure for cost analysis	Cognitive Affective	Understand Receive
CO4	***Estimate*** replacement problem	Cognitive	Understand
CO5	***Compute, Explain*** and ***make Use of*** different methods of depreciation	Cognitive	Understand &Apply

UNIT I INTRODUCTION TO ECONOMICS	8
Flow in an economy, Law of supply and demand, Concept of Engineering Economics – Engineering efficiency, Economic efficiency, Scope of engineering economics- types of costing, element of costs, preparation of cost sheet and estimation, Marginal cost, Marginal Revenue, Sunk cost, Opportunity cost	
UNIT IIBREAK-EVEN ANALYSIS&SOCIAL COST BENEFIT ANALYSIS	**12**
Margin of Safety, Profit, Cost & Quantity analysis-Product Mix decisions and CVP analysis, Profit/Volume Ratio (P/V Ratio), Application of Marginal costing, Limitations **Social Cost Benefit Analysis**: compare different project alternatives, Calculate direct, indirect and external effects; Monetizing effects; Result of a social cost benefit analysis.	
UNIT III VALUE ENGINEERING &COST ACCOUNTING:	**10**
Value engineering – Function, aims, Value engineering procedure - Make or buy decision Business operating costs, Business overhead costs, Equipment operating costs	
UNIT IV REPLACEMENT ANALYSIS	**7**
Replacement analysis –Types of replacement problem, determination of economic life of an asset, Replacement of an asset with a new asset.	
UNIT V DEPRECIATION	**8**
Depreciation- Introduction, Straight line method of depreciation, declining balance method of depreciation-Sum of the year's digits method of depreciation, sinking fund method of depreciation, Annuity method of depreciation, service output method of depreciation.	

LECTURE:45	TUTORIAL:0	PRACTICAL:0	TOTAL:45

TEXT BOOKS

1.	Sp Gupta, Ajay Sharma & Satish Ahuja, "Cost Accounting", V K Global Publications,Faridabad, Haryana, 2012.
2.	S.P.Jain&Narang, "Cost accounting – Principles and Practice", Kalyani Publishers, Calcutta, 2012.
3.	PanneerSelvam, R, "Engineering Economics", Prentice Hall of India Ltd, New Delhi, 2001.

4.	William G.Sullivan, James A.Bontadelli& Elin M.Wicks, "Engineering Economy", Prentice Hall International, New York, 2001.
REFERENCES	
1.	Luke M Froeb / Brian T Mccann, "Managerial Economics – A problem solving approach" Thomson learning 2007
2.	Truett&Truett, "Managerial economics- Analysis, problems & cases "Wiley India 8th edition 2004.
3.	Chan S.Park, "Contemporary Engineering Economics", Prentice Hall of India, 2002.
4.	Donald.G. Newman, Jerome.P.Lavelle, "Engineering Economics and analysis" Engg. Press, Texas, 2002

XUM405 - Mapping of CO with PO

CO Vs PO	CO1	CO2	CO3	CO4	CO5	Total	Scaled to 0,1,2 and 3
PO_1	1	2	2	1	2	8	2
PO_2	1	2	2	1	3	9	2
PO_3	1	1	2	1	2	7	2
PO_4	1	1	2	0	1	5	1
PO_5	1	2	2	1	2	8	2
PO_6	1	2	2	1	3	9	2
PO_7	1	1	2	1	2	7	2
PO_8	1	1	2	0	1	5	1
PO_9	1	2	2	1	2	8	2
PO_{10}	1	2	2	1	3	9	2
PO_{11}	1	1	2	1	2	7	2
PO_{12}	1	1	2	0	1	5	1
PSO_1	1	2	2	1	2	8	2
PSO_2	1	2	2	1	3	9	2
TOTAL	14	22	28	11	29	-	-

1-5 → 1, 6-10 → 2, 11-15 → 3

0 – No Relation, 1 – Low Relation, 2 – Medium Relation, 3 – High Relation

COURSE CODE	**XUM406**	**L**	**T**	**P**	**C**
COURSE NAME	**DISASTER MANAGEMENT**	**0**	**0**	**0**	**3**
PREREQUISITES	**NIL**	**L**	**T**	**P**	**H**

C:P:A= 3:0:0		0	0	0	3

COURSE OUTCOMES		DOMAIN	LEVEL
CO1	***Understand*** the concepts of disasters, their significance and types	Cognitive	Understand
CO2	***Understand*** the relationship between vulnerability, disasters, disaster prevention and risk reduction	Cognitive	Understand
CO3	***Able*** to understanding of preliminary approaches of Disaster Risk Reduction (DRR)	Cognitive	Understand
CO4	***Develop*** awareness of institutional processes in the country	Cognitive	Application
CO5	***Develop*** rudimentary ability to respond to their surroundings with potential disaster response in areas where they live, with due sensitivity	Cognitive	Application

UNIT I	INTRODUCTION TO DISASTERS	6
Importance &Significance, Types of Disasters, Climate Change, DM cycle		

UNIT II	RISK ASSESSMENT	12
Risk, Vulnerability, Types of Risk, Risk identification, Emerging Risks, Risk Assessment, Damage Assessment, Risk modeling.		

UNIT III	DISASTER MANAGEMENT	10
Phases, Cycle of Disaster Management, Institutional Framework, Incident Command System, DM Plan, Community Based DM, Community health and safety, Early Warning and Disaster Monitoring, Disaster Communication, Role of GIS and Remote Sensing, Do's and Don'ts in various disasters.		

UNIT IV	DISASTER RISK MANAGEMENT IN INDIA	10
Hazard and Vulnerability profile of India, Components of Disaster Relief: Water, Food, Sanitation, Shelter, Health, Waste Management, Institutional arrangements (Mitigation, Response and Preparedness), Disaster Management Act and Policy – Other related policies, plans, programmes and legislation		

UNIT V	DISASTER MANAGEMENT: APPLICATIONS AND CASE STUDIES	7
Landslide Hazard Zonation, Earthquake Vulnerability Assessment of Buildings and Infrastructure, Drought Assessment, Coastal Flooding, Forest Fire, Man Made disasters, Space Based Inputs for Disaster Mitigation and Management, Cast Study		

TEXT BOOKS

1.	Singhal J.P. Disaster Management, Laxmi Publications, 2010. ISBN-10: 9380386427 ISBN-13: 978-9380386423
2.	Tushar Bhattacharya, Disaster Science and Management, McGraw Hill India Education Pvt. Ltd., 2012. **ISBN-10:** 1259007367, **ISBN-13:** 978-1259007361)
3.	Gupta Anil K, Sreeja S. Nair. Environmental Knowledge for Disaster Risk Management, NIDM, New Delhi, 2011
4.	KapurAnu Vulnerable India: A Geographical Study of Disasters, IIAS and Sage Publishers,

	New Delhi, 2010
REFERENCE BOOKS	
1.	Siddhartha Gautam and K Leelakrisha Rao, "Disaster Management Programmes and Policies", Vista International Pub House, 2012
2.	Arun Kumar, "Global Disaster Management", SBS Publishers, 2008
3.	Pardeep Sahni, Alka Dhameja and Uma medury, "Disaster mitigation: Experiences and reflections", PHI, 2000.
4.	Govt. of India: Disaster Management Act , Government of India, New Delhi, 2005
5.	Government of India, National Disaster Management Policy, 2009
E –REFERENCES	
1.	NIDM Publications at http://nidm.gov.in- Official Website of National Institute of Disaster Management (NIDM), Ministry of Home Affairs, Government of India
2.	http://cwc.gov.in , http://ekdrm.net , http://www.emdat.be , http://www.nws.noaa.gov , http://pubs.usgs.gov , http://nidm.gov.ini http://www.imd.gov.ini

LECTURE: 45	**TUTORIAL: 0**	**PRACTICAL: 0**	**TOTAL :45**

XUM406 - Mapping of CO with PO

CO/PO	PO1	PO2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO1	PSO2
CO 1			2	1	1		1		1		1	1		
CO 2	1	1	3	2	3		1	1						
CO 3					2		1		1					
CO 4	1	1	2	2	2		1				1	1		
CO 5	2	3		2	3		1	2	1			2		
Total	4	5	7	7	11		5	3	3		2	4		
Scaled Value	1	1	2	2	3		1	1	1		1	1		

1-6 → 1, 7-12 → 2, 13-18 → 3

0 – No Relation, 1 – Low Relation, 2 – Medium Relation, 3 – High Relation

COURSE CODE	**XAS407**	**L**	**T**	**P**	**C**
COURSE NAME	**AERODYNAMICS LAB**	**0**	**0**	**1**	**1**
PREREQUISITES	**FLUID MECHANICS LAB**	**L**	**T**	**P**	**H**
C:P:A= 0:1:0		**0**	**0**	**1**	**2**

COURSE OBJECTIVES

- To study about the pressure difference, Forces acting over various models placed inside the

wind tunnel.			
COURSE OUTCOMES		**DOMAIN**	**LEVEL**
CO1	***Illustrate*** the flow patterns over the model	Psychomotor	Understand
CO2	***Study*** the components and working of subsonic wind tunnel	Psychomotor	Understand
CO3	***Illustrate*** the rotor speed vs velocity	Psychomotor	Evaluate
CO4	***Determine*** the pressure distribution over various models placed in wind tunnel	Psychomotor	Evaluate
CO5	***Study*** of Schlieren method	Psychomotor	Understand
CO6	***Study*** of Shadowgraph method	Psychomotor	Understand

LIST OF EXPERIMENTS

Ex. No	**Experiments**	**COs**
1.	Flow visualization in water flow channel.	CO1
2.	Flow visualization in smoke tunnel	CO1
3.	Study of Low speed subsonic wind tunnel	CO2
4.	Plot of rotor speed Vs velocity in a subsonic wind tunnel.	CO2
5.	Find the Pressure distribution over circular cylinder and plot it.	CO3
6.	Enumerate and plot Pressure distribution over Symmetrical airfoil and estimation of C_L and C_D.	CO4
7.	Enumerate and plot Pressure distribution over Un Symmetrical airfoil and estimation of C_L and C_D.	CO4
8.	Enumerate and plot Pressure distribution over Cambered airfoil and estimation of C_L and C_D.	CO4
9.	Study of Schlieren system to visualize shock.	CO5
10.	Study of Shadow graph system to visualize shock.	CO5
LECURE:0	**TUTORIAL: 0** **PRACTICAL: 30**	**TOTAL:30**
TEXT BOOKS		
1.	Laboratory Manual, “Aerodynamics Lab”., Dept. of Aerospace Engineering, PMIST.	

XAS407 - Mapping of CO with PO

CO Vs PO	**CO1**	**CO2**	**CO3**	**CO4**	**CO5**	**CO6**	**Total**	**Scaled to 0,1,2 and 3**
PO_1	3	3	3	3	3	3	18	3
PO_2	1	1	1	1	1	1	6	2
PO_3	3	3	3	3	1	3	16	3
PO_4	3	3	3	3	3	2	17	3
PO_5	0	0	0	0	0	0	0	0

PO_6	3	3	3	3	3	3	18	3
PO_7	1	1	1	1	1	0	5	1
PO_8	0	0	0	0	0	0	0	0
PO_9	3	3	3	3	3	3	18	3
PO_{10}	1	1	1	2	0	2	0	0
PO_{11}	0	0	0	0	0	0	0	0
PO_{12}	2	2	2	2	2	2	12	3
PSO_1	0	0	0	0	0	0	0	0
PSO_2	3	3	3	3	3	3	18	3
TOTAL	23	23	23	24	20	22	-	-

1-5 → 1, 6-10 → 2, 11-15 → 3

0 – No Relation, 1 – Low Relation, 2 – Medium Relation, 3 – High Relation

COURSE CODE	**XAS408**	**L**	**T**	**P**	**C**
COURSE NAME	**THERMAL AND PROPULSION LAB**	**0**	**0**	**1**	**1**
PREREQUISITES	**FLUID MECHANICS LAB**	**L**	**T**	**P**	**H**
C:P:A= 0:1:0		**0**	**0**	**1**	**2**

COURSE OBJECTIVES

- Understand the working principle of SI and CI engine
- Analyze the thermal efficiency of diesel engine with different load conditions
- Understand the concept of heat transfer in a flat plate
- Study the functions of Aircraft Piston and Jet engines components

COURSE OUTCOMES		**DOMAIN**	**LEVEL**
CO1	***Sketch***the valve and Port timing diagram of SI engine & CI engine	Psychomotor	Mechanism
CO2	***Detects*** the flash point and fire point of various fuels	Psychomotor	Perception

CO3	***Measures*** the IHP,BHP and Brake thermal efficiency of 4-stroke diesel engine	Psychomotor	Guided Response
CO4	***Describes*** the working principle of piston and jet engine components	Psychomotor	Perception
CO5	***Detects*** the different node temperatures of Aluminum flat plate using free and forced convection apparatus	Psychomotor	Perception
CO6	***Measures*** the pressure and velocity of the jet in different axis	Psychomotor	Guided Response

LIST OF EXPERIMENTS

Ex. No	Experiments	COs
1.	Valve Timing Diagram for single cylinder four stroke Diesel engine.	CO1
2.	Port Timing Diagram for single cylinder two stroke Petrol engine.	CO1
3.	Determination of Flash point and Fire point (Open cup)	CO2
4.	Determination of Flash point and Fire point (Closed cup)	CO2
5.	Retardation test to find frictional power of a single cylinder Diesel engine.	CO3
6.	Study of an aircraft piston engine	CO4
7.	Study of an aircraft jet engine	CO4
8.	Study of forced convection and free convection heat transfer over a flat plate.	CO5
9.	Study of free jet	CO6
10.	Study of wall jet	CO6
LECURE:0	**TUTORIAL: 0** **PRACTICAL: 30**	**TOTAL:30**
TEXT BOOKS		
1.	Laboratory Manual, "Thermal Engineering and Propulsion"., Dept. of Aerospace/Mechanical Engineering, PMIST.	

XAS408 - Mapping of CO with PO

CO Vs PO	CO1	CO2	CO3	CO4	CO5	CO6	Total	Scaled to 0,1,2 and 3
PO_1	3	3	3	3	3	3	18	3
PO_2	1	1	1	1	1	1	6	2
PO_3	1	1	1	1	1	1	6	2
PO_4	1	1	0	0	1	1	4	1
PO_5	0	0	0	0	0	0	0	0
PO_6	3	3	3	3	3	3	18	3
PO_7	0	0	0	0	0	0	0	0

PO_8	0	0	0	0	0	0	0	0
PO_9	2	2	2	2	2	2	12	3
PO_{10}	0	0	0	0	0	0	0	0
PO_{11}	0	0	0	0	0	0	0	0
PO_{12}	2	2	2	2	2	2	12	3
PSO_1	0	0	0	0	0	0	0	0
PSO_2	3	3	3	3	3	3	18	3
TOTAL	16	16	15	15	16	16	-	-

1-5 → 1, 6-10 → 2, 11-15 → 3

0 – No Relation, 1 – Low Relation, 2 – Medium Relation, 3 – High Relation

COURSE CODE	**XAS409**	**L**		**T**	**P**	**C**
COURSE NAME	**CAD LAB**	**0**		**0**	**1**	**1**
PREREQUISITES	**NIL**	**L**		**T**	**P**	**H**
C:P:A= 0:1:0		**0**		**0**	**1**	**2**

COURSE OBJECTIVES

- To make students to obtain skills in design software and designing various components of aircraft and spacecraft.

COURSE OUTCOMES		**DOMAIN**		**LEVEL**
CO1	***Describe*** sketcher tools	Psychomotor		Perception
CO2	***Construct*** 3D models using part design	Psychomotor		Mechanism
CO3	***Assemble*** the 3D parts	Psychomotor		Guided Response
CO4	***Display*** 3 views using drafting	Psychomotor		Mechanism
CO5	***Sketch*** parts usingwireframe and surface design	Psychomotor		Guided Response
CO6	***Construct*** 3D models usingsurface design.	Psychomotor		Mechanism

LIST OF EXPERIMENTS

Ex. No	**Experiments**	**COs**

1.	Practice different sketcher tools	CO1
2.	Draw 2D sketch for the given geometry	CO1
3.	Draw 3D components for the given sketches	CO2
4.	Assemble the parts of piston engine	CO3
5.	Display 3 views using drafting	CO4
6.	Draw airframe components using wireframe design	CO5
7.	Draw fuselage surface design	CO6
LECURE:0	**TUTORIAL: 0** **PRACTICAL: 30**	**TOTAL:30**
TEXT BOOKS		
1.	Laboratory Manual, "CAD Lab"., Dept. of Aerospace Engineering, PMIST.	

XAS409 - Mapping of CO with PO

CO Vs PO	CO1	CO2	CO3	CO4	CO5	CO6	Total	Scaled to 0,1,2 and 3
PO_1	1	1	1	1	1	1	6	1
PO_2	1	1	1	1	1	1	6	1
PO_3	3	3	3	3	3	3	18	3
PO_4	0	0	0	0	0	0	0	0
PO_5	3	3	3	3	3	3	18	3
PO_6	0	0	0	0	0	0	0	0
PO_7	0	0	0	0	0	0	0	0
PO_8	0	0	0	0	0	0	0	0
PO_9	0	0	0	0	0	0	0	0
PO_{10}	0	0	0	0	0	0	0	0
PO_{11}	1	1	1	1	1	1	6	1
PO_{12}	1	1	1	1	1	1	6	1
PSO_1	1	1	1	1	1	1	6	1
PSO_2	0	0	0	0	0	0	0	0

TOTAL	11	11	11	11	11	11	-	-

1-5→ 1, 6-10→2, 11-15→ 3

0 – No Relation, 1 – Low Relation, 2 – Medium Relation, 3 – High Relation

COURSE CODE	**XAS501**	**L**	**T**	**P**	**C**
COURSE NAME	**AERODYNAMICS II**	**3**	**0**	**0**	**3**
PREREQUISITES	**AERODYNAMICS I**	**L**	**T**	**P**	**H**
C:P:A= 3:0:0		**3**	**0**	**0**	**3**

COURSE OBJJECTIVES

- To introduce the concepts of compressibility, to make the student understand thetheory behind the formation of shocks and expansion fans in Supersonic flows.
- Tointroduce the methodology of measurements in Supersonic flows.

COURSE OUTCOMES		**DOMAIN**	**LEVEL**
CO1	***Recall*** the basic concepts of Aerodynamics and ***Explain*** compressible flow for various conditions	Cognitive	Remember Understand Analysis
CO2	***Generalize*** the concepts of Normal shock	Cognitive	Understand Analysis
CO3	***Analyze*** about oblique shock and flow past through various shapes	Cognitive	Understand Analysis
CO4	***Analyze*** differential equations of motions for steady compressible flows at Linearized condition	Cognitive	Understand Analysis
CO5	***Interpret*** various designs of Aero foils and ***Explain***its characteristics	Cognitive	Remember Understand
CO6	***Infer*** the various types of wind tunnels and ***Discuss*** study of flow visualization methods	Cognitive	Remember Understand

UNIT I	**ONE DIMENSIONAL COMPRESSILBLE FLOW**	**9**

Specific Heat ratios–velocity of sound –Adiabatic steady state flow equations – Flow through converging, diverging passages – Performance under various back pressures - Mach waves and Mach angles.

UNIT II	**NORMAL, OBLIQUE SHOCKS AND EXPANSION WAVES**	**9**

Prandtl equation and Rankine–Hugonoit relation - Normal shock-Oblique shocks and corresponding equations –shock polar – Flow past wedges and concave corners –Rayleigh and Fanno Flow – Flow past convex corners.

UNIT III	**DIFFERENETIAL EQUATIONS OF MOTION FOR A STEADY COMPRESSIBLE FLOWS**	**9**

Small perturbation potential theory – solutions for subsonic flows- Prandtl-Glauert affine transformation relations for subsonic flows, Linearized two dimensional supersonic flow theory.

UNIT IV	**AIRFOIL IN HIGH SPEED FLOWS**	**9**

Lower and upper critical Mach numbers – Lift and drag divergence - Characteristics of swept

wings -Effects of thickness,camber and aspect ratio of wings - Transonic area rule - Super Critical Aerofoils - Tip effects.			
UNIT V	**HIGH SPEED WIND TUNNELS**		**9**
Blow down, In-draft and induction tunnel layouts and their design features - Transonic, supersonic and hyper sonic tunnels and their peculiarities – Helium and gun tunnels - Shock tubes - Optical methods of flow visualization.			
LECTURE:45	**TUTORIAL:0**	**PRACTICAL:0**	**TOTAL:45**
TEXT BOOKS			
1.	John.D.Anderson, "Modern Compressible Flows". Tata McGraw Hill, New Delhi, 1999.		
2.	Rathakrishnan, E., "Gas Dynamics", Prentice Hall of India, 2003.		
REFERENCE BOOKS			
1.	McCornick.W.,"Aerodynamics,AeronauticsandFlightMechanics",JohnWiley,1979		
2.	Zcrow and J.D.Anderson, "Elements of Gas dynamics" Tata McGraw Hill, New Delhi, 1999.		

XAS501 - Mapping of CO with PO

CO Vs PO	CO1	CO2	CO3	CO4	CO5	CO6	Total	Scaled to 0,1,2 and 3
PO_1	3	3	3	3	3	3	15	3
PO_2	2	3	3	3	3	3	16	3
PO_3	1	2	2	3	3	3	11	2
PO_4	3	3	3	3	3	3	15	3
PO_5	0	2	2	2	3	3	9	1
PO_6	0	3	3	3	2	2	13	2
PO_7	1	2	2	2	2	2	9	1
PO_8	0	2	2	0	0	0	4	1
PO_9	0	3	3	0	0	0	6	1
PO_{10}	1	1	1	1	1	1	6	1
PO_{11}	1	1	1	1	1	1	6	1
PO_{12}	3	3	3	3	2	2	16	3
PSO_1	0	0	0	0	0	0	0	0
PSO_2	2	2	2	2	1	1	10	2
TOTAL	17	30	30	26	24	24	-	-

1-5 → 1, 6-10 → 2, 11-15 → 3

0 – No Relation, 1 – Low Relation, 2 – Medium Relation, 3 – High Relation

COURSE CODE	XAS502	L	T	P	C
COURSE NAME	AIRCRAFT STRUCTURES – II	3	1	0	4
PREREQUISITES	STRENGTH OF MATERIALS, AIRCRAFT STRUCTURES	L	T	P	H
C:P:A= 3:1:0		3	1	0	4

COURSE OBJECTIVES

- To understand the behavior of various aircraft structural components under different types of loads.
- To study the concepts of shear flow.
- To understand buckling stress of thin-walled sections.

COURSE OUTCOMES		DOMAIN	LEVEL
CO1	***Express*** the flexure formula and ***apply*** it to symmetrical and unsymmetrical sections of beams.	Cognitive	Understand, Apply
CO2	***Describe*** stresses in beams and ***compute*** shear flow in open sections.	Cognitive	Remember, Understand, Apply
CO3	***Discuss*** shear flow in closed sections and ***distinguish*** single cell and multi-cell structures.	Cognitive	Understand, Analyze
CO4	***Explain*** bucking of plates; ***calculate*** crippling stresses by Needham's and Gerard's methods.	Cognitive	Understand, Apply
CO5	***Explain*** and ***analyze*** the stresses in wing and fuselage structures of an aircraft.	Cognitive	Apply, Analyze
CO6	***Choose*** the specimen and ***measure*** the deflection; ***explain*** structural repair works.	Cognitive	Understand, Evaluate

UNIT I	BENDING OF BEAMS	9+3

Introduction to semi-monocoque structures - Stresses in beams of symmetrical and unsymmetrical sections -Box beams – General formula for bending K-method – stresses principal axes method.

UNIT II	SHEAR FLOW IN OPEN SECTIONS	9+3

Shear stresses in beams – Shear flow in stiffened panels - Shear flow in thin-walled open tubes – Shear centre – Shear flow in open sections with stiffeners.

UNIT III	SHEAR FLOW IN CLOSED SECTIONS	10+3

Shear flow in closed sections with stiffeners– Angle of twist - Shear flow in two flange and three flange box beams – Shear centre - Shear flow in thin-walled closed tubes - Bredt-Batho theory –

Torsional shear flow in multi cell tubes - Flexural shear flow in multi cell stiffened structures.		
UNIT IV	**BUCKLING OF PLATES**	**8+3**
Rectangular sheets under compression - Local buckling stress of thin-walled sections - Crippling stresses by Needham's and Gerard's methods - Thin walled column strength-Sheet stiffener panels - Effective width, inter rivet and sheet wrinkling failures.		
UNIT V	**STRESS ANALYSIS IN WING AND FUSELAGE**	**9+3**
Procedure–Shear and bending moment distribution for semi cantilever and other types of wings and fuselage, thin webbed beam with parallel and non-parallel flanges – Shear resistant web beams - Tension field web beams (Wagner's).		

LECTURE:45	**TUTORIAL:15**	**PRACTICAL:0**	**TOTAL:60**

TEXT BOOKS

1.	E.F. Bruhn, "Analysis and Design of Flight Vehicle Structures", Tristate Offset Co., 1980.
2.	Megson T.M.G, "Aircraft Structures for Engineering Students", Edward Arnold, 1995.

REFERENCE BOOKS

1.	Peery, D.J. and Azar, J.J., "Aircraft Structures", 2nd Edition, McGraw-Hill, New York, 1993.
2.	Stephen P. Tinnoshenko&S.woinowsky Krieger, Theory of Plates and Shells, 2nd Edition, McGraw-Hill, Singapore, 1990.
3.	Rivello, R.M., Theory and Analysis of Flight structures, McGraw-Hill, N.Y., 1993.

XAS502- Mapping of CO with PO

CO Vs PO	CO1	CO2	CO3	CO4	CO5	CO6	Total	Scaled to 0,1,2 and 3
PO_1	3	3	3	3	3	3	18	3
PO_2	3	3	3	3	3	3	18	3
PO_3	0	2	0	0	2	2	6	1
PO_4	1	1	1	1	1	1	6	1
PO_5	0	0	0	0	0	0	0	0
PO_6	1	1	1	1	1	1	6	1

PO_7	2	2	2	2	2	2	12	2
PO_8	0	0	0	0	0	0	0	0
PO_9	2	2	2	2	2	2	12	2
PO_{10}	0	0	0	0	0	0	0	0
PO_{11}	0	0	0	0	0	0	0	0
PO_{12}	1	1	1	1	1	1	6	1
PSO_1	1	1	1	1	1	1	6	1
PSO_2	0	0	0	0	0	0	0	0
Total	14	16	14	14	16	16	**90**	**15**

1-5 → 1, 6-10 → 2, 11-15 → 3

0 – No Relation, 1 – Low Relation, 2 – Medium Relation, 3 – High Relation

COURSE CODE	**XAS503**	**L**	**T**	**P**	**C**
COURSE NAME	**AEROSPACE PROPULSION**	**3**	**0**	**0**	**3**
PREREQUISITES	**AERO ENGINEERING THERMODYNAMICS AIRCRAFT PROPULSION**	**L**	**T**	**P**	**H**
C:P:A= 3:0:0	**-**	**3**	**0**	**0**	**3**

COURSE OBJJECTIVES

- To understand the principles of operation and design of rocket and spacecraft propulsion.
- To study about the Non-Air breathing Engines.
- To understand the concepts of cryogenic propulsion

COURSE OUTCOMES		**DOMAIN**	**LEVEL**
CO1	***Illustrate*** solid, liquid and hybrid technology in space	Cognitive	Remember
CO2	***Analyze*** the performance of propellant tank, Injector design and cooling systems	Cognitive	Analyze
CO3	***Explain*** the operation of nuclear rocket and its types in space	Cognitive	Understand
CO4	***Classify*** various electric propulsion techniques in	Cognitive	Understand

	space		
CO5	***Discuss*** the importance of cryogenic systems and its applications.	Cognitive	Understand
CO6	***Explain*** the need of rocket and spacecraft propulsion	Cognitive	Understand

UNIT I	**INTRODUCTION**	**9**
Ramjet and scramjet: basic principle - geometry - diffuser - combustor - nozzle - performance and control - testing difficulties - thrust to weight ratio - combustion mechanism - propellant usage - advantages and disadvantages.		
UNIT II	**CHEMICAL PROPULSION**	**9**
Various propulsive devices used for aerospace applications - Applications of Rocket- fuel oxidizer combination - Grain composition- Design of Grains- Solid rocket - liquid rocket engine - pressure feed system - pump feed system - propellant tanks - hybrid rockets - performance analysis combustion instability –Cryogenic propulsion.		
UNIT III	**NUCLEAR PROPULSION**	**9**
Nuclear power in space - Nuclear pulse propulsion - Nuclear thermal rocket - direct nuclear rocket - nuclear electric rocket - solid core - liquid core - gas core - test firing - current research - limitations.		
UNIT IV	**ELECTRIC PROPULSION**	**9**
Ideal flight performance - electrothermal thrusters - non thermal electric thrusters - optimum flight performance - mission applications - electric space power supplies and power conditioning systems.		
UNIT V	**APPLICATIONS**	**9**
Rocket propulsion - rocket boosters - military operations - missiles - spaceships - reentry vehicle - satellite propulsion - application in research - future concepts.		
LECTURE:45	**TUTORIAL:0**	**PRACTICAL:0**	**TOTAL:45**

TEXT BOOKS

1.	George P.Sutton, Oscar Biblarz, "Rocket Propulsion Elements", seventh edition, Wiley India pvt.Ltd , 2014.
2.	Farokhi, Saeed, Aircraft Propulsion, Wiley-Blackwell 2nd Ed., 2014.
3.	T.W.Lee, "Aerospace Propulsion", Wiley India pvt.Ltd , 2013.
4.	Oates, G. C., Aerothermodynamics of Gas Turbine and Rocket Propulsion, AIAA, 1988
5.	SS Thipse Cryogenics, Narosa Publishing House, 2013.

REFERENCE BOOKS

1.	C.D.Brown, “spacecraft propulsion”, AIAA Education series, 81ashington, DC,1996
2.	R.G.Jahn, “Physics of electric propulsion”, McGraw-Hill book company, New York, 1968
3.	Barrere, M., Jaumotte, A., de Veubeke, B. F., Vendenkerchove, J., Rocket Propulsion, Elsevier Publishing Company, Amsterdam, 1960.
4.	Mukunda H. S. Understanding Aerospace Chemical Propulsion, Interline Publishing, Bangalore, 2004

XAS503 - Mapping of CO with PO

CO Vs PO	CO1	CO2	CO3	CO4	CO5	CO6	Total	Scaled to 0,1,2

								and 3
PO_1	3	3	3	3	3	3	18	3
PO_2	3	3	3	3	2	2	16	3
PO_3	0	0	0	0	0	0	0	0
PO_4	0	0	0	0	0	0	0	0
PO_5	0	0	0	0	0	0	0	0
PO_6	2	2	2	2	2	2	12	3
PO_7	1	1	1	1	1	2	5	1
PO_8	0	0	0	0	0	0	0	0
PO_9	0	0	0	0	0	0	0	0
PO_{10}	0	0	0	0	0	0	0	0
PO_{11}	0	0	0	0	0	1	0	0
PO_{12}	3	2	2	2	3	3	14	3
PSO_1	0	0	0	0	2	2	4	1
PSO_2	3	3	3	3	3	3	18	3
TOTAL	15	14	14	14	16	18	-	-

1-5 → 1, 6-10 → 2, 11-15 → 3

0 – No Relation, 1 – Low Relation, 2 – Medium Relation, 3 – High Relation

COURSE CODE	**XAS504**	**L**	**T**	**P**	**C**
COURSE NAME	**ELEMENTS OF SATELLITE TECHNOLOGY**	**3**	**0**	**0**	**3**
PREREQUISITES	**NIL**	**L**	**T**	**P**	**H**
C:P:A= 3:0:0	**-**	**3**	**0**	**0**	**3**
COURSE OBJECTIVES					

- To develop a basic knowledge about the solar system.
- To learn the different cases of satellite orbit transfer, different satellite injection errors.

COURSE OUTCOMES		DOMAIN	LEVEL
CO1	***Describe*** the basic satellite network systems.	Cognitive	Remember
CO2	***Estimate*** the orbital maneuver with help of orbit equation and satellite trajectories.	Cognitive	Understand
CO3	***Explain*** the structural configuration and need of thermal control in satellite.	Cognitive	Apply
CO4	***Differentiate*** the different control methods and systems of satellite.	Cognitive	Analyze
CO5	***Judge*** the power system and bus electronics requirements for the satellite operation.	Cognitive	Evaluate
CO6	***Explain*** the telemetry and telecommand systems.	Cognitive	Apply

UNIT I	**INTRODUCTION TO SATELLITE SYSTEMS**	**9**
Common satellite applications and missions – Satellite types – Orbit types – Launch vehicles – Satellite sub systems and their functions.		
UNIT II	**ORBITAL MECHANICS**	**9**
Time and coordinate system- Orbit determination and prediction – Orbital equation – GPS system - Satellite trajectories.		
UNIT III	**SATELLITE STRUCTURES & THERMAL CONTROL**	**9**
Satellite mechanical and structural configuration – Structural materials and fabrication – The need of thermal control: externally induced thermal environment – Internally induced thermal environment - Heat transfer mechanism – Thermal control systems: active and passive methods.		
UNIT IV	**SPACECRAFT CONTROL**	**9**
Control requirements: attitude control - type of control maneuvers – Stabilization schemes: spin stabilization, gravity gradient methods, 3 axis stabilization – Commonly used control systems: mass expulsion systems, momentum exchange systems.		
UNIT V	**POWER SYSTEM AND BUS ELECTRONICS**	**9**
Solar panels: Silicon and Ga-As cells – Space battery systems – battery types, characteristics and efficiency parameters – Power electronics. **Telemetry and telecommand systems:** Tm & TC functions - generally employed communication bands (UHF/VHF, S, L, Ku, Ka etc), their characteristics and applications - Onboard computer.		

TEXT BOOKS

1.	Rilay, FF , “Space Systems Engineering”, McGraw Hill, 1982.
2.	Vertregt.M.,”Principles of Astronautics”, Elsvier Publishing Company, 1985.
3.	Francis J. “Introduction Space Flight” Hale Prentice Hall, 1994.
4.	Michael D. Griffin and James R. “Space Vehicle Design” French, AIAAEducation Series, 1991.

REFERENCE BOOKS

1.	Hand Book, “Spacecraft Thermal Control” Aerospace Press, 2002.
2.	Lewis H. Abraham,Structural Design of Missiles & Space Craft, McGrawHill, 1992.
3.	Richard.F, Filipowsky Eugen I Muehllorf, “Space Communications Systems”, Princtice Hall, 1995.

4.	Hughes, P.C. Space Craft Altitude Dynamics, Wilsey, 1986.
5.	Gebmart, Heat Transfer, McGraw Hill, Martin J. "Communication Satellite Systems", McGraw Hill, 1978.
LECTURE: 45	**TUTORIAL: 0** **PRACTICAL:0** **TOTAL: 45**

XAS504 - Mapping of CO with PO

CO Vs PO	CO1	CO2	CO3	CO4	CO5	CO6	Total	Scaled to 0,1,2 and 3
PO_1	3	3	3	3	3	3	18	3
PO_2	3	2	2	3	2	2	14	3
PO_3	2	3	3	3	2	1	14	3
PO_4	2	2	2	2	2	2	12	2
PO_5	0	0	0	0	0	0	0	0
PO_6	1	1	1	2	2	2	9	1
PO_7	2	2	2	2	2	2	12	2
PO_8	0	0	0	0	0	0	0	0
PO_9	2	2	2	2	2	2	12	2
PO_{10}	0	0	0	0	0	0	0	0
PO_{11}	1	1	1	1	1	1	6	1
PO_{12}	2	2	2	2	2	2	12	2
PSO_1	2	2	2	2	2	2	12	2
PSO_2	3	3	3	3	3	2	17	3
TOTAL	23	23	23	25	23	21	-	-

1-6 → 1, 7-12 → 2, 13-18 → 3

0 – No Relation, 1 – Low Relation, 2 – Medium Relation, 3 – High Relation

COURSE CODE	XAS507	L	T	P	C
COURSE NAME	AIRCRAFT STRUCTURES LAB	0	0	1	1
PREREQUISITES	STRENGTH OF MATERIALS LAB	L	T	P	H
C:P:A= 0:2:0	-	0	0	1	2

COURSE OBJECTIVES

- Students understand the concepts of Aircraft structures loading conditions and their reactions

COURSE OUTCOMES		DOMAIN	LEVEL
CO1	***Choose*** the specimen and ***measure*** the deflection	Psychomotor	Perception, Set, Guided response
CO2	***Describes*** the end conditionsand ***Measure*** the deflection of beam	Psychomotor	Perception, Set, Guided response
CO3	***Alters*** the load and***measures***the stresses	Psychomotor	Adaptation, Guided response
CO4	***Selects*** the material and ***construct*** the repair work	Psychomotor	Perception and Complex
CO5	***Choose*** the material and ***construct*** the patch repair work using welding	Psychomotor	Perception, complex
CO6	***Choose*** the material and ***construct*** the patch repair work using welding	Psychomotor	Perception, complex

LIST OF EXPERIMENTS

Ex. No	Experiments	COs
1.	Determination of Young's modulus of Steel or Aluminum.	
2.	Deflection of Beams with various end conditions.	
3.	Verification of Maxwell's Reciprocal theorem.	
4.	Column – Testing.	
5.	Determination of Membrane stresses ina thin cylinder under internal pressure.	
6.	Exercise on Riveted joints & repair work.	
7.	Exercise on composites & repair work.	
8.	Repair of Sandwich panels.	
9.	Patch repair welding using TIG.	
10.	Patch repair welding using MIG.	
LECURE:0	**TUTORIAL: 0** **PRACTICAL: 30**	**TOTAL:30**
TEXT BOOKS		
1.	Laboratory Manual, "Aircraft Structures Lab" Dept. of Aerospace Engineering, PMIST.	

XAS507 - Mapping of CO with PO

CO Vs PO	CO1	CO2	CO3	CO4	CO5	CO6	Total	Scaled to 0,1,2 and 3
PO_1	3	3	3	2	3	2	16	3
PO_2	1	2	3	2	3	3	14	3
PO_3	2	2	2	0	0	1	7	2
PO_4	2	2	2	3	3	3	15	3
PO_5	0	0	0	0	0	0	0	0
PO_6	2	2	2	3	3	2	14	3
PO_7	1	1	1	3	3	2	11	2
PO_8	0	0	0	0	0	0	0	0
PO_9	3	3	3	3	3	3	18	3
PO_{10}	2	2	2	2	2	2	12	2
PO_{11}	3	3	3	2	2	2	15	3
PO_{12}	0	0	0	2	2	2	6	1
PSO_1	3	3	3	1	1	1	12	3
PSO_2	0	0	0	2	2	2	6	1
TOTAL	22	23	24	25	27	25	-	-

1-5 → 1, 6-10 → 2, 11-15 → 3

0 – No Relation, 1 – Low Relation, 2 – Medium Relation, 3 – High Relation

COURSE CODE	**XAS508**	**L**	**T**	**P**	**C**
COURSE NAME	**AIRCRAFT DESIGN PROJECT**	**0**	**0**	**1**	**1**
PREREQUISITES	**NIL**	**L**	**T**	**P**	**H**
C:P:A= 0:1:0		**0**	**0**	**1**	**2**
COURSE OBJECTIVES					
• To make the student work in groups and understand the Concepts involved in					

	Aerodynamic design, Performance analysis and stability aspects of different types of airplanes		
COURSE OUTCOMES		**DOMAIN**	**LEVEL**
CO1	***Describe*** sketcher tools.	Psychomotor	Perception
CO2	***Construct*** 3D models using part design.	Psychomotor	Mechanism
CO3	***Assemble*** the 3D parts	Psychomotor	Guided Response
CO4	***Display*** 3 views using drafting.	Psychomotor	Mechanism
CO5	***Sketch*** parts usingwireframe and surface design.	Psychomotor	Guided Response
CO6	***Explain*** stability analysis calculations.	Psychomotor	Set

LIST OF EXPERIMENTS

Ex. No	**Experiments**	**COs**
1.	Comparative studies of different types of airplanes and their specifications and performance details with reference to the design work under taken.	CO1
2.	Preliminary weight estimation, Selection of design parameters, power plant selection, aerofoil selection, fixing the geometry of Wing, tail, control surfaces Landing gear selection.	CO2, CO3
3.	Preparation of layout drawing, construction of balance and three view diagrams of the airplane under consideration.	CO4
4.	Drag estimation, Performance calculations, Stability analysis and V-n diagram.	CO5, CO6
LECURE:0	**TUTORIAL: 0** **PRACTICAL: 30**	**TOTAL:30**
TEXT BOOKS		
1.	Fellow Dr. Daniel P. Raymer "Aircraft Design: A Conceptual Approach", Sixth Edition by AIAA.	

XAS508 - Mapping of CO with PO

CO Vs PO	**CO1**	**CO2**	**CO3**	**CO4**	**CO5**	**CO6**	**Total**	**Scaled to 0,1,2 and 3**
PO_1	1	1	1	1	1	1	5	1
PO_2	1	1	1	1	1	1	5	1
PO_3	2	2	2	2	2	2	10	2
PO_4	0	0	0	0	0	0	0	0
PO_5	3	3	3	3	3	2	15	3
PO_6	0	0	0	0	0	0	0	0

PO_7	0	0	0	0	0	0	0	0
PO_8	0	0	0	0	0	0	0	0
PO_9	0	0	0	0	0	0	0	0
PO_{10}	0	0	0	0	0	0	0	0
PO_{11}	1	1	1	1	1	1	5	1
PO_{12}	1	1	1	1	1	1	5	1
PSO_1	0	0	0	0	0	0	0	0
PSO_2	1	1	1	1	1	1	5	1
TOTAL	10	10	10	10	10	9	-	-

1-5 → 1, 6-10 → 2, 11-15 → 3

0 – No Relation, 1 – Low Relation, 2 – Medium Relation, 3 – High Relation

COURSE CODE	**XAS509**	**L**	**T**	**P**	**C**
COURSE NAME	**IN PLANT TRAINING – II**	**0**	**0**	**0**	**1**
PREREQUISITES	**NIL**	**L**	**T**	**P**	**H**
C:P:A= 0.25:0.25:0.5		**0**	**0**	**0**	**0**

COURSE OBJECTIVES

- To enable students to learn the basic concepts of Project & Production Management.
- To enable students to implement Project Planning in their Industrial In-plant Training Project work.

COURSE OUTCOMES		**DOMAIN**	**LEVEL**
CO1	***Relate*** classroom theory with workplace practice	Cognitive	Understand
CO2	***Comply*** with factory discipline, management and business practices.	Affective	Response
CO3	***Demonstrates*** teamwork and time management.	Affective	Value

CO4	***Describe*** and ***display*** hands-on experience on practical skills obtained during the programme.	Psychometer	Perception, Set
CO5	***Summarize*** the tasks and activities done by technical documents and oral presentations.	Cognitive	Evaluate
LECTURE: 0	**TUTORIAL: 0**	**PRACTICAL: 30**	**TOTAL :30**

XAS509 - Mapping of CO with PO

CO Vs PO	CO1	CO2	CO3	CO4	CO5	CO6	CO7	Total	Scaled to 0,1,2 and 3
PO_1	3	2	1	2	1	0	1	10	2
PO_2	3	2	1	2	1	0	1	10	2
PO_3	0	0	1	3	1	0	0	5	1
PO_4	0	1	2	3	1	2	2	11	3
PO_5	0	0	2	3	1	0	0	6	2
PO_6	1	0	1	1	0	3	3	10	2
PO_7	1		1	1	0	1	0	4	1
PO_8	1	0	1	1	0	3	0	6	2
PO_9	0	0	0	0	2	3	1	6	2
PO_{10}	0	0	0	0	3	3	3	9	2
PO_{11}	0	0	0	0	2	2	2	6	2
PO_{12}	1	0	0	0	3	3	1	8	2
PSO_1	1	1	1	1	1	0	1	1	1
PSO_2	2	2	2	3	2	3	2	16	2
TOTAL	13	8	13	20	18	23	27	-	-

1-6 → 1, 7-12 → 2, 13-18 → 3

0 – No Relation, 1 – Low Relation, 2 – Medium Relation, 3 – High Relation

COURSE CODE	XAS601	L	T	P	C
COURSE NAME	FINITE ELEMENT ANALYSIS	3	1	0	4
PREREQUISITES	AIRCRAFT STRUCTURES	L	T	P	H
C:P:A= 3:1:0	-	3	1	0	4

COURSE OBJECTIVES

- To introduce importance and applications of Finite Element Method. Simple one-dimensional problem, analysis of beams and simplified modeling of two-dimensional problems were discussed. The analysis of one-dimensional steady state heat transfer is elaborated.

COURSE OUTCOMES		DOMAIN	LEVEL
CO1	***Differentiate*** various approximate methods.	Cognitive	Understand
CO2	***Compute*** stiffness matrix for bar elements.	Cognitive	Apply
CO3	***Compute*** stiffness matrix for beam elements.	Cognitive	Apply
CO4	***Analyze*** continuum elements.	Cognitive	Analyse
CO5	***Explain*** iso-parametric elements.	Cognitive	Understand
CO6	***Interpret*** field problems.	Cognitive	Evaluate

UNIT I	INTRODUCTION	9+3

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

UNIT II	DISCRETE ELEMENTS	9+3

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

UNIT III	CONTINUUM ELEMENTS	9+3

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

UNIT IV	ISOPARAMETRIC ELEMENTS	9+3

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

UNIT V	FIELD PROBLEM	9+3

Steady state Heat transfer problems, Steady state fin problem-Derivation of element matrices for

two dimensional problems, Torsion problems.			
LECTURE: 45	**TUTORIAL: 15**	**PRACTICAL:0**	**TOTAL: 60**

TEXT BOOKS	
1.	Tirupathi.R. Chandrapatha and Ashok D. Belegundu – "Introduction to FiniteElements in Engineering" – Printice Hall India, Third Edition, 2003.
2.	Rao. S.S., Finite Element Methods in Engineering, Butterworth and Heinemann, 2001.
REFERENCE BOOKS	
1.	Reddy J.N. – "An Introduction to Finite Element Method" – McGraw Hill – 2000.
2.	Krishnamurthy, C.S., "Finite Element Analysis", Tata McGraw Hill, 2000.
3.	Bathe, K.J. and Wilson, E.L., "Numerical Methods in Finite Elements Analysis", Prentice Hall of India, 1985.

XAS601 - Mapping of CO with PO

CO Vs PO	CO1	CO2	CO3	CO4	CO5	CO6	Total	Scaled to 0,1,2 and 3
PO_1	3	3	3	3	3	3	18	3
PO_2	3	2	2	3	2	2	14	3
PO_3	2	3	3	3	2	2	15	3
PO_4	2	3	3	3	2	2	15	3
PO_5	3	3	3	3	3	2	15	3
PO_6	1	1	1	2	2	2	9	2
PO_7	2	2	2	2	2	2	12	2
PO_8	0	0	0	0	0	0	0	0
PO_9	2	2	2	2	2	2	12	2
PO_{10}	0	0	0	0	0	0	0	0
PO_{11}	0	0	0	0	0	0	0	0

PO_{12}	2	2	2	2	2	2	12	2
PSO_1	3	3	3	3	3	3	18	3
PSO_2	2	2	2	2	2	2	12	2
TOTAL	25	26	26	28	25	24	-	-

1-6 → 1, 7-12 → 2, 13-18 → 3

0 – No Relation, 1 – Low Relation, 2 – Medium Relation, 3 – High Relation

COURSE CODE	**XAS602**	**L**	**T**	**P**	**C**
COURSE NAME	**FLIGHT DYNAMICS**	**3**	**1**	**0**	**4**
PREREQUISITES	**INTRODUCTION TO AEROSPACE ENGINEERING**	**L**	**T**	**P**	**H**
C:P:A= 3:1:0		**3**	**1**	**0**	**4**

COURSE OBJECTIVES

- To study the performance of airplanes under various operating conditions and the static and dynamic response of aircraft for both voluntary and involuntary changes in flight conditions.

COURSE OUTCOMES		**DOMAIN**	**LEVEL**
CO1	***Express*** the equation of motion and performance of airplane	Cognitive	Remember, Apply
CO2	***Express***the performance parameters of an airplane for a maneuvering flight	Cognitive	Understand, Apply
CO3	***Explain*** the influence of forces and moments on the static and dynamic stability of aircraft for stick fixed condition	Cognitive	Understand, Apply
CO4	***Explain***the aircraft stability for stick free condition	Cognitive	Understand, Apply
CO5	***Distinguish*** the conditions of aircraft lateral and directional static stability.	Cognitive	Understand, Apply
CO6	***Explain*** the dynamics and control of flight vehicles.	Cognitive	Understand, Apply

UNIT I	**CRUISING FLIGHT PERFORMANCE**	**12**

Equation of motion of a rigid flight vehicle - Different types of drag - Drag polar of vehicles from low speed to high speeds - Variation of thrust, power with velocity and altitudes for air breathing engines. Performance of airplane in level flight - Power available and power required curves. Maximum speed in level flight - Conditions for minimum drag and power required.

UNIT II	**MANOEUVERING FLIGHT PERFORMANCE**	**12**

Range and endurance - Climbing and gliding flight --Turning performance - Bank angle and load factor – limitations on turn - V-n diagram and load factor.		
UNIT III	**STATIC LONGITUDINAL STABILITY**	**12**
Degree of freedom of rigid bodies in space - Static and dynamic stability - Purpose of controls in airplanes–Static, Longitudinal stability - Stick fixed stability - Basic equilibrium equation - Stability criterion - Influence of CG location - Power effects - Stick fixed neutral point - Stick free stability-Hinge moment coefficient - Stick free neutral points – Symmetric maneuvers - Stick force gradients - Stick force per 'g' - Aerodynamic balancing.		
UNIT IV	**LATERAL AND DIRECTIONAL STABILITY**	**12**
Dihedral effect - Lateral control - Coupling between rolling and yawing moments - Adverse yaw effects - Aileron reversal - Static directional stability - Weather cocking effect - Rudder requirements - One engine inoperative condition - Rudder lock.		
UNIT V	**DYNAMIC STABILITY**	**12**
Introduction to dynamic longitudinal stability: - Modes of stability, effect of freeing the stick - Brief description of lateral and directional dynamic stability - Spiral, divergence, Dutch roll, autorotation and spin.		
TEXT BOOKS 1. Perkins, C.D., and Hage, R.E., "Airplane Performance stability and Control", Son:,Inc, NY, 1988.		
2. Mc Cornick. W., "Aerodynamics, Aeronautics and Flight Mechanics", John Wiley, NY,		
3. R.C. "Flight Stability and Automatic Control", McGraw-Hill Book Co., 2004.		
REFERENCES **1.** Etkin, B., "Dynamics of Flight Stability and Control", Edn. 2, John Wiley, NY, 1982.		
2.Babister, A.W., "Aircraft Dynamic Stability and Response", Pergamon Press, Oxford, 1980.		
3.Dommasch, D.O., Sherby, S.S., and Connolly, T.F., "Aeroplane Aero dynamics", Third Edition, Issac Pitman, London, 1981.		
LECTURE: 45	**TUTORIAL: 15**	**PRACTICAL:0**	**TOTAL: 60**

XAS602 -Mapping of CO with PO

CO Vs PO	CO1	CO2	CO3	CO4	CO5	CO6	Total	Scaled to 0,1,2 and 3
PO_1	3	3	3	3	1	3	13	2
PO_2	3	3	3	3	3	3	18	3
PO_3	3	3	3	3	3	3	18	3
PO_4	2	3	2	2	1	2	12	2

PO_5	3	0	3	3	3	3	15	3
PO_6	1	2	2	2	1	1	9	1
PO_7	1	1	1	1	1	3	8	1
PO_8	1	1	1	1	1	1	6	1
PO_9	1	2	2	2	2	1	10	2
PO_{10}	0	0	0	0	0	0	0	0
PO_{11}	1	1	1	1	1	1	6	1
PO_{12}	2	2	2	2	3	2	13	2
PSO_1	0	0	1	1	1	1	4	1
PSO_2	3	3	3	3	3	3	18	3
TOTAL	24	24	27	27	27	24	-	-

1-6 → 1, 7-12 → 2, 13-18 → 3

0 – No Relation, 1 – Low Relation, 2 – Medium Relation, 3 – High Relation

COURSE CODE	**XGS605**	**L**	**T**	**P**	**C**
COURSE NAME	**PROFESSIONAL SKILLS**	**1**	**0**	**2**	**3**
PREREQUISITES	**NIL**	**L**	**T**	**P**	**H**
C:P:A= 2.6:0.4:0	**-**	**1**	**0**	**4**	**5**

COURSE OUTCOMES		**DOMAIN**	**LEVEL**
CO1	***Ability*** to understand communications	Cognitive	Remember
CO2	***Apply*** the known skills for career	Cognitive	Apply
CO3	***Identify***inner strength	Cognitive	Remember
CO4	***Construct*** the attitude as a professional	Cognitive	Create
CO5	***Practicing***Etiquettes	Psychomotor	Guided Response

UNIT I	**COMMUNICATION**	**9**

1.1 – Brainstorming 1.2 – LSRW		
UNIT II	**CAREER SKILLS**	**9**
2.1 – Resume & CV preparing Skills 2.2 – Interview Skills 2.3 – Exploring Career Opportunities		
UNIT III	**TEAM SKILLS**	**9**
3.1 – Listening as a Team Skill 3.2 – Team Building at work place		
UNIT IV	**PROFESSIONAL SKILLS**	**9**
4.1 – Attitude and Goal Setting 4.2 – Verbal and Non Verbal Communications		
UNIT V	**PROFESSIONAL ETIQUETTES**	**9**
5.1 - Social Etiquettes 5.2 - Cultural Ethics at work place		

LECTURE: 45	**TUTORIAL: 0**	**PRACTICAL:0**	**TOTAL: 45**

SUGGESTED READINGS

1.	Er. A. K. Jain, Dr. Pravin S. R. Bhatia, Dr. A. M. Sheikh Professional Communication Skills S. Chand Publications, 2015
2.	Alan Pannett. *Key Skills for Professionals: How to Succeed in Professional Services*, Kogan Page; 1st edition, 2013

XGS605 - Mapping of CO with PO

CO Vs PO	CO1	CO2	CO3	CO4	CO5	Total	Scaled to 0,1,2 and 3
PO_1	0	0	0	0	0	0	0
PO_2	0	0	0	0	0	0	0
PO_3	0	0	0	0	0	0	0
PO_4	0	0	0	0	0	0	0
PO_5	0	0	0	0	0	0	0
PO_6	0	0	0	0	0	0	0
PO_7	0	0	0	0	0	0	0
PO_8	3	3	3	3	3	12	3

PO_9	2	2	2	2	2	10	2
PO_{10}	3	3	3	3	3	12	3
PO_{11}	0	0	0	0	0	0	0
PO_{12}	0	0	0	0	0	0	0
PSO_1	0	0	0	0	0	0	0
PSO_2	0	0	0	0	0	0	0
TOTAL	8	8	8	8	8	34	8

1-5 → 1, 6-10 → 2, 11-15 → 3

0 – No Relation, 1 – Low Relation, 2 – Medium Relation, 3 – High Relation

COURSE CODE	**XUM606**	**L**	**T**	**P**	**C**
COURSE NAME	**CYBER SECURITY**	**0**	**0**	**0**	**0**
PREREQUISITES	**NIL**	**L**	**T**	**P**	**H**
C:P:A= 3:0:0	**-**	**3**	**0**	**0**	**3**

COURSE OBJECTIVES

- To give knowledge on the cyber space and its security.
- To understand the cyber security structure of organization
- To Understand the security policy of Organization
- To aware of the Cyber security initiatives and IT Act.
- To make the students to know cyber security ractices.

COURSE OUTCOMES	**DOMAIN**	**LEVEL**

CO1	Understand the fundamentals of Cyber Security and the technologies.	Cognitive	Understand
CO2	Understand the organizational structure of Cyber security	Cognitive	Understand
CO3	Understand the Cyber Security policy development	Cognitive	Understand
CO4	Understand the Indian IT act and the initiatives	Cognitive	Understand
CO5	Understand and Apply the Cyber security practices	Cognitive	Understand and Apply

UNIT I	**INTRODUCTION**	**9**

Cyber Security – Cyber Security policy – Domain of Cyber Security Policy – Laws and Regulations – Enterprise Policy – Technology Operations – Technology Configuration - Strategy Versus Policy – Cyber Security Evolution – Productivity – Internet – E commerce – Counter Measures – Challenges

UNIT II	**CYBER SECURITY OBJECTIVES AND GUIDANCE**	**9**

Cyber Security Metrics – Security Management Goals – Counting Vulnerabilities – Security Frameworks – E Commerce Systems – Industrial Control Systems – Personal Mobile Devices – Security Policy Objectives – Guidance for Decision Makers – Tone at the Top – Policy as a Project– Cyber Security Management – Arriving at Goals – Cyber Security Documentation – The Catalog Approach – Catalog Format – Cyber Security Policy Taxonomy.

UNIT III	**CYBER SECURITY POLICY CATALOG**	**9**

Cyber Governance Issues – Net Neutrality – Internet Names and Numbers – Copyright and Trademarks – Email and Messaging - Cyber User Issues - Malvertising - Impersonation – Appropriate Use – Cyber Crime – Geo location – Privacy - Cyber Conflict Issues – Intellectual property Theft – Cyber Espionage – Cyber Sabotage – Cyber Welfare- Computer Forensics – Steganography

UNIT IV	**CYBER SECURITY INITIATIVES AND IT ACT**	**9**

Counter Cyber Security Initiatives in India, Cyber Security Excercsie, Cyber Security Incident Handling, Cyber Security Assurance, IT Act, Hackers-Attacker-Counter measures ,Web Application Security , Digital Infrastructure Security ,Defensive Programming. Traditional Problems Associated with Computer Crime, Introduction to Incident Response.

UNIT V	**SECURITY PRACTICES**	**9**

Guidelines to choose web browsers, Securing web browser, Antivirus, Email security ,Guidelines for setting up a Secure password ,Two-steps authentication ,Password Manager ,Wi-Fi Security ,Guidelines for social media security ,Tips and best practices for safer Social Networking. Basic Security for Windows, User Account Password Introduction to mobile Smartphone Security ,Android Security ,IOS Security Online Banking Security ,Mobile Banking

Security ,Security of Debit and Credit Card ,UPI Security Security of Micro ATMs e-wallet Security Guidelines Security Guidelines for Point of Sales(POS)			
LECTURE: 45	**TUTORIAL: 0**	**PRACTICAL:0**	**TOTAL: 45**

TEXT BOOKS	
1.	Jennifer L. Bayuk, J. Healey, P. Rohmeyer, Marcus Sachs , Jeffrey Schmidt, Joseph Weis "Cyber Security Policy Guidebook" John Wiley & Sons 2012.
2.	Rick Howard "Cyber Security Essentials" Auerbach Publications 2011.
3.	Cyber Laws & Information Technology, Jothi Rathan,VijayRathan,Bhrath Pubishers,7th Edition January 2019.
4.	Modern Cyber security Practices by Pascal Ackerman, BPB Publications,2020
5.	Dan Shoemaker Cyber security The Essential Body Of Knowledge, 1st ed. Cengage Learning 2011
6.	Rhodes-Ousley, Mark, "Information Security: The Complete Reference", Second Edition, McGraw-Hill, 2013.
E- BOOKS	
1.	https://www.coursera.org/specializations/cyber-security
2.	https://us.norton.com/internetsecurity-how-to-cyber-security-best-practices-for-employees.html
3.	https://www.meity.gov.in/content/cyber-laws
4.	www. nptel.ac.in

XUM606 - Mapping of CO with PO

CO Vs PO	CO1	CO2	CO3	CO4	CO5	Total	Scaled to 0,1,2 and 3
PO_1	0	0	3	0	3	6	2
PO_2	0	0	0	0	0	0	0
PO_3	0	0	0	0	0	0	0
PO_4	0	0	0	0	0	0	0
PO_5	0	0	0	0	0	0	0
PO_6	2	0	2	0	0	4	1
PO_7	0	2	3	0	0	5	1
PO_8	3	0	0	0	0	3	1

PO_9	0	1	1	0	0	2	1
PO_{10}	0	0	0	2	0	2	1
PO_{11}	0	0	0	0	0	0	0
PO_{12}	0	0	0	0	0	0	0
PSO_1	0	0	3	0	3	6	2
PSO_2	0	0	0	0	0	0	0
TOTAL	5	3	12	2	6	-	-

1-5 → 1, 6-10 → 2, 11-15 → 3

0 – No Relation, 1 – Low Relation, 2 – Medium Relation, 3 – High Relation

COURSE CODE	**XAS607**	**L**	**T**	**P**	**C**
COURSE NAME	**MACHINE DYNAMICS LAB**	**0**	**0**	**1**	**1**
PREREQUISITES	**NIL**	**L**	**T**	**P**	**H**
C:P:A= 0:2:1		**0**	**0**	**1**	**2**

COURSE OBJECTIVES

- Measure radius of gyration, moment of inertia for different components.
- Analyse the dynamic behaviour of the machine elements/ components like Gyroscope and vibration parameters.

COURSE OUTCOMES	**DOMAIN**	**LEVEL**

CO1	***Identify*** the characteristics of Watt governor and Porter governor	Psychomotor	Perception
CO2	Detect the angular velocity using motorized gyroscope	Psychomotor	Perception
CO3	Describes the kinematics mechanism and CAM analyzer	Psychomotor	Perception
CO4	Measure the whirling of shaft velocity and dynamics balancing of rotating masses	Psychomotor	Mechanism
CO5	Explain the natural frequency of undamped free vibration.	Psychomotor	Set
CO6	Identify the moment of inertia of connecting rod with flywheel.	Psychomotor	Guided response

LIST OF EXPERIMENTS

Ex.No	Experiments	COs
1.	Determination of characteristics of Watt Governor	CO1
2.	Determination of characteristics of Porter Governor	
3.	Motorized Gyroscope	CO2
4.	Study of Kinematic Links	CO3
5.	Study and experiments on static and dynamic balancing of rotating masses.	CO4
6.	Whirling of shaft. - Determination of critical speed	
7.	Study and experiments on Cam Analyzer.	CO3
8.	Experimental verification of natural frequency of undamped free vibration of equivalent spring mass system.	CO5
9.	Determination of mass moment of Inertia of Fly wheel.	CO6
10.	Determination of mass moment of Inertia of connecting rod with flywheel.	
LECURE:0	**TUTORIAL: 0** **PRACTICAL: 30**	**TOTAL:30**
TEXT BOOKS		
1.	Laboratory Manual, “Machine Dynamics Lab”., Dept. of Mechanical Engineering, PMIST.	

XAS607 - Mapping of CO with PO

CO Vs PO	CO1	CO2	CO3	CO4	CO5	CO6	Total	Scaled to 0,1,2 and 3
PO_1	3	3	3	3	3	3	18	3
PO_2	1	1	1	1	1	1	6	2
PO_3	3	3	3	3	1	3	16	3
PO_4	3	3	3	3	3	2	17	3

PO_5	0	0	0	0	0	0	0	0
PO_6	3	3	3	3	3	3	18	3
PO_7	1	1	1	1	1	0	5	1
PO_8	0	0	0	0	0	0	0	0
PO_9	3	3	3	3	3	3	18	3
PO_{10}	1	1	1	2	0	2	0	0
PO_{11}	0	0	0	0	0	0	0	0
PO_{12}	2	2	2	2	2	2	12	3
PSO_1	0	0	0	0	0	0	0	0
PSO_2	3	3	3	3	3	3	18	3
TOTAL	23	23	23	24	20	22	-	-

1-5 → 1, 6-10 → 2, 11-15 → 3

0 – No Relation, 1 – Low Relation, 2 – Medium Relation, 3 – High Relation

COURSE CODE	**XAS608**	**L**	**T**	**P**	**C**
COURSE NAME	**AEROMODELING LAB**	**0**	**0**	**1**	**1**
PREREQUISITES	**NIL**	**L**	**T**	**P**	**H**
C:P:A= 0:2:1		**0**	**0**	**1**	**2**

COURSE OBJECTIVES

- Understand Aerodynamics, Designing, Electronics and Technology
- Design, Fabricate and Fly models
- Know wood crafting and the technology of new materials

COURSE OUTCOMES		**DOMAIN**	**LEVEL**
CO1	***Describes*** the concepts of Airfoil and wing planforms	Psychomotor	Perception
CO2	Making a ***Design*** calculation of gliders and ***create*** a model of Powered and Un-Powered gliders	Psychomotor	Origination
CO3	***Build*** a model of commercial and fighter Aircraft model	Psychomotor	Mechanism

CO4	***Detects*** the list of electronic components used in Aero models and ***create*** a RC Airplane	Psychomotor	Perception, Origination
CO5	***Detects*** the various modes transmitter channels and ***Identifies***the functions Airplane components through simulation training	Psychomotor	Perception
CO6	***Measure*** the range and endurance of water rocketry model.	Psychomotor	Guided response

LIST OF EXPERIMENTS

Ex.No	Experiments	COs
1.	Introduction to wing planforms and Airfoil	CO1
2.	Introduction to Gliders and its Design calculation	CO2
3.	Design and fabrication of Powered & Un-Powered Gliders.	CO2
4.	Making a model of commercial Aircraft using Foam sheet	CO3
5.	Study of electronic equipment's used in Aero models	CO4
6.	Making a model of fighter Aircraft using foam sheet	CO3
7.	Making/Assembly of RC aircraft flying model	CO4
8.	Testing of 4 channel/6 channel/9 channel transmitter operation using mode 1 and mode 2	CO5
9.	Remote control simulation training	CO5
10.	Making and Testing of a water rocketry model.	CO6
LECURE:0	**TUTORIAL: 0** **PRACTICAL: 30**	**TOTAL:30**
TEXT BOOKS		
1.	Laboratory Manual, "Aeromodelling Lab"., Dept. of Aerospace Engineering, PMIST.	

XAS608 - Mapping of CO with PO

CO Vs PO	CO1	CO2	CO3	CO4	CO5	CO6	Total	Scaled to 0,1,2 and 3
PO_1	3	3	3	3	3	3	18	3
PO_2	1	1	1	1	1	1	6	2
PO_3	3	3	3	3	1	3	16	3
PO_4	3	3	3	3	3	2	17	3
PO_5	0	0	0	0	0	0	0	0
PO_6	3	3	3	3	3	3	18	3
PO_7	1	1	1	1	1	0	5	1
PO_8	0	0	0	0	0	0	0	0

PO_9	3	3	3	3	3	3	18	3
PO_{10}	1	1	1	2	0	2	0	0
PO_{11}	0	0	0	0	0	0	0	0
PO_{12}	2	2	2	2	2	2	12	3
PSO_1	0	0	0	0	0	0	0	0
PSO_2	3	3	3	3	3	3	18	3
TOTAL	23	23	23	24	20	22	-	-

1-5 → 1, 6-10 → 2, 11-15 → 3
0 – No Relation, 1 – Low Relation, 2 – Medium Relation, 3 – High Relation

COURSECODE	**XAS701**	**L**	**T**	**P**	**C**
COURSENAME	**COMPUTATIONALFLUIDDYNAMICS**	**3**	**1**	**1**	**5**
PREREQUISITES	**AERODYNAMICSII**	**L**	**T**	**P**	**H**
C:P:A=4:1:0		**3**	**1**	**2**	**6**

COURSEOBJECTIVES

- To know about mesh generation.
- To know about different modules of computation.
- To find solutions for fluid dynamics problems using different methods.

COURSEOUTCOMES		**DOMAIN**	**LEVEL**
CO1	***Describe*** the basic definitions and governing Equations of CFD.	Cognitive	Remember
CO2	***Explain*** and ***manipulate*** the approach of finite Difference method	Cognitive	Apply Guided response
CO3	***Illustrate*** and ***measure*** the basic techniques of finite Volume method	Cognitive	Analyze Mechanism

CO4	***Formulate*** and ***measure*** the basic techniques of finite Element method.	Cognitive	Create Overt response
CO5	***Appraise*** the applications of CFD in various fields.	Cognitive	Evaluate
CO6	***Explain*** the use of CFDin Aerospace vehicles.	Cognitive	Apply

UNITI INTRODUCTION 9L +3T

Governing equations– Discretization – Pressure velocity coupling – Mesh generation – Multigrid method – Consistency – Stability – Convergence – Accuracy – Efficiency – Boundaryconditions– Turbulencmodeling– Different panel methods.

UNITII FINITEDIFFERENCEMETHOD 9L +3T

Classification of partial differential equation - Explicit and Implicit methods – ADI methods –First order wave equation – Stability of Hyperbolic and elliptic equation -Conservative, Upwind and TransportiveProperty –Upwind Differencing and Artificial Viscosity–Hybrid scheme.

UNITIII FINITEVOLUMEMETHOD 9L +3T

Basic techniques–Generalized approach–Lax-Vendor off Time Stepping–Runge Kutta Time Stepping–Multistage Time Stepping-Equations with first derivatives–Equations with secondDerivatives-Vorticitytran sport formulation–Applications.

UNITIV FINITEELEMENTMETHOD 9L +3T

Galerkin'sweakformulation–weightedresidualwiththeanalyticalsolutionasthetrialfunction – Galerkin's weighted residual form at elemental level – Element formulation for the 2D steadystate heat transfer problem - Approximation for the thermal profile – Determination of element equations– Assembly of elements and solutions of theglobal system equations.

UNITV APPLICATIONS 12

CFD as a Design tool – CFD as a Research tool – Aerospace applications - Steady and unsteady Analysis - Fluid analysis over the aircrafts& rockets - Fluid analysis inside the Engine – Thermal Analysis – Re-entry Vehicle - Aerodynamic heating - Fluid structure interaction –Satellite's Thermal environment-Introductionto CFD simulation softwarepackages.

TEXTBOOKS

1. GautamBiswas,SomenathMukherjee,,"ComputationalFluidDynamics"AlphaScience International,2014.
2. JiyuanTu,GuanHengYeoh,ChaoqunLiu,"ComputationalFluidDynamics:APracticalApproach",Butterworth-HeinemannLtd;2ndRevisededitionedition(21September 2012).
3. JohnD.AndersonJr.,"ComputationalFluidDynamics",Mcgraw-HillSeries,2010.
4. C.A.J.Fletcher,"ComputationalTechniquesforFluidDynamics1"SpringerVerlag,1995.
5. C.A.J.Fletcher,"ComputationalTechniquesforFluidDynamics2",SpringerVerlag,1995.

REFERENCEBOOKS

1. H.K.VersteegandW.Malalsekera"AnIntroductiontoComputationalFluidDynamics, TheFiniteVolumeMethod",Longman Scientific& Technical,1995.

2. T.J.Chung,"ComputationalFluidDynamics",CambridgeUniversityPress,2002.
3. C.Hirch,"NumericalComputationofInternalandExternalFlows"Volume-2,JohnWileyand Sons,1994.

List of Experiments

1. Steadyandtransientflow overAerofoil.
2. TurbulentflowandHeattransferin amixedElbow.
3. Nozzleflowforasolidpropellantrocket.
4. Waterand air inaspinning bowl.
5. ChemicalmixingandGaseouscombustion.
6. CombinedradiationandNaturalconvectionin asquarebox.
7. CombustioninJetengine'sCombustionchamber.
8. CombustioninLiquidrocketEngine.
9. Rotorandstatorinteractionusingslidingmeshes.
10. Turbineblade coolingtechniques.

LECTURE:45 TUTORIAL:15 PRACTICAL:30 TOTAL:90

XAS701--Mapping of CO with PO

COVs PO	**CO1**	**CO2**	**CO3**	**CO4**	**CO5**	**CO6**	**Total**	**Total /5**
PO_1	3	3	3	3	3	3	18	3
PO_2	3	2	2	3	2	2	14	3
PO_3	2	3	3	3	2	2	15	3
PO_4	2	3	3	3	2	2	15	3
PO_5	3	3	3	3	3	2	15	3
PO_6	1	1	1	2	2	2	9	2
PO_7	2	2	2	2	2	2	12	2
PO_8	0	0	0	0	0	0	0	0
PO_9	2	2	2	2	2	2	12	2
PO_{10}	0	0	0	0	0	0	0	0

PO_{11}	0	0	0	0	0	0	0	0
PO_{12}	2	2	2	2	2	2	12	2
PSO_1	2	2	2	2	2	2	12	2
PSO_2	3	3	3	3	3	3	18	3

Semester	**VII**		
Subject Name	**AVIONICS**		
Subject Code	**XAS 702**		
Prerequisite	**NIL**		
L –T –P –C **3- 0 – 1- 4**	**C:P:A** **3:0.9:0.1**	**L –T –P –H** **3- 0 -2- 5**	
Course Outcome:			**Domain** **C or P or A**
CO1	Describe, understand, construct and report Avionics system design and development		C (Remember, Understand, Apply) P (Mechanism) A (Respond)
CO2	Describe, understand, react and perform the Digital Avionics Architecture		C (Remember, Understand) P (Set) A (Respond)
CO3	Define, select, compare, reproduce and identify the displays, i/o devices and power in the avionics systems.		C (Remember, Understand, Evaluate) P (Guided Response) A (Receiving)
CO4	Outline, explain the Aerials and Propagation in the avionics systems.		C (Remember, Understand) P (Mechanism) A (Respond)
CO5	Design, create, construct and report the Assessment, Validation and Certification in the avionics systems.		C (Analyze, Create) P (Mechanism) A (Respond)
COURSE CONTENT			
UNIT-I	**INTRODUCTION TO AVIONICS**		**15hrs**
	Introduction to Construction Management - Project organization – Construction Economics - Economic Decision Making - Time value of money - cash flow diagrams - Evaluation Alternatives –BOT, BOOT, BOM, DBOT Projects.		

UNIT –II	**DIGITAL AVIONICS ARCHITECTURE**	**15hrs**
	Basic concepts in the development of construction plans– types of project plans - work breakdown structure – planning techniques - bar charts - preparation of network diagram - critical path method -program evaluation and review technique -	
UNIT-III	**DISPLAYS, I/O DEVICES AND POWER**	**15 hrs**
	Materials- inventory control: types of inventory, EOQ - different tools for inventory controls. Equipment: Classification of construction equipment- planning and selecting of equipment. Manpower: Classes of labour - cost of labour- labour productivity.	
UNIT -IV	**AERIALS AND PROPAGATIO**	**15 hrs**
	Tender notice-Tender document-EMD-SD-Prebid conference-Award and signing of contract agreement-Site meeting-Payment of bills-Breach of contract-Liquidated damages-Project closure	
UNIT V	**SYSTEM ASSESSMENT, VALIDATION AND CERTIFICATION**	**15 hrs**
	Introduction to construction quality - Inspection, quality control and quality assurance – Quality circle - Quality management system. - Construction safety – accidents and injuries - Personal protective equipments - Health and safety act and OSHAS regulations - Safety and health management system- Safety manual.	

TEXT BOOKS

1. R.P.G. Collinson, “Introduction to Avionics”, Chapman & Hall Publications, 1996
2. Myron Kayton and Walter R fried, Avionics Navigation Systems, John Wiley and Sons.
3. RF Hnasforde, Heywood and Company London: Radio Aids to Civil Aviation.

REFERENCES

1. Middleton, D.H., Ed., “Avionics Systems, Longman Scientific and Technical”, Longman Group UK Ltd.,England, 1919.
2. Spitzer, C.R., “Digital Avionic Systems”, Prentice Hall, Englewood Cliffs, N.J., USA., 1917
3. Brain Kendal, “Manual of Avionics”, The English Book House, 3rd Edition, New Delhi, 1993.

PRACTICALS	**15hrs**

1. Study of basic gates.
2. Study of installing and configuring of AFDX card in transmitting and receiving mode.
3. Study of Determination of gain for the given antenna.
4. Adder / Subtractor
5. Multiplexer / Demultiplexer
6. Encoder / Decoder

7. Interface programming with 4 digit 7 segment display and switches and LED 8. Study of MIL-STD 1553B Data bus 9. Digital to analog converter
L-45 hrs P-30hrs Total – 75 hrs

Mapping of COs with POs

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO 1	PSO2
CO1	3	3	0	2	1	1	2	0	**0**	0	0	1	0	0
CO2	2	2	0	2	2	1	1	0	0	0	0	1	0	0
CO3	3	3	0	3	2	2	2	0	0	0	0	1	2	2
CO4	1	2	0	1	1	0	0	0	0	0	0	1	0	0
CO5	2	2	0	2	3	2	1	0	0	0	0	1	0	0
	11	12	0	10	9	6	6	0	0	0	0	5	2	2

1 - Low, 2 – Medium, 3 – High

COURSE CODE	**XASE17**	**L**	**T**	**P**	**C**
COURSE NAME	**AERO ENGINE MAINTENANCE**	**3**	**0**	**0**	**3**
PREREQUISITES	**AIRCRAFT PROPULSION**	**L**	**T**	**P**	**H**
C:P:A= 3:0:0		**3**	**0**	**0**	**3**

COURSE OBJECTIVES

- To know about aircraft engine maintenance procedures.
- To know about overhaul procedures and inspection procedures of Aircraft engine.

COURSE OUTCOMES		**DOMAIN**	**LEVEL**
CO1	***Recall***about basis of Piston engine and***Describe*** about its Maintenance Procedures.	Cognitive	Remember Understand
CO2	***Illustrate*** various inspections methods of Piston Engine and ***Explain*** its overhaul procedures.	Cognitive	Understand Apply
CO3	***Explain*** about checks and maintenance to be carried out for piston engine parts.	Cognitive	Understand Apply

CO4	***Recall***about basis of Jet engine and inspection procedures.	Cognitive	Remember Understand
CO5	***Describe*** about Maintenance Procedures of Jet engine.	Cognitive	Understand Apply
CO6	***Illustrate***various inspections methods of Jet Engine and ***Explain*** its overhaul procedures.	Cognitive	Understand Apply

UNIT I CLASSIFICATION OF PISTONENGINE COMPONENTS 5

Typesofpistonengines–Principlesofoperation–Functionofcomponents–Materialsused–Detailsofstartingtheengines–Detailsofcarburetionandinjectionsystemsforsmalland largeengines–Ignitionsystemcomponents–Sparkplugdetails–Engineoperatingconditions at various altitudes – Maintenance and inspection check to be carried out.

UNIT II INSPECTIONS OF PISTON ENGINES 8

Inspectionandmaintenanceandtroubles hooting–Inspectionofallenginecomponents–Dailyandroutinechecks–Overhaulprocedures–Compressiontestingofcylinders–Special inspectionschedules–Enginefuel,controlandexhaustsystems–Enginemountandsuper charger – Checks and inspection procedures.

UNIT III INSPECTIONS OF PISTON ENGINES 10

Symptomsoffailure–Faultdiagnostics–Casestudiesofdifferentenginesystems–Tools andequipmentrequirementsforvariouschecksandalignmentduringoverhauling–Toolsfor inspection–Toolsforsafetyandforvisualinspection–Methodsandinstrumentsfornon destructivetestingtechniques–Equipmentforreplacementofpartandtheirrepair.Engine testing: Engine testing procedures and schedule preparation – Online maintenance.

UNIT IV CLASSIFICATION OF JET ENGINE COMPONENTS 12

12Typesofjetengines–Principlesofoperation–Functionsofcomponents–Materialsused–Detailsofstartingandoperatingprocedures–Gasturbineengineinspection&checks–Useof instrumentsforonline maintenance– Specialinspectionprocedures:ForeignObjectDamage– Blade damage – Maintenanceproceduresofgasturbineengines–Troubleshootingandrectificationprocedures– Component maintenance procedures – Systems maintenance procedures.

UNIT V OVERHAUL PROCEDURES 10

EngineOverhaulprocedures–Inspectionsandcleaningofcomponents–Repairsschedulesfor overhaul –Balancing of Gas turbine components – Trouble Shooting - Procedures for rectification–Conditionmonitoringoftheengineongroundandataltitude–Enginehealth monitoring and corrective methods.

LECTURE: 45 TUTORIAL: 0 TOTAL: 45

TEXT BOOKS

1. Kroes &Wild, “Aircraft Power plants”, 7th Edition – McGraw Hill, 1994.

REFERENCE BOOKS

1. Turbomeca, "Gas Turbine Engines", The English Book Store, 1993.
2. United TechnologiesPratt &Whitney, "The Aircraft Gas turbine Engine and its Operation", The English Book, 1993.

XASE17 -Mapping of CO with PO

CO Vs PO	CO1	CO2	CO3	CO4	CO5	CO6	Total	Scaled to 0,1,2 and 3
PO_1	3	3	3	3	3	3	18	3
PO_2	3	3	3	3	3	3	18	3
PO_3	0	3	3	3	3	3	15	2
PO_4	0	3	3	3	3	3	15	2
PO_5	0	0	0	0	0	0	0	0
PO_6	1	1	1	1	1	1	6	1
PO_7	0	0	0	0	0	0	0	0
PO_8	1	2	2	1	1	2	9	2
PO_9	0	0	0	0	0	0	0	0
PO_{10}	0	0	0	0	0	0	0	0
PO_{11}	0	0	0	0	0	0	0	0
PO_{12}	3	2	2	3	3	2	15	3
PSO_1	0	0	0	0	0	0	0	0
PSO_2	2	2	2	2	2	2	12	2

COURSE CODE **XASE21** **L T P C**
COURSE NAME **ROCKETS AND MISSILES** **3 0 0 3**
PREREQUISITES **NIL** **L T P H**
C:P:A= 3:0:0 **3 0 0 3**

COURSE OBJECTIVES

- To learn about rocket systems.
- To understand the aerodynamic behavior of rocket and missiles.
- To know about the staging and control**.**

COURSE OUTCOMES		DOMAIN	LEVEL
CO1	***Explain*** the design considerations of igniters, injectors and combustion chamber used in rocket system.	Cognitive	Understand
CO2	***Identify*** the elements and components of missiles and rockets.	Cognitive	Apply
CO3	***Assess*** the forces and moments acting on rocket and missiles.	Cognitive	Evaluate

CO4	***Compare*** the one dimensional and two dimensional rocket motions in free space and gravitational field.	Cognitive	Understand
CO5	***Inspect*** the staging and control methods of rockets and missiles.	Cognitive	Analyze
CO6	***Examine*** the performance of materials used rockets and missiles.	Cognitive	Analyze

UNIT I ROCKETS SYSTEM 8

Ignition System in rockets–Types of Igniters–Igniter Design Considerations– Design Consideration of liquid Rocket Combustion Chamber, Injector Propellant Feed Lines, Valves, Propellant Tanks Outlet and Helium Pressurized and Turbine feed Systems – Propellant Slash and Propellant Hammer – Combustion System of Solid Rockets.

UNIT II AERODYNAMICS OF ROCKETS AND MISSILES 11

Airframe Components of Rockets and Missiles– Forces Acting on a Missile – Classification of Missiles – Methods of Describing Aerodynamic Forces and Moments – Lateral Aerodynamic Moment – Lateral Damping Moment and Longitudinal Moment of a Rocket – lift and Drag Forces– Drag Estimation–Body Upwash and Downwash in Missiles – Rocket Dispersion – Numerical Problems.

UNIT III ROCKETMOTION 11

One Dimensional and Two Dimensional rocket Motions in Free Space and Homogeneous Gravitational Fields – Description of Vertical, Inclined and Gravity Turn Trajectories – Determination of range and Altitude Simple Approximations to Burnout Velocity.

UNIT IV STAGING AND CONTROL OF ROCKET VEHICLES 10

Rocket Vector Control–Methods – Thrust determination– SITVC– Multistage rockets– Vehicle Optimization – Stage Separation Dynamics – Separation Techniques.

UNIT V MATERIALS FOR ROCKETS AND MISSILES 5

Selection of Materials – Special Requirements of Materials at Adverse conditions.

LECTURE: 45 TUTORIAL: 0 TOTAL: 45

TEXT BOOKS

1. Sutton, G.P., et al., "Rocket Propulsion Elements", John Wiley & Sons Inc., 1993.

REFERENCE BOOKS

1. Mathur, M., and Sharma, R.P., "Gas Turbines and Jet and Rocket Propulsion", Standard Publishers, 1998.
2. Cornelisse,J.W.,"RocketPropulsionandSpaceDynamics",J.W.,Freeman&Co.Ltd.,1982.
3. Parket,E.R.,"MaterialsforMissilesandSpacecraft",McGraw-HillBookCo.Inc.,1982.

XASE21 -Mapping of CO with PO

CO Vs PO	CO1	CO2	CO3	CO4	CO5	CO6	Total	Scaled to 0,1,2 and 3
PO_1	3	3	3	3	3	2	17	3

PO_2	3	2	2	3	2	2	14	2
PO_3	2	3	3	3	2	2	15	3
PO_4	3	3	3	3	2	1	15	3
PO_5	0	0	0	0	0	1	1	0
PO_6	1	1	1	2	2	1	8	1
PO_7	2	2	2	2	2	2	12	2
PO_8	0	0	0	0	0	2	2	1
PO_9	1	1	1	1	1	1	6	1
PO_{10}	0	0	0	0	0	0	0	0
PO_{11}	1	1	1	1	1	1	6	1
PO_{12}	2	2	2	2	3	2	12	2
PSO_1	0	0	0	0	0	0	0	0
PSO_2	1	1	1	1	1	2	7	2

Semester	**VII**	
Subject Name	**CYBER SECURITY**	
Subject Code	**XUM 706**	
L –T –P –C **0- 0 – 0- 0**	**C:P:A** **3:0:0**	**L –T –P –H** **3- 0 – 0- 3**

Course Outcome:		**Domain C or P or A**
CO1	Able to understandthe Cyber Security Policy, Laws and Regulations	C (Remember)
CO2	Able to discuss the Cyber Security Management Concepts	C (Understand)
CO3	Able to understand *t*he Cyber Crime and Cyber welfare	C (Understand)
CO4	Able to discuss on issues related to Information Security Concepts	C (Understand)
CO5	Able to understandvarious security threats	C (Understand)

COURSE CONTENT

UNIT I	**INTRODUCTION**	**9 hrs**
	Cyber Security – Cyber Security policy– Domain of Cyber Security Policy – Laws and Regulations – Enterprise Policy – Technology Operations – Technology Configuration - Strategy Versus Policy – Cyber Security Evolution – Productivity – Internet – E commerce – Counter Measures – Challenges	
UNIT II	**CYBER SECURITY OBJECTIVES AND GUIDANCE**	**9 hrs**

	Cyber Security Metrics – Security Management Goals – Counting Vulnerabilities – Security Frameworks – E Commerce Systems – Industrial Control Systems – Personal Mobile Devices – Security Policy Objectives – Guidance for Decision Makers – Tone at the Top – Policy as a Project– Cyber Security Management – Arriving at Goals – Cyber Security Documentation – The Catalog Approach – Catalog Format – Cyber Security Policy Taxonomy.	
UNIT III	**CYBER SECURITY POLICY CATALOG**	**9hrs**
	Cyber Governance Issues – Net Neutrality – Internet Names and Numbers – Copyright and Trademarks – Email and Messaging - Cyber User Issues - Malvertising- Impersonation – Appropriate Use – Cyber Crime – Geo location – Privacy - Cyber Conflict Issues – Intellectual property Theft – Cyber Espionage – Cyber Sabotage – Cyber Welfare	
UNIT IV	**SECURITY SYSTEMS**	**9hrs**
	Information Security Overview: Background and Current Scenario -Types of Attacks - Goals for Security - E-commerce Security - Computer Forensics – Steganography	
UNIT V	**LEGAL ETHICS**	**9hrs**
	Overview of Security threats -Weak / Strong Passwords and Password Cracking - Insecure Network connections - Malicious Code - Programming Bugs - Cyber crime and Cyber terrorism - Information Warfare and Surveillance	
	L- 45 hrsTotal – 45 hrs	

TEXT BOOKS

1. Nina Godbole, "Information Systems Security: Security Management, Metrics, Frameworks and Best Practices, w/cd", Wiley Publications, 2008, ISBN 10: 8126516925, ISBN 13 :9788126516926
2. Thomas J. Mowbray, "Cybersecurity: Managing Systems, Conducting Testing and Investigating Intrusions", Wiley Publications, 2013, Kindle Edition,ISBN 10: 812654919X, ISBN 13 :9788126549191
3. D.S. Yadav, "Foundations of Information Technology", New Age International publishers, 3rd Edition, 2006, ISBN-10: 8122417620, ISBN-13: 978-8122417623

REFERENCES

1. Mike Shema, "Anti-Hacker Tool Kit", McGraw Hill Education, 4th edition, 2014,
2. Nina Godbole, SunitBelapure, "Cyber Security Understanding Cyber Crimes, Computer Forensics and Legal Perspectives", Wileypublilcations, 2013, ISBN 10 : 8126521791, ISBN 13:9788126521791.
3. Corey Schou, Daniel Shoemaker, "Information Assurance for the Enterprise: A Roadmap to Information Security (McGraw-Hill Information Assurance & Security)", Tata McGraw Hill, 2013, ISBN-10: 0072255242, ISBN-13: 978-0072255249.
4. VivekSood, "Cyber Laws Simplified", McGraw Hill Education (INDIA) Private Limited in 2001, ISBN-10: 0070435065, ISBN-13: 978-0070435063.Steven M.Furnell, "Computer

Insecurity", Springer Publisher, 2005 Edition.

E-REFERENCES

1. https://www.cryptool.org/en/
2. https://www.metasploit.com/
3. http://sectools.org/tool/hydra/
4. http://www.hping.org/
5. http://www.winpcap.org/windump/install/
6. http://www.tcpdump.org/
7. https://www.wireshark.org/
8. https://ettercap.github.io/ettercap/
9. https://www.concise-courses.com/hacking-tools/top-ten/
10. https://www.cirt.net/Nikto2
11. http://sqlmap.org/

Mapping of COs with Gas

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO 1**	**PSO2**
CO1	3	2	0	2	0	0	1	0	0	0	0	0	0	0
CO2	3	2	3	2	3	2	2	0	2	0	2	2	1	0
CO3	3	2	3	2	3	2	2	0	2	0	2	2	1	0
CO4	3	2	3	2	3	2	2	0	2	0	2	2	1	0
CO5	2	2	0	2	0	0	1	0	0	0	0	0	0	0
CO6	1	2	0	3	0	2	2	2	2	0	2	2	0	0
	15	12	9	13	9	8	10	2	8	0	8	8	3	0

1 - Low, 2 – Medium, 3 – High

Semester	**VII**		
Subject Name	**PROJECT PHASE-I**		
Subject Code	**XAS 705**		
L –T –P –C **0- 0 – 2- 2**	**C:P:A** **1.5:0.5:0.5**	**L –T –P –H** **0- 0 – 2- 4**	

Course Outcome:		**Domain C or P or A**
CO1	Identify the engineering problem relevant to the domain interest.	C(Analyze)
CO2	Interpret and infer literature survey for its worthiness.	C(Analyze& Apply)
CO3	Analyse and identify an appropriate technique for solve the problem.	C(Analyze, Apply)
CO4	Perform experimentation /Simulation/Programming/Fabrication, Collect and interpret data.	P&C(CoR, Create, Apply)
CO5	Record and report the technical findings as a document.	C(Remember, Understand)
CO6	Devote oneself as a responsible member and display as a leader in a team to manage projects.	A &C(Value, Organization, Create)
CO7	Responding of project findings among the technocrats.	A(Responding)

Mapping of COs with Pos

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO 1**	**PSO2**
CO1	3	2	0	2	0	0	1	0	0	0	0	0	0	0
CO2	3	2	3	2	3	2	2	0	2	0	2	2	1	0
CO3	3	2	3	2	3	2	2	0	2	0	2	2	1	0
CO4	3	2	3	2	3	2	2	0	2	0	2	2	1	0
CO5	2	2	0	2	0	0	1	0	0	0	0	0	0	0
CO6	1	2	0	1	0	2	2	2	2	0	2	2	0	0
	15	12	9	11	9	8	10	2	8	0	8	8	3	0

1 – Low, 2 – Medium, 3 – High

COURSECODE	XASM03	L	T	P	C
COURSENAME	AERO AND SPACE MODELING	1	0	1	0
PREREQUISITES C:P:A=0:0:0	NIL	L 2	T 0	P 0	H 2

COURSEOBJECTIVES

- Toimparttheskillsthestudentstoredaerospace componentandassemblydrawing.
- Tomakestudentstoobtainskillsindesignanddesigningvariouscomponents ofAerospaceVehicles.

COURSEOUTCOMES		DOMAIN	LEVEL
CO1	***Explain*** theimportanceof industrydrawing	Cognitive	Understand
CO2	***Indicate***thecomponentsofproductiondrawings	Cognitive	Analyze
CO3	***Predict*** theconceptofassemblyprocess	Cognitive	Remember
CO4	***Identify***themachine elements	Cognitive	Remember
CO5	***Describe***the componentsofAerospacevehicles	Cognitive	Understand
CO6	***Exercise***designanddraftingoffuselageandrocket	Psychomotor	Respond

UNITI	INTRODUCTION	6
Purpose ofthedrawingindustry;Typesofdrawings-sketches,charts,blockdiagramsand graphs;Componentandassemblydrawings;productiondrawings.		
UNITII	**COMPONENTS OFPRODUCTIONDRAWINGS**	**6**
Components in the production drawings- drawing template, bill of material (BOM) with theirindicationonmaindrawing;Conventionalrepresentationofmaterials,surfaceroughness;Notes,scale,unitandmanufacturingorassemblyprocesssheet,reference;Descriptionon their specification,convention, indicationsymbols andtheirlocationwithinthedrawing.		
UNITIII	**MACHINEELEMENTS**	**6**
Terminology,symbolicrepresentationofthread-sectionalviewsofthreads;Fasteners-boltandnutwithwasher;Keys,rivetedjoints,pulleysandcouplings;Weldedjoints;bearings, ChainsandGears.		

UNITIV	AEROSPACEVEHICLES, COMPONENTSANDASSEMBLIES	6
Sketchesandlayoutofaircrafts,launchvehicleswithterminology,andmainfunctions-parachute, hot air balloons, glider, drone, helicopter, gyroplane, propeller plane, stunt plane,biplane,seaplane,militaryjetplane,militarytransportplane,supersonicaircraftandspace shuttle.		
UNITV	**PRACTICE**	**6**
Layoutoffuselageassembly andThreedimensionaldesign anddraftingof rocket.		
SOFTWAREUSED		
CATIA		
REFERENCE		
1.	John,K.C.,TextbookofMachineDrawing,PHILearning,2009.	
2.	Narayana,K.L.,Kannaiah,P.,andVenkataReddyK.,MachineDrawing,4thed.,NewAgeInternational,2010.	
LECTURE:30	**TUTORIAL: 0** **PRACTICAL:0** **TOTAL: 30**	

XASM03-Mapping ofCO withPO

COVs PO	CO1	CO2	CO3	CO4	CO5	CO6	Total	Total /5
PO_1	1	1	1	1	1	1	6	1
PO_2	1	1	1	1	1	1	6	1
PO_3	3	3	3	3	3	3	18	3
PO_4	0	0	0	0	0	0	0	0
PO_5	3	3	3	3	3	3	18	3
PO_6	0	0	0	0	0	0	0	0
PO_7	0	0	0	0	0	0	0	0
PO_8	0	0	0	0	0	0	0	0
PO_9	0	0	0	0	0	0	0	0
PO_{10}	0	0	0	0	0	0	0	0
PO_{11}	1	1	1	1	1	1	6	1

PO_{12}	1	1	1	1	1	1	6	1
PSO_1	1	1	1	1	1	1	6	1
PSO_2	0	0	0	0	0	0	0	0

Semester	**VIII**	
Subject Name	**PROJECT PHASE-II**	
Subject Code	**XAS 804**	
L –T –P –C **0- 0 – 12- 12**	**C:P:A** **6:3:3**	**L –T –P –H** **0- 0 – 12- 24**

Course Outcome:		**Domain C or P or A**
CO1	Identify the Engineering Problem relevant to the domain interest.	C(Analyze)
CO2	Interpret and Infer Literature survey for its worthiness.	C(Analyze, Apply)
CO3	Analyse and identify an appropriate technique for solve the problem.	C(Analyze, Apply)
CO4	Perform experimentation /Simulation/Programming/Fabrication, Collect and interpret data.	P&C(CoR, Create, Apply)
CO5	Record and Report the technical findings as a document.	C(Remember, Understand)
CO6	Devote oneself as a responsible member and display as a leader in a team to manage projects.	A &C(Value, Organization, Create)
CO7	Responding of project findings among the technocrats.	A(Responding)

Mapping of COs with GAs

	CO1	**CO2**	**CO3**	**CO4**	**CO5**	**CO6**	**CO7**	**Total**
PO1	3	2	1	2	1	-	1	10
PO2	3	2	1	2	1	-	1	10
PO3	-	-	1	3	1	-	-	5
PO4	-	1	2	3	1	2	2	11
PO5	-	-	2	3	1	-	-	6

PO6	1	-	1	1	-	3	3	10
PO7	1		1	1	-	1		4
PO8	1	-	1	1	-	3	-	6
PO9	-	-	-	-	2	3	1	6
PO10	-	-	-	-	3	3	3	9
PO11	-				2	2	2	6
PO12	1				3	3	1	8

1 - Low, 2 – Medium, 3 – High

UAV Specialization Course Syllabus

COURSECODE	XASH01	L	T	P	C
COURSENAME	ELEMENTS OF UAV	3	0	0	3
PREREQUISITES	-	L	T	P	H
C:P:A=3:0:0	-	0	0	0	3

UNIT I	INTRODUCTION TO UAV	9

UAV Basic terminology - Classification – Applications – C3 system – Difference between UAV and Drones.

UNITII	UNMANNED AERIAL VEHICLES AND SYSTEMS (UAV, UAS)	9

UAV – UAS – Difference between UAV and UAS - Long-range, Medium-range, tactical UAV - Close-range / battle field UAV – MUAV - MAV & NAV – UCAV - Novel hybrid UAV - Research UAV – RPA & RPAS - Ground Control UAS – UAS Operational Safety Issues – Application of UAS.

UNITIII	UNMANNED PARTS, COMPONENTS, SYSTEMS AND ACCESSORIES	9

UAV Hardware's - UAV Hardware's Architecture - Sensors – RF Communications –Antennas – Ground Equipments – Imaging – Propulsion – UAV Softwares - UAV Software's Architecture. – Fixed Wing Unmanned Aerial Vehicle – Multirotor Unmanned Aerial Vehicle- VTOL - Difference between Wings and Rotors.

UNIT IV	UAV KINEMATICS	9

Forces and Moments – Working Principle of Drone - Rigid Body Dynamics – Aircraft State Variables – UAV Kinematics on Quadcopters –Transitional Kinematics – Rotational Kinematics – State Equation.

UNITV	UAV THE FUTURE	9

Ground Control stations launch and recovery – Variable Paylods on UAV - Application on Remote Sensing – Application on Precession Agriculture - Naval application, Army application, Air Force application, Civilian, Paramilitary and Commercial application, UAS future -Case Studies.

LECTURE:45 **TUTORIAL:0** **TOTAL:45**

TEXTBOOKS

1. **Reg Austin.,** *"Unmanned Aircraft Systems"*, John Wiley and Sons., 2010.

REFERENCEBOOKS

1. **Milman&Halkias,** *"Integrated Electronics"*, McGraw Hill, 1999.
2. **Malvino& Leach,** *"Digital Principles & Applications"*, McGraw Hill, 1986.
3. **Collinson R.P.G,** *"Introduction to Avionics"*, Chapman and Hall, India, 1996
4. **BernadEtikin,** *"Dynamic of flight stability and control",* John Wiley, 1972

COURSECODE	XASH02	L	T	P	C
COURSENAME	UAVDESIGN, CONTROL & METEOROLOGY	3	0	0	3
PREREQUISITES	-	L	T	P	H
C:P:A=3:0:0		0	0	0	3

UNIT I	INTRODUCTION TO UAV DESIGN	9

History – UAV Types and classification & Configurations – Design of UAV – Fixed Wing Drone – Blended Wing Drone – Rotor Wing Drone – Basic Parts of Airfoil – Angle of attack – Symmetric Airfoil – Aerodynamic Stall – Aerodynamic Drag – Selection of Airfoil for Main Wing – Flapping Wings Ornithopters – Design and Technical Comparison of UAV's.

UNITII	DESIGN OF FIXED WING UAV & MULTIROTOR UAV	9

Anatomy of fixed wing and multirotor – Airframe Structures and Mechanisms - Material Selection Parameter – Fuselage Design – Electric Propulsion system – Payload Calculation – Thrust Calculation – Flight Controller Selection – ESC Selection - BEC – 4 to 10 channel Transmitter and Receiver calibration Techniques - Power flow in an UAV - Engine Propulsion system.

UNITIII	DESIGN AND CONTROL	9

UAV Dynamics on Quadcopter - Transitional Dynamics – Rotational Dynamics – Newton Euler Equation for Quadcopter – controller input – Control system Design – PID, PWM, PPM, Difference between PPM and PWM.

UNIT IV	AUTONOMOUS AND AUTOPILOT SYSTEMS	9

Autonomous systems – Autopilot Systems – Difference between Autonomous and Autopilot System - Ground Control Station – Gyroscope – Magnetometer – Aceelerometer - Global Positioning System (GPS) – Telemetry System - Mid-air collision (MAC) avoidance system- Way-point Navigation System – Flight Planning - System In-flight Testing Future Prospects and Challenges-Case Studies.

UNITV	UAV METROLOGY SYSTEMS	9

Aviation Meteorology - SOP for Aviation Meteorology - Meteodrones - Meteorology sensors - Ultrasonic Anemometer – Ultrasonic Wind Sensor – Autonomous Weather Station – Infrasonic acoustics – Radiosondes – Benefits of drone metrology.

LECTURE:45	TUTORIAL:0	TOTAL:45

TEXTBOOKS

1. Jane's Unmanned Aerial Vehicles and Targets, Jane's Information Group; ASIN:

	0710612575, 1999.
2.	R. Said and H. Chayeb, “Power supply system for UAV”, KTH, 2002.
3.	Robert C. Nelson, Flight Stability and Automatic Control, McGraw-Hill, Inc, 1998.
4.	Skafidas, “Microcontroller Systems for a UAV”, KTH, TRITA-FYS 2002:51 ISSN 0280-316 X. 34, 2002
REFERENCEBOOKS	
1.	Kimon P. Valavanis, “Advances in Unmanned Aerial Vehicles: State of the Art and the Road to Autonomy”,Springer, 2007
2.	P.J.Swatton , “Ground studies for pilots’ flight planning”, Sixth edition, 2002.
3.	Dr. Armand J. Chaput, “Design of Unmanned Air Vehicle Systems”, Lockheed Martin Aeronautics Company, 2001
4.	Paul G Fahlstrom, Thomas J Gleason, “Introduction to UAV Systems”, UAV Systems, Inc, 1998.

COURSECODE	**XASH03**	**L**	**T**	**P**	**C**
COURSENAME	**UAV BUSINESS AND OPERATIONAL INDUSTRIAL ASPECTS**	**3**	**0**	**0**	**3**
PREREQUISITES	**-**	**L**	**T**	**P**	**H**
C:P:A=3:0:0		**0**	**0**	**0**	**3**

UNIT I	**UAVs FOR BUSINESS**	**9**

Drone for Photography – Drone for video graphy – Drone for Precision Agriculture – Drone for Survey and Mapping – Drone for Inspection – Drone for Monitoring and Object Tracking -Drones in Project Management.

UNITII	**UAV SOFTWARES & OPERATIONS**	**9**

Introduction to Litchi software, Arducopter Software - flight Planning & Way Point setup – Drones on Property Management – Drones on Roof top Inspection – Drones on Pipeline Inspection – Drones on Thermal Inspection – Drones on Fishing – Drones on Power line Inspection – Drones on 3D Mapping outputs. –Mapping outputs and types.

UNITIII	**UAV ON INDUSTRIAL ASPECTS**	**9**

General group – Military robotics history – Military robotics history operations– Civil robotics history – Civil robotics history operations – Design Considerations - Acquisition & Life Cycle Costs – UGV Architecture - UGV Components – Ground Vehicle concepts.

UNIT IV	**UAV VARIANTS AND WARFARE**	**9**

Categories/Classification – Small size UGV – Large UGV – Law Enforcement Usage – Future Combat System (FCS) – FCS plan and overview – FCS current situation		
UNITV	**SENSORS AND CHARACTERISTICS**	**9**
Sensor Acquisition - Optical (EO) - Infrared (IR) - Multi Spectral Imaging (MSI) - Hyper Spectral Imaging (HSI) - Laser Detection & Ranging (LIDAR) - Synthetic Aperture Radar (SAR) - UGV Perception concept - Environmental and Weather Effects - Sensor integration - Future Sensor Trends Control Definitions - Low Level Control (LLC) - High Level Control (HLC) - Vision and sensing - Automatic control functionality - Autonomous control functionality - Advanced AI Applications - Intelligent Control Techniques		
LECTURE:45	**TUTORIAL:0**	**TOTAL:45**

TEXTBOOKS

1.	'Unmanned aircraft systems UAVs design, development and deployment' Reg Austin Aeronautical Consultant, A John Wiley and Sons, Ltd., Publication
2.	Mathematical Techniques in Multi-sensor Data Fusion (Artech House Information Warfare Library) [Hardcover] David L. Hall, Sonya A. H. McMullen

REFERENCEBOOKS

1.	Handbook of Multisensor Data Fusion: Theory and Practice, Second Edition (Electrical Engineering & Applied Signal Processing Series) Martin Liggins II David Hall, James
2.	P.J.Swatton , "Ground studies for pilots' flight planning", Sixth edition, 2002.
3.	Dr. Armand J. Chaput, "Design of Unmanned Air Vehicle Systems", Lockheed Martin Aeronautics Company, 2001

COURSECODE	XASH04	L	T	P	C
COURSENAME	DESIGN AND DEVELOPMENT OF UAV	0	0	3	3
PREREQUISITES	-	L	T	P	H
C:P:A=0:3:0		0	0	3	3

LIST OF EXPERIMENTS:

1. Study on Types, Classification and Categories of UAVs.
2. Study and compare any 3 Hybrid UAVs with Technical DATA.
3. Study on Electronic Components used in Fixedwing UAV/ multirotor UAV assembly.
4. Designing and Building of an Quadcopter
5. Flight controller calibration and PID Tuning of an Quadcopter.
6. Designing and Building of an Fixed wing airplane.
7. Hands on with Autonomous / Autopilot Software in Brief.
8. Integration and testing Autonomous Fixed Wing UAV
9. Integration and testing Autonomous Mutirotor UAV
10. Study on Future of Artificial Intelligent AI drones.

LECTURE:0	TUTORIAL:0	PRACTICAL: 45	TOTAL:45

TEXTBOOKS

1. Refer Manual

REFERENCEBOOKS

1. ‘Unmanned aircraft systems UAVs design, development and deployment’ Reg Austin Aeronautical Consultant, A John Wiley and Sons, Ltd., Publication

COURSECODE	XASH05	L	T	P	C
COURSENAME	REMOTE PILOT TRAINING	0	0	3	3
PREREQUISITES	-	L	T	P	H
C:P:A=0:3:0		0	0	3	3

LIST OF EXPERIMENTS:

1. Study on Regulations of DGCA, Civil Aviation Requirements section on UAV / Drones.
2. Study on ATC procedures & Radio Telephony for UAV operation
3. Study on Weather and meteorology for UAV operation
4. SOP on Drone equipment maintenance and Fail safe - Emergency identification and handling
5. Flight Simulator Training on Fixed wing UAV
6. Flight Simulator Training on Multi rotor UAV.
7. Study on Flying Field mandates and prerequisites.
8. Remote Pilot Training on Fixed wing UAVs.
9. Remote Pilot Training on Multi rotor UAVs.
10. Flight Planning on Autonomous/Autopilot Systems in an Fixed Wing or Multirotor.

LECTURE:0 TUTORIAL:0 PRACTICAL: 45 TOTAL:45

TEXTBOOKS

1. Refer Manual

REFERENCEBOOKS

1. ‘Unmanned aircraft systems UAVs design, development and deployment’ Reg Austin Aeronautical Consultant, A John Wiley and Sons, Ltd., Publication