SRM UNIVERSITY
(Under section 3 of UGC Act 1956)

B.Tech. (Full Time) - Aerospace Engineering
Curriculum & Syllabus
2013 – 2014

Volume – I
(all courses except open electives)

FACULTY OF ENGINEERING AND TECHNOLOGY
SRM UNIVERSITY
SRM NAGAR, KATTANKULATHUR – 603 203

STUDENT OUTCOMES

The curriculum and syllabus for B.Tech programs (2013) conform to outcome based teaching learning process. In general, **ELEVEN STUDENT OUTCOMES** (a-k) have been identified and the curriculum and syllabus have been structured in such a way that each of the courses meets one or more of these outcomes. Student outcomes describe what students are expected to know and be able to do by the time of graduation. These relate to the skills, knowledge, and behaviors that students acquire as they progress through the program. Further each course in the program spells out clear instructional objectives which are mapped to the student outcomes.

The student outcomes are:

(a) an ability to apply knowledge of mathematics, science, and engineering
(b) an ability to design and conduct experiments, as well as to analyze and interpret data
(c) an ability 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
(d) an ability to function on multidisciplinary teams
(e) an ability to identify, formulate, and solve engineering problems
(f) an understanding of professional and ethical responsibility
(g) an ability to communicate effectively
(h) the broad education necessary to understand the impact of engineering solutions in global, economic, environmental, and societal context
(i) a recognition of the need for, and an ability to engage in life-long learning
(j) a knowledge of contemporary issues
(k) an ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.

B.Tech. Aerospace Engineering
Curriculum – 2013
(Applicable for students admitted from the academic year 2013 -14 onwards)

SEMESTER I						
COURSE CODE	**CATEGORY**	**COURSE NAME**	**L**	**T**	**P**	**C**
PD1001	G	SOFT SKILLS I	1	0	1	1
LE1001	G	ENGLISH	1	2	0	2
MA1001	B	CALCULUS AND SOLID GEOMETRY	3	2	0	4
PY1001	B	PHYSICS	3	0	0	3
PY1002	B	PHYSICS LABORATORY	0	0	2	1
CY1003	B	PRINCIPLES OF ENVIRONMENTAL SCIENCE	2	0	0	2
ME1004	E	WORK SHOP PRACTICE	0	0	3	2
Courses From Table I						
Student shall register for minimum 20 credits in I semester and minimum 20credits in II semester. However student shall have registered for all the courses enlisted under Semester I and II as well the courses in Table I by the time the registration process is complete in II semester. Keeping this in mind student shall register for the courses in I and II semesters.						

Legend:
L - Number of lecture hours per week
T - Number of tutorial hours per week
P - Number of practical hours per week
C - Number of credits for the course

Category of courses:
G - General
B - Basic Sciences
E - Engineering Sciences and Technical Arts
P - Professional Subjects

SEMESTER II						
COURSE CODE	**CATEGORY**	**COURSE NAME**	**L**	**T**	**P**	**C**
PD1002	G	SOFT SKILLS II	1	0	1	1
LE1002	G	VALUE EDUCATION	1	0	0	1
MA1002	B	ADVANCED CALCULUS AND COMPLEX ANALYSIS	3	2	0	4
PY1003	B	MATERIALS SCIENCE	2	0	2	3
ME1005	E	ENGINEERING GRAPHICS	0	1	4	3
ME1002	E	ENGINEERING MECHANICS	3	2	0	4
CY1001	B	CHEMISTRY	3	0	0	3
CY1002	B	CHEMISTRY LAB	0	0	2	1
CE1001	E	BASIC CIVIL ENGINEERING	2	0	0	2
Courses From Table I						
Student shall register for minimum 20 credits in I semester and minimum 20 credits in II semester. However student shall have registered for all the courses enlisted under Semester I and II as well the courses in Table I by the time the registration process is complete in II semester. Keeping this in mind student shall register for the courses in I and II semesters.						

TABLE I
COURSES WHICH CAN BE REGISTERED FOR EITHER IN I OR II SEMESTER

SEMESTER I / II						
Course Code	**Category**	**Course Name**	**L**	**T**	**P**	**C**
CS1001	G	PROGRAMMING USING MATLAB	0	1	2	2
BT1001	B	BIOLOGY FOR ENGINEERS	2	0	0	2
ME1001	E	BASIC MECHANICAL ENGINEERING	2	0	0	2
EE1001	E	BASIC ELECTRICAL ENGINEERING	2	0	0	2
EC1001	E	BASIC ELECTRONICS ENGINEERING	2	0	0	2
AS1001	E	ELEMENTS OF AERONAUTICS	2	0	0	2
NC1001/ NS1001/ SP1001/ YG1001	G	*NCC/ NSS/ NSO/ YOGA	0	0	1	1

NCC-National Cadet Corps
NSS-National Service Scheme
NSO-National Sports Organization (India)

SEMESTER III						
COURSE CODE	**CATEGORY**	**COURSE NAME**	**L**	**T**	**P**	**C**
LE1003/ LE1004/ LE1005/ LE1006/ LE1007	G	GERMAN LANGUAGE PHASE I/FRENCH LANGUAGE PHASE I/JAPANESE LANGUAGE PHASE I /KOREAN LANGUAGE PHASE I/CHINESE LANGUAGE PHASE I	2	0	0	2
PD1003	G	APTITUDE I	1	0	1	1
MA1013	B	FOURIER SERIES, PARTIAL DIFFERENTIAL EQUATIONS & ITS APPLICATIONS	4	0	0	4
IC1051	E	ELECTRONICS AND INSTRUMENTATION	3	0	0	3
AS1002	P	AERO THERMODYNAMICS	3	2	0	4
AS1003	P	AERO-FLUID MECHANICS	3	2	0	4
ME1008	P	MANUFACTURING TECHNOLOGY	3	0	0	3
AS1004	P	AERO-FLUID DYNAMICS LABORATORY	0	0	2	1

ME1014	P	MANUFACTURING PROCESS LABORATORY	0	0	2	1
TOTAL			**19**	**04**	**05**	**23**
Total Contact Hours			**28**			

SEMESTER IV						
Course Code	**Category**	**Course Name**	**L**	**T**	**P**	**C**
LE1008/ LE1009/ LE1010/ LE1011/ LE1012	*G*	GERMAN LANGUAGE PHASE II / FRENCH LANGUAGE PHASE II/ JAPANESE LANGUAGE PHASE II /KOREAN LANGUAGE PHASE II / CHINESE LANGUAGE PHASE II	2	0	0	2
PD1004	*G*	APTITUDE II	1	0	1	1
MA1004	B	NUMERICAL METHODS	4	0	0	4
ME1010	P	MECHANICS OF SOLIDS	2	2	0	3
ME1012	P	MACHINES & MECHANISMS	2	2	0	3
AS1005	P	AERODYNAMICS – I	3	2	0	4
	P	DEP. ELECTIVE-I	3	0	0	3
AS1006	P	AERODYNAMICS LABORATORY – I	0	0	2	1
AS1007	P	AIRCRAFT COMPONENT DRAWING	0	1	3	2
TOTAL			**17**	**7**	**6**	**23**
Total Contact Hours			**30**			

SEMESTER V						
Course Code	**Category**	**Course Name**	**L**	**T**	**P**	**C**
PD1005	G	APTITUDE III	1	0	1	1
MA 1005	B	PROBABILITY AND STATISTICS	4	0	0	4
AS1008	P	AIRCRAFT SYSTEMS AND INSTRUMENTS	3	0	0	3
AS1009	P	FLIGHT DYNAMICS –I	3	0	0	3
AS1010	P	AIRCRAFT STRUCTURES	3	0	0	3
AS1011	P	AERODYNAMICS –II	3	1	0	3
AS1012	P	AIR BREATHING PROPULSION	3	0	0	3
	P	DEP.ELECTIVE-II	3	0	0	3
AS1013	P	PROPULSION LABORATORY	0	0	2	1

AS1014	P	AERODYNAMICS LABORATORY – II	0	0	2	1
AS1045	P	INDUSTRIAL TRAINING I	0	0	1	1
TOTAL			**23**	**1**	**6**	**26**
Total Contact Hours			**30**			

SEMESTER VI						
Course Code	**Category**	**Course Name**	**L**	**T**	**P**	**C**
PD1006	G	APTITUDE IV	1	0	1	1
AS1015	P	INTRODUCTION TO SPACE TECHNOLOGY	3	0	0	3
AS1016	P	FLIGHT DYNAMICS –II	3	0	0	3
AS1017	P	HEAT TRANSFER	3	0	0	3
AS1018	P	ROCKET PROPULSION	3	0	0	3
ME1188	P	TQM & RELIABILITY ENGINEERING	3	0	0	3
	P	DEP. ELECTIVE-III	3	0	0	3
AS1019	P	AIRCRAFT DESIGN PROJECT-I	0	0	2	1
AS1020	P	AIRCRAFT STRUCTURES LABORATORY	0	0	2	1
AS1049	P	MINOR PROJECT	0	0	2	1
TOTAL			**19**	**0**	**7**	**22**
Total Contact Hours			**26**			

SEMESTER VII						
Course Code	**Category**	**COURSE NAME**	**L**	**T**	**P**	**C**
ME1034	P	ECONOMICS & PRINCIPLES OF MANAGEMENT	3	0	0	3
AS1021	P	VIBRATIONS AND ELEMENTS OF AEROELASTICITY	3	0	0	3
	P	*DEP. ELECTIVE-IV*	3	0	0	3
	P	*DEP. ELECTIVE-V*	3	0	0	3
	P	*OPEN ELECTIVE-I*	3	0	0	3
	P	*OPEN ELECTIVE-II*	3	0	0	3
	P	*OPEN ELECTIVE- III*	3	0	0	3

AS1022	P	AIRCRAFT DESIGN PROJECT – II	0	0	2	1
AS1023	P	AEROSPACE COMPUTATIONAL ANALYSIS LABORATORY	0	0	2	1
AS1046	P	INDUSTRIAL TRAINING II	0	0	1	1
TOTAL			**21**	**0**	**5**	**24**
Total contact hours			**26**			

SEMESTER VIII						
Course code	**Category**	**Course Name**	**L**	**T**	**P**	**C**
AS1050	P	PROJECT WORK/PRACTICE SCHOOL	0	0	24	12
Total			0	0	24	12
Total contact hours			**24**			

DEPARTMENTAL ELECTIVES						
Course code	**Category**	**Course name**	**L**	**T**	**P**	**C**
AS1101	P	HELICOPTER AERODYNAMICS	3	0	0	3
AS1102	P	ROCKETS AND MISSILES	3	0	0	3
AS1103	P	AIRCRAFT ENGINE AND INSTRUMENT SYSTEMS	3	0	0	3
AS1104	P	COMBUSTION ENGINEERING	3	0	0	3
AS1105	P	CRYOGENICS	3	0	0	3
AS1106	P	THEORY OF PLATES AND SHELLS	3	0	0	3
AS1107	P	FATIGUE AND FRACTURE MECHANICS	3	0	0	3
AS1108	P	COMPUTER AIDED DESIGN AND ANALYSIS	3	0	0	3
AS1109	P	AIRFRAME MAINTENANCE AND REPAIR	3	0	0	3
AS1110	P	AIR TRANSPORTATION AND AIRCRAFT MAINTENANCE MANAGEMENT	3	0	0	3
AS1111	P	AUTOMATIC CONTROL SYSTEMS	3	0	0	3
AS1112	P	SPACECRAFT TECHNOLOGY	3	0	0	3
AS1113	P	AIRCRAFT MATERIALS	3	0	0	3

Summary of credits									
Category	**I II**	**III**	**IV**	**V**	**VI**	**VII**	**VIII**	**Total**	**%**
G	8	3	3	1	1	0	0	16	9.0
B	23	4	4	4	0	0	0	35	19.4
E	19	3	0	0	0	0	0	22	12.2
P	0	13	16	21	21	15	12	98	54.4
Open Elective	0	0	0	0	0	9	0	9	5.0
Total	**50**	**23**	**23**	**26**	**22**	**24**	**12**	**180**	**100**

SEMESTER I

PD1001	SOFT SKILLS-I	L	T	P	C
	Total Contact Hours – 30	1	0	1	1
	Prerequisite				
	Nil				

PURPOSE

To enhance holistic development of students and improve their employability skills.

INSTRUCTIONAL OBJECTIVES

1.	To develop inter personal skills and be an effective goal oriented team player.
2.	To develop professionals with idealistic, practical and moral values.
3.	To develop communication and problem solving skills.
4.	To re-engineer attitude and understand its influence on behavior.

UNIT I - SELF ANALYSIS **(4 hours)**

SWOT Analysis, Who am I, Attributes, Importance of Self Confidence, Self Esteem

UNIT II - ATTITUDE **(4 hours)**

Factors influencing Attitude, Challenges and lessons from Attitude.

Change Management

Exploring Challenges, Risking Comfort Zone, Managing Change

UNIT III - MOTIVATION **(6 hours)**

Factors of motivation, Self talk, Intrinsic & Extrinsic Motivators.

UNIT IV - GOAL SETTING **(6 hours)**

Wish List, SMART Goals, Blue print for success, Short Term, Long Term, Life Time Goals.

Time Management

Value of time, Diagnosing Time Management, Weekly Planner To do list, Prioritizing work.

UNIT V - CREATIVITY **(10 hours)**

Out of box thinking, Lateral Thinking

Presentation

ASSESSMENT

1. A practical and activity oriented course which has continuous assessment for 75 marks based on class room interaction, activities etc.
2. Presentation – 25 marks

TEXT BOOK

1. INSIGHT Career Development Centre, SRM Publications, 2012,

REFERENCES

1. Covey Sean, "*Seven Habits of Highly Effective Teen"s*, New York, Fireside Publishers, 1998.
2. Carnegie Dale, "*How to win Friends and Influence People"*, New York: Simon & Schuster, 1998.
3. Thomas A Harris, "*I am ok, You are ok"* , New York-Harper and Row, 1972.
4. Daniel Coleman, *Emotional Intelligence*, Bantam Book, 2006.

PD1001 - SOFT SKILLS-I												
Course designed by		**Career Development Centre**										
1.	Student Outcome	a	b	c	d	e	f	g	h	i	j	K
					X		X	X		X		
2.	Mapping of instructional objectives with student outcome				1		2	3		4		
3.	Category	General (G)	Basic Sciences(B)			Engineering Sciences and Technical Arts (E)				Professional Subjects(P)		
		X										
4.	Approval	23rd meeting of Academic Council, May 2013										

LE1001	**ENGLISH**	**L**	**T**	**P**	**C**
	Total Contact Hours-45	**1**	**2**	**0**	**2**
	Prerequisite				
	Nil				

PURPOSE

To help students achieve proficiency in English and develop their professional communication skills to meet the demand in the field of global communication to enable them to acquire placement anywhere with ease and confidence.

INSTRUCTIONAL OBJECTIVES

1.	To enable students improve their lexical, grammatical and communicative competence.
2.	To enhance their communicative skills in real life situations.
3	To assist students understand the role of thinking in all forms of communication.
4.	To equip students with oral and appropriate written communication skills.
5.	To assist students with employability and job search skills.

UNIT I- INVENTIONS **(9 hours)**

1. Grammar and Vocabulary – Tense and Concord:
2. Listening and Speaking – Common errors in Pronunciation (Individual sounds); Process description (Describing the working of a machine, and the manufacturing process)
3. Writing – Interpretation of data (Flow chart, Bar chart)
4. Reading -- (Reading Comprehension -- Answering questions)

UNIT II- ECOLOGY **(9 hours)**

1. Grammar and Vocabulary – Error Analysis – Synonyms and Antonyms, Parallelisms
2. Listening and Speaking - Conducting Meetings
3. Writing – Notice, Agenda, Minutes , letters to the editor via email : Email etiquette
4. D Reading Comprehension – Summarizing and Note-making

UNIT III- SPACE **(9 hours)**

1. Grammar and Vocabulary – tense and concord; word formation
2. Listening and Speaking – Distinction between native and Indian English (Speeches by TED and Kalam) – accent, use of vocabulary and rendering;
3. Writing – Definitions and Essay writing
4. Reading Comprehension – Predicting the content

UNIT IV- CAREERS **(9 hours)**

1. Grammar and Vocabulary –Homonyms and Homophones
2. Listening and Speaking – – Group Discussion
3. Writing Applying for job, cover letter and resume
4. Reading, etymology (roots ; idioms and phrases), Appreciation of creative writing.

UNIT V- RESEARCH **(9 hours)**

1. Grammar and Vocabulary – Using technical terms, Analogies
2. Listening and Speaking -- Presentation techniques (Speech by the learner)
3. Writing – Project Proposal
4. Reading Comprehension -- Referencing Skills for Academic Report Writing (Research Methodology – Various methods of collecting data) Writing a report based on MLA Handbook

TEXTBOOK

1. Department of English and Foreign Languages. "*English for Engineers*", SRM University Publications, 2013.

REFERENCES

1. Dhanavel, S.P. "*English and Communication Skills for Students of Science and Engineering*"**,** Orient Blackswan Ltd., 2009.
2. Meenakshi Raman and Sangeetha Sharma**.** "*Technical Communication-Principles and Practice*", Oxford University Press, 2009.
3. Day, R A.. Scientific English: "*A Guide for Scientists and Other Professionals*", 2nd ed. Hyderabad: Universities Press, 2000.

LE1001 ENGLISH												
Course designed by		**Department of English and Foreign Languages**										
1.	Student Outcome	a	b	c	d	e	f	g	h	i	j	k
					x		x	x		x		
2.	Mapping of instructional objectives with student outcome							1-5				
3.	Category	General (G)	Basic Sciences(B)			Engineering Sciences and Technical Arts (E)				Professional Subjects(P)		
		X										
4.	Approval	23rd meeting of Academic Council, May 2013										

MA1001	**CALCULUS AND SOLID GEOMETRY**	**L**	**T**	**P**	**C**
	Total Contact Hours-75	3	2	0	4
	(Common to all Branches of Engineering except Bio group)				

PURPOSE

To impart analytical ability in solving mathematical problems as applied to the respective branches of Engineering.

INSTRUCTIONAL OBJECTIVES

1	To apply advanced matrix knowledge to Engineering problems.
2	To equip themselves familiar with the functions of several variables.
3	To familiarize with the applications of differential equations.
4	To improve their ability in solving geometrical applications of differential calculus problems
5	To expose to the concept of three dimensional analytical geometry.

UNIT I- MATRICES (15 hours)

Characteristic equation – Eigen values and Eigen vectors of a real matrix – Properties of Eigen values – Cayley – Hamilton theorem orthogonal reduction of a symmetric matrix to diagonal form – Orthogonal matrices – Reduction of quadratic form to canonical form by orthogonal transformations.

UNIT II- FUNCTIONS OF SEVERAL VARIABLES (15 hours)

Function of two variables – Partial derivatives – Total differential – Taylor's expansion – Maxima and Minima – Constrained Maxima and Minima by Lagrangian Multiplier method – Jacobians – Euler's theorem for homogeneous function.

UNIT III- ORDINARY DIFFERENTIAL EQUATIONS (15 hours)

Linear equations of second order with constant and variable coefficients – Homogeneous equation of Euler type – Equations reducible to homogeneous form – Variation of parameter – Simultaneous first order with constant co-efficient.

UNIT IV- GEOMETRICAL APPLICATIONS OF DIFFERENTIAL CALCUL (15 hours)

Curvature – Cartesian and polar coordinates – Circle of curvature – Involutes and Evolutes – Envelopes – Properties of envelopes.

UNIT V- THREE DIMENSIONAL ANALYTICAL GEOMETRY (15 hours)

Equation of a sphere – Plane section of a sphere – Tangent Plane – Orthogonal Sphere - Equation of a cone – Right circular cone – Equation of a cylinder – Right circular cylinder.

TEXT BOOKS

1. Kreyszig.E, "*Advanced Engineering Mathematics*", John Wiley & Sons. Singapore, 10th edition, 2012.
2. K.Ganesan, Sundarammal Kesavan, K.S.Ganapathy Subramanian & V.Srinivasan, "*Engineering Mathematics*",Gamma publications, Revised Edition, 2013.

REFERENCES

1. Grewal B.S, "*Higher Engineering Mathematics"*, Khanna Publications, 42nd Edition,2012.
2. Veerajan. T, "*Engineering Mathematics I*", Tata McGraw Hill Publishing Co, New Delhi, 5th edition, 2006.
3. Kandasamy P etal. "*Engineering Mathematics*", Vol.I (4th revised edition), S.Chand &Co., New Delhi, 2000.
4. Narayanan S., Manicavachagom Pillay T.K., Ramanaiah G., "*Advanced Mathematics for Engineering students*", Volume I (2nd edition), S.Viswanathan Printers and Publishers, 1992.
5. Venkataraman M.K., "*Engineering Mathematics*" – First Year (2nd edition), National Publishing Co., Chennai, 2000.

MA1001 CALCULUS AND SOLID GEOMETRY												
Course designed by		Department of Mathematics										
1.	Student Outcome	a	b	c	d	e	f	g	h	i	j	k
		x				x						
2.	Mapping of instructional objectives with student outcome	1-5				1-5						
3.	Category	General (G)	Basic Sciences(B)			Engineering Sciences and Technical Arts (E)					Professional Subjects(P)	
		--	x			--					--	
4.	Approval	23rd meeting of Academic Council, May 2013										

PY1001	PHYSICS	L	T	P	C
	Total Contact Hours-45	3	0	0	3
	Prerequisite				
	Nil				

PURPOSE

The purpose of this course is to provide an understanding of physical concepts and underlying various engineering and technological applications. In addition, the course is expected to develop scientific temperament and analytical skill in students, to enable them logically tackle complex engineering problems in their chosen area of application.

INSTRUCTIONAL OBJECTIVES

1.	To understand the general scientific concepts required for technology
2.	To apply the Physics concepts in solving engineering problems
3.	To educate scientifically the new developments in engineering and technology
4.	To emphasize the significance of Green technology through Physics principles

UNIT I–MECHANICAL PROPERTIES OF SOLIDS AND ACOUSTICS (9 hours)

Mechanical properties of solids: Stress-strain relationship – Hooke's law – Torsional Pendulum – Young's modulus by cantilever – Uniform and non-uniform bending –– Stress-strain diagram for various engineering materials – Ductile and brittle materials – Mechanical properties of Engineering materials (Tensile strength, Hardness, Fatigue, Impact strength, Creep) – Fracture – Types of fracture (Elementary ideas).

Acoustics: Intensity – Loudness – Absorption coefficient and its determination – Reverberation – Reverberation time – Factors affecting acoustics of buildings and their remedies – Sources and impacts of noise – Sound level meter – Strategies on controlling noise pollution – Ultrasonic waves and properties – Methods of Ultrasonic production (Magnetostriction and Piezoelectric) – Applications of Ultrasonics in Engineering and medicine.

UNIT II–ELECTROMAGNETIC WAVES, CIRCUITS AND APPLICATIONS (9 hours)

Del operator – grad, div, curl and their physical significances - displacement current –Maxwell's equations (derivation) – Wave equation for electromagnetic waves – Propagation in free space – Poynting theorem – Characteristic of Transverse electric and magnetic waves – Skin depth – Rectangular and circular waveguides – High powered vacuum-based cavity magnetrons – Applications including radars, microwave oven and lighting systems.

UNIT III– LASERS AND FIBER OPTICS (9 hours)

Lasers: Characteristics of Lasers – Einstein's coefficients and their relations – Lasing action – Working principle and components of CO_2 Laser, Nd-YAG Laser, Semiconductor diode Laser, Excimer Laser and Free electron Laser – Applications in Remote sensing, holography and optical switching – Mechanism of Laser cooling and trapping.

Fiber Optics: Principle of Optical fiber – Acceptance angle and acceptance cone – Numerical aperture – V-number – Types of optical fibers (Material, Refractive index and mode) – Photonic crystal fibers – Fiber optic communication – Fiber optic sensors.

UNIT IV– QUANTUM MECHANICS AND CRYSTAL PHYSICS (9 hours)

Quantum mechanics: Inadequacies of Classical Mechanics – Duality nature of electromagnetic radiation – De Broglie hypothesis for matter waves – Heisenberg's uncertainty principle –Schrödinger's wave equation – Particle confinement in 1D box (Infinite Square well potential). **Crystal Physics:** Crystal directions – Planes and Miller indices – Symmetry elements – Quasi crystals – Diamond and HCP crystal structure – Packing factor – Reciprocal lattice – Diffraction of X-rays by crystal planes – Laue method and powder method – Imperfections in crystals.

UNIT V– GREEN ENERGY PHYSICS (9 hours)

Introduction to Green energy – **Solar energy:** Energy conversion by photovoltaic principle – Solar cells – **Wind energy:** Basic components and principle of wind energy conversion systems – **Ocean energy:** Wave energy – Wave energy conversion devices – Tidal energy – single and double basin tidal power plants – Ocean Thermal Electric Conversion (OTEC) – **Geothermal energy:** Geothermal sources (hydrothermal, geo-pressurized hot dry rocks, magma) – **Biomass:** Biomass and bio-fuels – bio-energies from wastages – **Fuel cells**: H_2O_2 – **Futuristic Energy:** Hydrogen – Methane Hydrates – Carbon capture and storage (CCS).

One problem sheet consisting of 10 to 15 problems is to be prepared for each unit and discussed in the class.

Few problems based on design considerations related to appropriate branches of engineering can be incorporated in each problem sheet.

TEXT BOOKS

1. Thiruvadigal, J. D., Ponnusamy,S..Sudha.D. and Krishnamohan M., "*Physics for Technologists"*, Vibrant Publication, Chennai, 2013
2. Dattu R.Joshi, "Engineering Physics",Tata McGraw- Hill,New Delih,2010.

REFERENCES

1. Wole Soboyejo, "*Mechanical Properties of Engineered Materials*", Marcel Dekker Inc., 2003.
2. Frank Fahy, "*Foundations of Engineering Acoustics*", Elsevier Academic Press, 2005.
3. Alberto Sona, "*Lasers and their applications*", Gordon and Breach Science Publishers Ltd., 1976.
4. David J. Griffiths, "*Introduction to electrodynamics*", 3rd ed., Prentice Hall, 1999.
5. Leonard. I. Schiff, "*Quantum Mechanics"*, Third Edition, Tata McGraw Hill, 2010.
6. Charles Kittel, "*Introduction to Solid State Physics*", Wiley India Pvt. Ltd, 7th ed., 2007.
7. Godfrey Boyle, "*Renewable Energy: Power sustainable future*", 2nd edition, Oxford University Press, UK, 2004.

PY1001 PHYSICS												
Course designed by		**Department of Physics and Nanotechnology**										
1.	Student Outcome	a	b	c	d	e	f	g	h	i	j	k
		x		x		x						x
2.	Mapping of instructional objectives with student outcome	1		4		2						3
3.	Category	General (G)	Basic Sciences(B)			Engineering Sciences and Technical Arts (E)					Professional Subjects(P)	
		--	x			--					--	
4.	Approval	23rd meeting of Academic Council, May 2013										

PY1002	PHYSICS LABORATORY	L	T	P	C
	Total Contact Hours - 30	**0**	**0**	**2**	**1**
	Prerequisite				
	Nil				

PURPOSE

The purpose of this course is to develop scientific temper in experimental techniques and to reinforce the physics concepts among the engineering students

INSTRUCTIONAL OBJECTIVES

1.	To gain knowledge in the scientific methods and learn the process of measuring different Physical variables
2.	Develop the skills in arranging and handling different measuring instruments
3.	Get familiarized with experimental errors in various physical measurements and to plan / suggest on how the contributions could be made of the same order, so as to minimize the errors.

LIST OF EXPERIMENTS

1. Determination of Young's modulus of a given material – Uniform / Non-uniform bending methods.
2. Determination of Rigidity modulus of a given material – Torsion pendulum
3. Determination of dispersive power of a prism – Spectrometer
4. Determination of laser parameters – divergence and wavelength for a given laser source –laser grating/ Particle size determination using laser
5. Study of attenuation and propagation characteristics of optical fiber cable
6. Calibration of voltmeter / ammeter using potentiometer
7. Construction and study of IC regulation properties of a given power supply
8. Study of electrical characteristics of a solar cell
9. Mini Project – Concept based Demonstration

TEXT BOOKS

1. Thiruvadigal. J. D., Ponnusamy,S..Sudha.D. and Krishnamohan M., "*Physics for Technologists"*, Vibrant Publication, Chennai, 2013.
2. R.K.Shukla and Anchal Srivastava, "*Practical Physics*", 1st Edition, New Age International (P) Ltd, New Delhi, 2006.

REFERENCES

1. Souires. G.L. "*Practical Physics:*", 4th Edition, Cambridge University, UK, 2001.
2. Chattopadhyay. D. . Rakshit. P. C and Saha. B. "*An Advanced Course in Practical Physics*", 2nd ed., Books & Allied Ltd., Calcutta, 1990.

PY1002 PHYSICS LABORATORY												
Course designed by		**Department of Physics and Nanotechnology**										
1.	Student Outcome	a	b	c	d	e	f	g	h	i	j	k
		x	x			x						
2.	Mapping of instructional objectives with student outcome	1	3			2						
3.	Category	General (G)	Basic Sciences(B)			Engineering Sciences and Technical Arts (E)					Professional Subjects(P)	
		--	x			--					--	
4.	Approval	23rd meeting of Academic Council, May 2013										

CY1003	**PRINCIPLES OF ENVIRONMENTAL SCIENCE**	**L**	**T**	**P**	**C**
	Total Contact Hours - 30	2	0	0	2
	Prerequisite				
	Nil				

PURPOSE

The course provides a comprehensive knowledge in environmental science, environmental issues and the management.

INSTRUCTIONAL OBJECTIVES

To enable the students

1.	To gain knowledge on the importance of environmental education and ecosystem.
2.	To acquire knowledge about environmental pollution- sources, effects and control measures of environmental pollution.
3.	To understand the treatment of wastewater and solid waste management.
4.	To acquire knowledge with respect to biodiversity, its threats and its conservation and appreciate the concept of interdependence.
5.	To be aware of the national and international concern for environment for protecting the environment

UNIT I- ENVIRONMENTAL EDUCATION AND ECOSYSTEMS (6 hours)

Environmental education: Definition and objective. Structure and function of an ecosystem – ecological succession –primary and secondary succession - ecological pyramids – pyramid of number, pyramid of energy and pyramid of biomass.

UNIT II- ENVIRONMENTAL POLLUTION (6 hours)

Environmental segments – structure and composition of atmosphere - Pollution – Air, water, soil , thermal and radiation – Effects – acid rain, ozone layer depletion and green house effect – control measures – determination of BOD, COD, TDS and trace metals.

UNIT III- WASTE MANAGEMENT (6 hours)

Waste water treatment (general) – primary, secondary and tertiary stages.
Solid waste management: sources and effects of municipal waste, bio medical waste - process of waste management.

UNIT IV- BIODIVERSITY AND ITS CONSERVATION (6 hours)

Introduction: definition - genetic, species and ecosystem diversity – bio diversity hot spots - values of biodiversity: consumptive use, productive use, social, ethical, aesthetic and option values - threats to biodiversity: habitat loss, poaching of wildlife – endangered and endemic species of India, Conservation of biodiversity: in-situ and ex-situ conservations.

UNIT V- ENVIRONMENTAL PROTECTION (6 hours)

National concern for environment: Important environmental protection acts in India – water, air (prevention and control of pollution) act, wild life conservation and forest act – functions of central and state pollution control boards - international effort – key initiatives of Rio declaration, Vienna convention, Kyoto protocol and Johannesburg summit.

TEXT BOOKS

1. Kamaraj.P & Arthanareeswari.M, "*Environmental Science – Challenges and Changes"*, 4th Edition, Sudhandhira Publications, 2010.
2. Sharma.B.K. and Kaur, "*Environmental Chemistry",* Goel Publishing House, Meerut, 1994.

REFERENCES

1. De.A.K., "*Environmental Chemistry"*, New Age International, New Delhi, 1996.
2. Helen P Kavitha, "*Principles of Environmental Science*", Sci tech Publications, 2nd Edition, 2008.

CY1003 – PRINCIPLES OF ENVIRONMENTAL SCIENCE												
Course designed by		Department of Chemistry										
1.	Student Outcome	a	b	c	d	e	f	g	h	i	j	k
				x		x	x		x	x	x	
2.	Mapping of instructional objectives with student outcome			5		2	4		1,3	3	2, 5	

3.	Category	General (G)	Basic Sciences(B)	Engineering Sciences and Technical Arts (E)	Professional Subjects(P)
		--	x	--	--
4.	Approval	23rd meeting of Academic Council, May 2013			

ME1004	WORKSHOP PRACTICE	L	T	P	C
	Total contact hours - 45	0	0	3	2
	Prerequisite				
	Nil				

PURPOSE

To provide the students with hands on experience on different trades of engineering like fitting, carpentry, smithy, welding and sheet metal.

INSTRUCTIONAL OBJECTIVES

1.	To familiarize with the basics of tools and equipments used in fitting, carpentry, sheet metal, welding and smithy
2.	To familiarize with the production of simple models in the above trades.

UNIT I-FITTING **(9 hours)**

Tools & Equipments – Practice in filing.
Making Vee Joints, Square, Dovetail joints and Key making - plumbing.
Mini project – Assembly of simple I.C. engines.

UNIT II-CARPENTRY **(9 hours)**

Tools and Equipments- Planning practice.
Making Half Lap, Dovetail, Mortise &Tenon joints.
Mini project - model of a single door window frame.

UNIT III-SHEET METAL **(9 hours)**

Tools and equipments– practice.
Making rectangular tray, hopper, scoop, etc.
Mini project - Fabrication of a small cabinet, dust bin, etc.

UNIT IV-WELDING **(9 hours)**

Tools and equipments -
Arc welding of butt joint, Lap joint, Tee fillet.
Demonstration of gas welding, TIG & MIG welding.

UNIT V-SMITHY **(9 hours)**

Tools and Equipments –
Making simple parts like hexagonal headed bolt, chisel.

TEXT BOOKS

1. Gopal, T.V., Kumar, T., and Murali, G., "*A first course on workshop practice – Theory, Practice and Work Book"*, Suma Publications, Chennai, 2005.

REFERENCE

1. Kannaiah,P., and Narayanan, K. C., "*Manual on Workshop Practice"*, Scitech Publications, Chennai, 1999.
2. Venkatachalapathy, V. S., "*First year Engineering Workshop Practice"*, Ramalinga Publications, Madurai, 1999.
3. Laboratory Manual.

ME1004 - WORKSHOP PRACTICE												
Course designed by		**Department of Mechanical Engineering**										
1.	Student Outcome	a	b	c	d	e	f	g	h	i	j	k
			×	×				×				
2.	Mapping of instructional objectives with student outcome		1, 2	1, 2				1, 2				
3.	Category	General (G)	Basic Sciences(B)		Engineering Sciences and Technical Arts (E)				Professional Subjects(P)			
		--	--		x				--			
4.	Approval	23rd meeting of Academic Council, May 2013										

SEMESTER II

PD1002	**SOFT SKILLS-II**	**L**	**T**	**P**	**C**
	Total Contact Hours - 30	**1**	**0**	**1**	**1**
	Prerequisite				
	Nil				

PURPOSE

To enhance holistic development of students and improve their employability skills.

INSTRUCTIONAL OBJECTIVES

1.	To develop inter personal skills and be an effective goal oriented team player.
2.	To develop professionals with idealistic, practical and moral values.
3.	To develop communication and problem solving skills.
4.	To re-engineer attitude and understand its influence on behavior.

UNIT I - INTERPERSONAL SKILLS (6 hours)

Understanding the relationship between Leadership Networking & Team work, Realizing Ones Skills in Leadership, Networking & Team Work, and Assessing Interpersonal Skills Situation description of Interpersonal Skill.

Team Work

Necessity of Team Work Personally, Socially and Educationally

UNIT II - LEADERSHIP (4 hours)

Skills for a good Leader, Assessment of Leadership Skills

Change Management

Exploring Challenges, Risking Comfort Zone, Managing Change

UNIT III - STRESS MANAGEMENT (6 hours)

Causes of Stress and its impact, how to manage & distress, Understanding thecircle of control, Stress Busters.

Emotional Intelligence

What is Emotional Intelligence, emotional quotient why Emotional Intelligence matters, Emotion Scales. Managing Emotions.

UNIT IV - CONFLICT RESOLUTION (4 hours)

Conflicts in Human Relations – Reasons Case Studies, Approaches to conflict resolution.

UNIT V - DECISION MAKING **(10 hours)**

Importance and necessity of Decision Making, process of Decision Making, Practical way of Decision Making, Weighing Positives & Negatives.

Presentation

ASSESSMENT

1. A practical and activity oriented course which has a continuous assessment for 75 marks based on class room interaction, activities etc.,
2. Presentation - 25 marks

TEXT BOOK

1. INSIGHT, 2009. Career Development Centre, SRM Publications.

REFERENCES

1. Covey Sean, *Seven "Habit of Highly Effective Teens"*, New York, Fireside Publishers, 1998.
2. Carnegie Dale, "*How to win Friends and Influence People"*, New York: Simon & Schuster, 1998.
3. Thomas A Harris, "*I am ok, You are ok"*, New York-Harper and Row, 1972.
4. Daniel Coleman, "*Emotional Intelligence"*, Bantam Book, 2006.

PD1002 - SOFT SKILLS-II												
Course designed by		**Career Development Centre**										
1.	Student Outcome	a	b	c	d	e	f	g	h	i	j	k
					x		x	x		x		
2.	Mapping of instructional objectives with student outcome				1		2	3		4		
3.	Category	General (G)	Basic Sciences(B)			Engineering Sciences and Technical Arts (E)				Professional Subjects(P)		
		x	--			--				--		
4.	Approval	23rd meeting of Academic Council, May 2013										

LE1002	VALUE EDUCATION	L	T	P	C
	Total Contact Hours- 15	**1**	**0**	**0**	**1**
	Prerequisite				
	Nil				

PURPOSE

To provide guiding principles and tools for the development of the whole person recognizing that the individual is comprised of Physical, Intellectual, Emotional and Spiritual dimensions.

INSTRUCTIONAL OBJECTIVES	
1.	To help individuals think about and reflect on different values.
2.	To deepen understanding, motivation and responsibility with regard to making personal and social choices and the practical implications of expressing them in relation to themselves, others, the community and the world at large
3.	To inspire individuals to choose their own personal, social, moral and spiritual values and be aware of practical methods for developing and deepening

UNIT I- INTRODUCTION (3 hours)

Definition, Relevance, Types of values, changing concepts of values

UNIT II- INDIVIDUAL AND GROUP BEHAVIOUR (3 hours)

Personal values – Self – Strengths (self-confidence, self-assessment, self-reliance, self-discipline, determination, self-restraint, contentment, humility, sympathy and compassion, gratitude, forgiveness) Weaknesses (Influences -- Peer pressure, familial and societal expectations, media)

UNIT III- SOCIETIES IN PROGRESS (3 hours)

Definition of society; Units of society; Communities – ancient and modern – Agents of change – Sense of survival, security, desire for comfort and ease sense of belonging, social consciousness and responsibility

UNIT IV- ENGINEERING ETHICS (3 hours)

Definition - Societies for engineers – Code of Ethics – Ethical Issues involved in cross border research -- Ethical and Unethical practices – case studies – situational decision making

UNIT V- SPIRITUAL VALUES (3 hours)

What is religion? -- Role of religion – Misinterpretation of religion – moral policing – Consequences -- Religion as spiritual quest – Aesthetics and religion

TEXT BOOK

1. Department of English and Foreign Languages SRM University, "*Rhythm of Life",* SRM Publications, 2013.

REFERENCE

1. Values **(**Collection of Essays). Published by : Sri Ramakrishna Math, Chennai-4. 1996.

LE1002 VALUE EDUCATION												
Course designed by		Department of English and Foreign Languages										
1.	Student Outcome	a	b	c	d	e	f	g	h	i	J	k
							x			x		
2.	Mapping of instructional objectives with student outcome						1-3			1-3		
3.	Category	General (G)	Basic Sciences(B)			Engineering Sciences and Technical Arts (E)				Professional Subjects(P)		
		x	--			--				--		
4.	Approval	23rd meeting of Academic Council, May 2013										

MA1002	ADVANCED CALCULUS AND COMPLEX ANALYSIS	L	T	P	C
	Total Contact Hours -75	3	2	0	4
	(Common to all Branches of Engineering except Bio group)				

PURPOSE

To impart analytical ability in solving mathematical problems as applied to the respective branches of Engineering.

INSTRUCTIONAL OBJECTIVES

1.	To have knowledge in multiple calculus
2.	To improve their ability in Vector calculus
3.	To equip themselves familiar with Laplace transform
4.	To expose to the concept of Analytical function
5.	To familiarize with Complex integration

UNIT I- MULTIPLE INTEGRALS (15 hours)

Double integration in Cartesian and polar coordinates – Change of order of integration – Area as a double integral – Triple integration in Cartesian coordinates – Conversion from Cartesian to polar – Volume as a Triple Integral.

UNIT II- VECTOR CALCULUS (15hours)

Gradient, divergence, curl – Solenoidal and irrotational fields – Vector identities (without proof) – Directional derivatives – Line, surface and volume integrals – Green's, Gauss divergence and Stoke's theorems (without proof) – Verification and applications to cubes and parallelopipeds only.

UNIT III- LAPLACE TRANSFORMS (15 hours)

Transforms of simple functions – Basic operational properties – Transforms of derivatives and integrals – Initial and final value theorems – Inverse transforms – Convolution theorem – periodic functions – Applications of Laplace transforms for solving linear ordinary differential equations up to second order with constant coefficients only.

UNIT IV- ANALYTIC FUNCTIONS (15 hours)

Definition of Analytic Function – Cauchy Riemann equations – Properties of analytic functions - Determination of harmonic conjugate – Milne-Thomson's method – Conformal mappings: 1/z, az, az+b and bilinear transformation.

UNIT V- COMPLEX INTEGRATION (15 hours)

Line integral – Cauchy's integral theorem (without proof) – Cauchy's integral formulae and its applications – Taylor's and Laurent's expansions (statements only) – Singularities – Poles and Residues – Cauchy's residue theorem – Contour integration – Unit circle and semi circular contour.

TEXT BOOKS

1. Kreyszig.E, "*Advanced Engineering Mathematics*", 10th edition, John Wiley & Sons.Singapore, 2012.
2. K.Ganesan, Sundarammal Kesavan, K.S.Ganapathy Subramanian & V.Srinivasan, "*Engineering Mathematics*", Gamma publications, Revised Edition, 2013.

REFERENCES

1. Grewal B.S, "*Higher Engg Maths*", Khanna Publications, 42nd Edition, 2012.
2. Veerajan, T., "*Engineering Mathematics I*", Tata McGraw Hill Publishing Co., New Delhi, 5th edition, 2006.
3. Kandasamy P etal. "*Engineering Mathematics*", Vol.I (4th revised edition), S.Chand &Co., New Delhi, 2000.
4. Narayanan S., Manicavachagom Pillay T.K., Ramanaiah G., "*Advanced Mathematics*" for Engineering students, Volume I (2nd edition), S.Viswanathan Printers and Publishers, 1992.
5. Venkataraman M.K., "*Engineering Mathematics*" – First Year (2nd edition), National Publishing Co., Chennai, 2000.

MA1002 ADVANCED CALCULUS AND COMPLEX ANALYSIS												
Course designed by		Department of Mathematics										
1.	Student Outcome	a	b	c	d	e	f	g	h	i	j	k
		x				x						
2.	Mapping of instructional objectives with student outcome	1-5				1-5						
3.	Category	General (G)	Basic Sciences(B)			Engineering Sciences and Technical Arts (E)				Professional Subjects(P)		
		--	x			--				--		
4.	Approval	23rd meeting of Academic Council, May 2013										

PY1003	MATERIALS SCIENCE	L	T	P	C
	Total Contact Hours - 60	2	0	2	3
	Prerequisite				
	Nil				

PURPOSE

The course introduces several advanced concepts and topics in the rapidly evolving field of material science. Students are expected to develop comprehension of the subject and to gain scientific understanding regarding the choice and manipulation of materials for desired engineering applications.

INSTRUCTIONAL OBJECTIVES

1.	To acquire basic understanding of advanced materials, their functions and properties for technological applications
2.	To emphasize the significance of materials selection in the design process
3.	To understand the principal classes of bio-materials and their functionalities in modern medical science
4.	To get familiarize with the new concepts of Nano Science and Technology
5.	To educate the students in the basics of instrumentation, measurement, data acquisition, interpretation and analysis

UNIT I– ELECTRONIC AND PHOTONIC MATERIALS (6 hours)

Electronic Materials: Fermi energy and Fermi–Dirac distribution function – Variation of Fermi level with temperature in intrinsic and extrinsic semiconductors – Hall effect – Dilute Magnetic Semiconductors (DMS) and their applications

Superconducting Materials: Normal and High temperature superconductivity – Applications.

Photonic Materials: LED – LCD – Photo conducting materials – Photo detectors – Photonic crystals and applications – Elementary ideas of Non-linear optical materials and their applications.

UNIT II– MAGNETIC AND DIELECTRIC MATERIALS (6 hours)

Magnetic Materials: Classification of magnetic materials based on spin – Hard and soft magnetic materials – Ferrites, garnets and magnetoplumbites – Magnetic bubbles and their applications – Magnetic thin films – Spintronics and devices (Giant magneto resistance, Tunnel magneto resistance and Colossal magneto resistance).

Dielectric Materials: Polarization mechanisms in dielectrics – Frequency and temperature dependence of polarization mechanism – Dielectric loss – Dielectric waveguide and dielectric resonator antenna – Piezoelectric, pyroelectric and ferroelectric materials and their applications.

UNIT III– MODERN ENGINEERING AND BIOMATERIALS `(6 hours)

Modern Engineering Materials: Smart materials – Shape memory alloys – Chromic materials (Thermo, Photo and Electro) – Rheological fluids – Metallic glasses – Advanced ceramics – Composites.

Bio-materials: Classification of bio-materials (based on tissue response) – Comparison of properties of some common biomaterials – Metallic implant materials (stainless steel, cobalt-based and titanium-based alloys) – Polymeric implant materials (Polyamides, polypropylene, Acrylic resins and Hydrogels) – Tissue replacement implants – Soft and hard tissue replacements – Skin implants – Tissue engineering – Biomaterials for organ replacement (Bone substitutes) – Biosensor.

UNIT IV– INTRODUCTION TO NANOSCIENCE AND NANOTECHNOLOGY(6 hours)

Basic concepts of Nanoscience and Nanotechnology – Quantum wire – Quantum well – Quantum dot – fullerenes – Graphene – Carbon nanotubes – Material processing by chemical vapor deposition and physical vapor deposition – Principle of SEM, TEM, AFM, Scanning near-field optical microscopy (SNOM) – Scanning ion-conducting microscopy (SCIM) – Potential uses of nanomaterials in electronics, robotics, computers, sensors, sports equipment, mobile electronic devices, vehicles and transportation – Medical applications of nanomaterials.

UNIT V– MATERIALS CHARACTERIZATION (6 hours)

X-ray diffraction, Neutron diffraction and Electron diffraction– X-ray fluorescence spectroscopy – Fourier transform Infrared spectroscopy (FTIR) – Ultraviolet and visible spectroscopy (UV-Vis) – Thermogravimetric Analysis (TGA) – Differential Thermal Analysis (DTA) – Differential Scanning Calorimetry (DSC).

PRACTICAL EXPERIMENTS **(30 hours)**

1. Determination of resistivity and band gap for a semiconductor material – Four probe method / Post-office box
2. Determination of Hall coefficient for a semiconducting material
3. To study V-I characteristics of a light dependent resistor (LDR)
4. Determination of energy loss in a magnetic material – B-H curve
5. Determination of paramagnetic susceptibility – Quincke's method
6. Determination of dielectric constant for a given material
7. Calculation of lattice cell parameters – X-ray diffraction
8. Measurement of glucose concentration – Electrochemical sensor
9. Visit to Advanced Material Characterization Laboratory (Optional)

TEXT BOOKS

1. Thiruvadigal.J.D, Ponnusamy,S..Sudha.D. and Krishnamohan M., "*Materials Sciences"*, Vibrant Publication, Chennai, 2013.
2. Rajendran.V, "*Materials Science*",Tata McGraw- Hill,New Delhi,2011.

REFERENCES

1. Rolf.E. Hummel, "*Electronic Properties of Materials"*, 4th ed., Springer, New York, 2011.
2. Dennis.W. Prather, "*Photonic Crystals: Theory, Applications, and Fabrication"*, John Wiley & Sons, Hoboken, 2009.
3. James R. Janesick, "*Scientific Charge-Coupled Devices",* Published by SPIE - The International Society for Optical Engineering, Bellingham, Washington, 2001.
4. David M. Pozar, "*Microwave Engineering*", 3rd ed., John Wiley & Sons, 2005.
5. F. Silver and C. Dillion, "*Biocompatibility: Interactions of Biological and Implantable Materials*", VCH Publishers, New York, 1989.
6. Severial Dumitriu, "*Polymeric Biomaterials*" Marcel Dekker Inc, CRC Press, Canada 2001.
7. G. Cao, "*Nanostructures and Nanomaterials: Synthesis, Properties and Applications*", Imperial College Press, 2004.
8. T.Pradeep, "*A Text Book of Nanoscience and Nanotechnology*", Tata McGraw Hill, New Delhi, 2012.
9. Sam Zhang, "*Materials Characterization Techniques*", CRC Press, 2008.

PY1003 MATERIALS SCIENCE												
Course designed by		Department of Physics and Nanotechnology										
1.	Student Outcome	a	b	c	d	e	f	g	h	i	j	k
		x	x		x	x						x
2.	Mapping of instructional objectives with student outcome	1	5		4	2						3
3.	Category	General (G)	Basic Sciences(B)			Engineering Sciences and Technical Arts (E)					Professional Subjects(P)	
		--	x			--					--	
4.	Approval	23rd meeting of Academic Council, May 2013										

ME1005	ENGINEERING GRAPHICS	L	T	P	C
	Total Contact Hours - 75	0	1	4	3
	Prerequisite				

First Angle Projection is to be followed - Practice with Computer Aided Drafting tools

PURPOSE

1. To draw and interpret various projections of 1D, 2D and 3D objects.
2. To prepare and interpret the drawings of buildings.

INSTRUCTIONAL OBJECTIVES

1. To familiarize with the construction of geometrical figures
2. To familiarize with the projection of 1D, 2D and 3D elements
3. To familiarize with the sectioning of solids and development of surfaces
4. To familiarize with the Preparation and interpretation of building drawing

UNIT I - FUNDAMENTALS OF ENGINEERING GRAPHICS (2 hours)

Lettering – Two dimensional geometrical constructions – Conics – Representation of three-dimensional objects – Principles of projections – Standard codes – Projection of points.

UNIT II - PROJECTION OF LINES AND SOLIDS (4 hours)

Projection of straight lines – Projection of planes - Projection of solids – Auxiliary projections.

UNIT III - SECTIONS AND DEVELOPMENTS (3 hours)

Sections of solids and development of surfaces.

UNIT IV - PICTORIAL PROJECTIONS **(4 hours)**

Conversion of Projections: Orthographic projection – Isometric projection of regular solids and combination of solids.

UNIT V - BUILDING DRAWING **(2 hours)**

Plan, Elevation and section of single storied residential (or) office building with flat RCC roof and brick masonry walls having not more than 3 rooms (planning / designing is not expected in this course) with electrical wiring diagram.

PRACTICAL **(60 hours)**

TEXT BOOKS

1. Venugopal, K. and Prabhu Raja, V., "*Engineering Graphics"*, Eighth Edition (Revised), New Age International Publishers, Chennai, 2007.
2. Natarajan, K.V., "*A Text Book of Engineering Graphics"*, 21st Edition, Dhanalakshmi Publishers, Chennai, 2012.
3. Jeyapoovan, T., "*Engineering Drawing and Graphics using AutoCAD"*, Vikas Publishing House Pvt. Ltd., New Delhi, 2010.

REFERENCES

1. Bethune.J.D, "Engineering Graphics with AutoCAD 2013", PHI Learning Private Limited, Delhi, 2013.
2. Bhatt.N.D, "*Elementary Engineering Drawing (First Angle Projection)"*, Charotar Publishing Co., Anand, 1999.
3. Narayanan.K.L and Kannaiah.P, "*Engineering Graphics"*, Scitech Publications, Chennai, 1999.
4. Shah1.M.B and Rana.B.C, "*Engineering Drawing"*, Pearson Education (Singapore) Pvt. Ltd., New Delhi, 2005.

ME1005 ENGINEERING GRAPHICS												
Course designed by		**Department of Mechanical Engineering**										
1.	Student Outcome	a	b	c	d	e	f	g	h	i	j	k
			x	x				x				
2.	Mapping of instructional objectives with student outcome		1-4	1-4				1-4				
3.	Category	General (G)	Basic Sciences(B)			Engineering Sciences and Technical Arts (E)				Professional Subjects(P)		
		--	--			x				--		
4.	Approval	23rd meeting of Academic Council, May 2013										

	ENGINEERING MECHANICS	L	T	P	C
ME1002	Total Contact Hours - 75	3	2	0	4
	Prerequisite				
	Nil				

PURPOSE

To develop the ability, in the engineering student, to understand, formulate, and solve a given problem in a logical manner and to apply it to solve a few basic problems in engineering mechanics.

INSTRUCTIONAL OBJECTIVES

1.	Static equilibrium of particles and rigid bodies.
2.	Analysis of trusses and friction.
3.	Properties of surfaces and volumes.
4.	Dynamic equilibrium of particles.
5.	Dynamic equilibrium of rigid bodies.

UNIT I - STATICS OF PARTICLES (16 hours)

Equilibrium of Particles: Fundamental concepts and principles of engineering mechanics - Forces on particles –vector addition- Concurrent forces in a plane - Resolution of forces - Resultant of several concurrent forces - Free body diagram –Forces in space. **Equilibrium of rigid bodies**: Principle of transmissibility - Moment of a force - Varignon's theorem - Equivalent system of forces - Reduction of system of forces into single force and couple-Equipollent system of forces - Types of supports and corresponding reactions - Equilibrium of rigid bodies in two dimensions.- Equilibrium of a two force body , statically determinate and indeterminate structures.

UNIT II - ANALYSIS OF TRUSSES AND FRICTION (15 hours)

Trusses: Definition of a truss - Simple Trusses - Analysis of Trusses - Method of joints- Method of sections. **Friction**: Laws of Friction - Angle of Friction –Dry friction- Wedges - Rolling friction - Belt Friction - Thrust and Journal bearings.

UNIT III - PROPERTIES OF SURFACES AND VOLUMES (14 hours)

Centre of Gravity: - Centroids of lines, areas, and volumes –Determination of centroids by integration - Theorem of Pappus-Guldinus - **Moment of Inertia**: Second moment or Moment of inertia of an area**-** Determination of moment of inertia of area by integration - Radius of gyration - Parallel and perpendicular axis theorems - Polar moment of inertia - Mass moment of inertia.

UNIT IV - DYNAMICS OF PARTICLES (15 hours)

Rectilinear motion –uniform velocity and uniformly accelerated motion- Rectangular components of velocity and acceleration- Curvilinear motion –Normal and tangential components- Radial and transverse components-Newton second law – D'Alembert's principle- Principle of work and energy –Applications- Conservative forces-Principle of impulse and momentum - Impulsive motion - Impact of elastic bodies – Direct central- Oblique central impact.

UNIT V - DYNAMICS OF RIGID BODIES (15 hours)

Introduction to Kinematics of rigid bodies - Translation and rotation of rigid bodies - Fixed axis rotation – General plane motion –Absolute and Relative velocity in plane motion - Instantaneous center of rotation in plane motion - Principle of work and energy for a rigid body - Principle of impulse and momentum for the plane motion of a rigid body.

TEXTBOOKS

1. Ferdinand P. Beer, E. Russell Johnston Jr., David Mazurek, Philip J Cornwell, "*Vector Mechanics for Engineers: Statics and Dynamics"* , McGraw - Hill, New Delhi, Tenth Edition, 2013.
2. Palanichamy, M. S., and Nagan, S., "*Engineering Mechanics (Statics and Dynamics)"*, Tata McGraw Hill, New Delhi Eighth reprint, 2011(Third edition).

REFERENCES

1. Timoshenko, and Young, "*Engineering Mechanics"*, Tata Mc-Graw Hill Book Company, Edition 4, New Delhi, 1988.
2. Mclean, and Nelson, "*Theory and problems of Engineering Mechanics (Statics and Dynamics)"*, 3rd Edition Schaum Series, 1980.
3. Rajasekaran, S., & Sankarasubramanian, G., "*Engineering Mechanics"*, Vikas Publishing House Pvt Ltd, 2011.
4. Shames, I.H., and Krishna Mohana Rao, G., "*Engineering Mechanics (Statics and Dynamics)"*, Dorling Kindersley (India) Pvt. Ltd. (Pearson Education), 2006.
5. Dr.R.K.Bansal & Sanjay Bansal, "*A Text book of Engineering Mechanics"*, Lakshimi publications, Edition 7, 2011.

ME1002 - ENGINEERING MECHANICS												
Course designed by		**Department of Mechanical Engineering**										
1.	Student Outcome	a	b	c	d	e	f	g	h	i	j	k
		x				x					x	
2.	Mapping of instructional objectives with student outcome	1-5				1-5					1-5	
3.	Category	General (G)	Basic Sciences(B)			Engineering Sciences and Technical Arts (E)					Professional Subjects(P)	
		--	x			--					--	
4.	Approval	23rd meeting of Academic Council, May 2013										

	CHEMISTRY	L	T	P	C
CY1001	Total Contact Hours - 45	**3**	**0**	**0**	**3**
	Prerequisite				
	Nil				

PURPOSE

To enable the students to acquire knowledge in the principles of chemistry for engineering applications

INSTRUCTIONAL OBJECTIVES

1.	The quality of water and its treatment methods for domestic and industrial applications.
2.	The classification of polymers, different types of polymerizations, preparation, properties and applications of important polymers and FRPs.
3.	The phase rule and its application to one and two component systems.
4.	The principle, types and mechanism of corrosion and protective coatings.
5.	The classification and selection of lubricants and their applications.
6.	The basic principles, instrumentation and applications of analytical techniques

UNIT I-WATER TREATMENT (9 hours)

Water quality parameters: Physical, Chemical & Biological significance - Hardness of water - estimation of hardness (EDTA method) - Dissolved oxygen – determination (Winkler's method), Alkalinity - determination - disadvantages of using hard water in boilers: Scale, sludge formation - disadvantages - prevention - treatment: Internal conditioning - phosphate, carbon and carbonate conditioning methods - External: Zeolite, ion exchange methods - desalination - reverse osmosis and electrodialysis - domestic water treatment.

UNIT II - POLYMERS AND REINFORCED PLASTICS (9 hours)

Classification of polymers - types of polymerization reactions - mechanism of addition polymerization: free radical, ionic and Ziegler - Natta - effect of structure on the properties of polymers - strength, plastic deformation, elasticity and crystallinity -Preparation and properties of important resins: Polyethylene, PVC, PMMA, Polyester, Teflon, Bakelite and Epoxy resins - compounding of plastics - moulding methods - injection, extrusion, compression and calendaring - reinforced plastics - FRP – Carbon and Glass- applications.

UNIT III - PHASE EQUILIBRIA, LUBRICANTS AND ADHESIVES (9 hours)

Phase rule: Statement - explanation of the terms involved - one component system (water system only). Condensed phase rule - thermal analysis - two component systems: simple eutectic, Pb-Ag; compound formation, Zn-Mg.

Lubricants: Classification –solid, semi solid, liquid, emulsion- properties – selection of lubricants for different purposes, Adhesives: classification-natural, synthetic, inorganic- Adhesive action - applications.

UNIT IV- CORROSION AND ITS CONTROL (9 hours)

Corrosion: Basic concepts - mechanism of chemical, electrochemical corrosion - Pilling Bedworth rule – Types of Electrochemical corrosion - galvanic corrosion - differential aeration corrosion - pitting corrosion - stress corrosion – Measurement of corrosion (wt. loss method only) - factors influencing corrosion. Corrosion control: Cathodic protection - sacrificial anodic method - corrosion inhibitors. Protective coatings: surface preparation for metallic coatings - electro plating (copper plating) and electroless plating (Nickel plating) - chemical conversion coatings - anodizing, phosphating & chromate coating.

UNIT V- INSTRUMENTAL METHODS OF ANALYSIS (9 hours)

Basic principles, instrumentation and applications of potentiometry, UV - visible spectroscopy, infrared spectroscopy, atomic absorption spectroscopy and flame photometry .

TEXT BOOKS

1. Kamaraj and Arthanareeswari. M, "*Applied Chemistry", 9th Edition*, Sudhandhira Publications, 2012.
2. Dara.S.S, A Text book of Engineering Chemistry, 10th Edition, S.Chand & Company Ltd., New Delhi, 2003.

REFERENCES

1. Jain.P.C and Monika Jain, "*Engineering Chemistry*", Danpat Rai publishing company (P) Ltd, New Delhi, 2010.
2. Helen P Kavitha, "*Engineering Chemistry – I", Scitech* Publications, 2nd edition, 2008.

CY1001 CHEMISTRY												
Course designed by		**Department of Chemistry**										
1.	Student Outcome	a	b	c	d	e	f	g	h	i	j	k
		x	x	x		x						x
2.	Mapping of instructional objectives with student outcome	1-6	1,5	3		2						4
3.	Category	General (G)	Basic Sciences(B)			Engineering Sciences and Technical Arts (E)				Professional Subjects(P)		
		--	x			--				--		
4.	Approval	23rd meeting of Academic Council, May 2013										

CY1002	CHEMISTRY LABORATORY	L	T	P	C
	Total Contact Hours - 30	**0**	**0**	**2**	**1**
	Prerequisite				
	Nil				

PURPOSE

To apply the concepts of chemistry and develop analytical skills for applications in engineering.

INSTRUCTIONAL OBJECTIVES

To enable the students to understand the basic concepts involved in the analyses.

LIST OF EXPERIMENTS

1. Preparation of standard solutions
2. Estimation of total, permanent and temporary hardness by EDTA method
3. Conductometric titration - determination of strength of an acid
4. Estimation of iron by potentiometry.
5. Determination of molecular weight of polymer by viscosity average method
6. Determination of dissolved oxygen in a water sample by Winkler's method
7. Determination of Na / K in water sample by Flame photometry (Demonstration)
8. Estimation of Copper in ore
9. Estimation of nickel in steel
10. Determination of total alkalinity and acidity of a water sample
11. Determination of rate of corrosion by weight loss method.

REFERENCES

1. Kamaraj & Arthanareeswari, Sudhandhira Publications "*Practical Chemistry*" (work book) , 2011.
2. Helen P. Kavitha "*Chemistry Laboratory Manual*" , Scitech Publications, 2008.

CY1002 CHEMISTRY LABORATORY												
Course designed by		**Department of Chemistry**										
1.	Student Outcome	a	b	c	d	e	f	g	h	i	j	k
		x	x									x
2.	Mapping of instructional objectives with student outcome	1	1									1
3.	Category	General (G)	Basic Sciences(B)			Engineering Sciences and Technical Arts (E)				Professional Subjects(P)		
		--	x			--				--		
4.	Approval	23rd meeting of Academic Council, May 2013										

CE1001	BASIC CIVIL ENGINEERING	L	T	P	C
	Total Contact Hours-30	2	0	0	2
	Prerequisite				
	Nil				

PURPOSE

To get exposed to the glimpses of Civil Engineering topics that is essential for an Engineer.

INSTRUCTIONAL OBJECTIVES

1.	To know about different materials and their properties
2.	To know about engineering aspects related to buildings
3.	To know about importance of surveying and the transportation systems
4.	To get exposed to the rudiments of engineering related to dams, water supply, and sewage disposal

UNIT I - BUILDING MATERILAS (6hours)

Introduction – Civil Engineering – Materials: Bricks – composition – classifications – properties –uses. Stone – classification of rocks – quarrying – dressing – properties –uses. Timber - properties –uses –ply wood. Cement – grades –types – properties –uses. Steel – types – mild steel – medium steel – hard steel – properties – uses – market forms. Concrete – grade designation – properties – uses.

UNIT II - MATERIAL PROPERTIES (6 hours)

Stress – strain – types – Hook's law – three moduli of elasticity – poisons ratio – relationship – factor of safety. Centroid - center of gravity – problems in symmetrical sections only (I, T and channel sections). Moment of inertia, parallel, perpendicular axis theorems and radius of gyration (definitions only).

UNIT III - BUILDING COMPONENTS (6 hours)

Building – selection of site – classification – components. Foundations –functions – classifications – bearing capacity. Flooring – requirements – selection – types – cement concrete marble – terrazzo floorings. Roof – types and requirements.

UNIT IV - SURVEYING AND TRANSPORTATION (6hours)

Surveying – objectives – classification – principles of survey. Transportation – classification – cross section and components of road – classification of roads. Railway – cross section and components of permanent way –functions. Water way – docks and harbor – classifications – components. Bridge – components of bridge.

UNIT V - WATER SUPPLY AND SEWAGE DISPOSAL (6hours)

Dams – purpose – selection of site – types –gravity dam (cross section only). Water supply – objective – quantity of water – sources – standards of drinking water – distribution system. Sewage – classification – technical terms – septic tank – components and functions.

TEXT BOOKS

1. Raju K.V.B, Ravichandran P.T, "*Basics of Civil Engineering"*, Ayyappa Publications, Chennai, 2012.
2. Rangwala,S.C.," *Engineering Material"s*, Charotar Publishing House, Anand, 2012.

REFERENCES

1. Ramesh Babu, "*Civil Engineering"* , VRB Publishers, Chennai, 2000.
2. National Building Code of India, Part V, "*Building Material"s*, 2005.
3. Surendra Singh, "*Building Material"s*, Vikas Publishing Company, New Delhi, 1996.

CE1001 - BASIC CIVIL ENGINEERING												
Course designed by		**Department of Civil Engineering**										
1.	Student Outcome	a	b	c	d	e	f	g	h	i	j	k
		x				x						x
2.	Mapping of instructional objectives with student outcome	1 - 4				1-4						2-4
3.	Category	General (G)	Basic Sciences(B)			Engineering Sciences and Technical Arts (E)					Professional Subjects(P)	
		--	--			x					--	
4.	Approval	23rd meeting of Academic Council, May 2013										

SEMESTER I / II

CS1001	PROGRAMMING USING MATLAB	L	T	P	C
	Total Contact Hours - 45	0	1	2	2
	Prerequisite				
	Nil				

PURPOSE

This Lab Course will enable the students to understand the fundamentals and programming knowledge in MATLAB.

INSTRUCTIONAL OBJECTIVES

1.	arn the MATLAB environment and its programming fundamentals
2.	y to write Programs using commands and functions
3.	Able to handle polynomials, and use 2D Graphic commands

LIST OF EXPERIMENTS

1. Practicing MATLAB environment with simple exercises to familiarize Command Window, History, Workspace, Current Directory, Figure window, Edit window, Shortcuts, Help files.
2. Data types, Constants and Variables, Character constants, operators, Assignment statements.
3. Control Structures: For loops, While, If control structures, Switch, Break, Continue statements.
4. Input-Output functions, Reading and Storing Data.
5. Vectors and Matrices, commands to operate on vectors and matrices, matrix Manipulations.
6. Arithmetic operations on Matrices, Relational operations on Matrices, Logical operations on Matrices.
7. Polynomial Evaluation, Roots of Polynomial, Arithmetic operations on Polynomials.
8. Graphics: 2D plots, Printing labels, Grid & Axes box, Text in plot, Bar and Pie chart.

TEXT BOOK

1. Bansa. R.K. A.Goel. .K Sharma. M.K, "*MATLAB and its Applications in Engineering*", Pearson Education, 2012.

REFERENCES

1. Amos Gilat, *"MATLAB-An Introduction with Applications"*, Wiley India, 2009.
2. Stephen.J.Chapman, *"Programming in MATLAB for Engineers"*, Cengage Learning, 2011.

CS1001 PROGRAMMING USING MATLAB												
Course designed by		Department of Computer Science and Engineering										
1.	Student Outcome	a	b	c	d	e	f	g	h	i	j	k
		x	x									x
2.	Mapping of instructional objectives with student outcome	2,3	1-3									1
3.	Category	General (G)	Basic Sciences(B)			Engineering Sciences and Technical Arts (E)					Professional Subjects(P)	
		x	--			--					--	
4.	Approval	23rd meeting of Academic Council, May 2013										

BT1001	BIOLOGY FOR ENGINEERS	L	T	P	C
	Total Contact Hours - 30	2	0	0	2
	Prerequisite				
	Nil				

PURPOSE

The purpose of this course is to provide a basic understanding of biological mechanisms of living organisms from the perspective of engineers. In addition, the course is expected to encourage engineering students to think about solving biological problems with engineering tools.

INSTRUCTIONAL OBJECTIVES

1.	To familiarize the students with the basic organization of organisms and subsequent building to a living being
2.	To impart an understanding about the machinery of the cell functions that is ultimately responsible for various daily activities.
3.	To provide knowledge about biological problems that require engineering expertise to solve them

UNIT I - BASIC CELL BIOLOGY (6hours)

Introduction: Methods of Science-Living Organisms: Cells and Cell theory Cell Structure and Function, Genetic information, protein synthesis, and protein structure, Cell metabolism-Homoeostasis- Cell growth, reproduction, and differentiation.

UNIT II - BIOCHEMISTRY AND MOLECULAR ASPECTS OF LIFE (5 hours)

Biological Diversity --Chemistry of life: chemical bonds--Biochemistry and Human biology--Protein synthesis—Stem cells and Tissue engineering.

UNIT III - ENZYMES AND INDUSTRIAL APPLICATIONS (5 hours)

Enzymes: Biological catalysts, Proteases, Carbonic anhydrase, Restriction enzymes, and Nucleoside monophosphate kinases—Photosynthesis

UNIT IV - MECHANOCHEMISTRY (7 hours)

Molecular Machines/Motors—Cytoskeleton—Bioremediation—Biosensors

UNIT V - NERVOUS SYSTEM, IMMUNE SYSTEM, AND CELL SIGNALING (7 hours)

Nervous system--Immune system- General principles of cell signaling

TEXT BOOK

1. ThyagaRajan. S Selvamurugan. N Rajesh. M. P Nazeer. R. A Richard Thilagaraj. S Barathi, and Jaganathan. M. K "*Biology for Engineers*," Tata McGraw-Hill, New Delhi, 2012.

REFERENCES

1. Jeremy M. Berg, John L. Tymoczko and Lubert Stryer, "*Biochemistry*," W.H. Freeman and Co. Ltd., 6th Ed., 2006.
2. Robert Weaver, "*Molecular Biology*," MCGraw-Hill, 5th Edition, 2012.
3. Jon Cooper, "*Biosensors A Practical Approach*" Bellwether Books, 2004.
4. Martin Alexander, "*Biodegradation and Bioremediation,"* Academic Press, 1994.
5. Kenneth Murphy, "*Janeway's Immunobiology*," Garland Science; 8th edition, 2011.
6. Eric R. Kandel, James H. Schwartz, Thomas M. Jessell, *"Principles of Neural Science*", McGraw-Hill, 5th Edition, 2012.

BT1001 BIOLOGY FOR ENGINEERS												
Course designed by		Department of Biotechnology										
1.	Student Outcome	a	b	c	d	e	f	g	h	i	j	k
		x			x						x	
2.	Mapping of instructional objectives with student outcome	1			2						3	
3.	Category	General (G)		Basic Sciences(B)			Engineering Sciences and Technical Arts (E)				Professional Subjects(P)	
		--		x			--				--	
4.	Approval	23rd meeting of Academic Council, May 2013										

ME1001	BASIC MECHANICAL ENGINEERING	L	T	P	C
	Total Contact Hours - 30	2	0	0	2
	Prerequisite				
	Nil				

PURPOSE

To familiarize the students with the basics of Mechanical Engineering.

INSTRUCTIONAL OBJECTIVES

1. To familiarize with the basic machine elements
2. To familiarize with the Sources of Energy and Power Generation
3. To familiarize with the various manufacturing processes

UNIT I – MACHINE ELEMENTS– I (5 hours)

Springs: Helical and leaf springs – Springs in series and parallel. **Cams:** Types of cams and followers – Cam profile.

UNIT II - MACHINE ELEMENTS– II (5 hours)

Power Transmission: Gears (terminology, spur, helical and bevel gears, gear trains). Belt drives (types). Chain drives. Simple Problems.

UNIT III - ENERGY (10 hours)

Sources: Renewable and non-renewable (various types, characteristics, advantages/disadvantages). **Power Generation:** External and internal combustion engines – Hydro, thermal and nuclear power plants (layouts, element/component description, advantages, disadvantages, applications). Simple Problems.

UNIT IV - MANUFACTURING PROCESSES - I (5 hours)

Sheet Metal Work: Introduction – Equipments – Tools and accessories – Various processes (applications, advantages / disadvantages). **Welding:** Types – Equipments – Tools and accessories – Techniques employed -applications, advantages / disadvantages – Gas cutting – Brazing and soldering.

UNIT V - MANUFACTURING PROCESSES– II (5 hours)

Lathe Practice: Types - Description of main components – Cutting tools – Work holding devices – Basic operations. Simple Problems. **Drilling Practice:** Introduction – Types – Description – Tools. Simple Problems.

TEXT BOOKS

1. Kumar. T., Leenus Jesu Martin and Murali, G., *"Basic Mechanical Engineering"*, Suma Publications, Chennai, 2007.
2. Prabhu. T. J., Jai Ganesh. V. and Jebaraj. S., *"Basic Mechanical Engineering"*, Scitech Publications, Chennai, 2000.

REFERENCES

1. Hajra Choudhary. S.K. and HajraChoudhary. A. K., "*Elements of Workshop Technology", Vols. I & II*, Indian Book Distributing Company Calcutta, 2007.
2. Nag. P.K., "*Power Plant Engineering"*, Tata McGraw-Hill, New Delhi, 2008.
3. Rattan. S.S., "*Theory of Machines"*, Tata McGraw-Hill, New Delhi, 2010.

ME1001 BASIC MECHANICAL ENGINEERING												
Course designed by		**Department of Mechanical Engineering**										
1.	Student Outcome	a	b	c	d	e	f	g	h	i	j	k
		x				x						
2.	Mapping of instructional objectives with student outcome	1-3				1- 3						
3.	Category	General (G)	Basic Sciences(B)			Engineering Sciences and Technical Arts (E)				Professional Subjects(P)		
		--	--			x				--		
4.	Approval	23rd meeting of Academic Council, May 2013										

EE1001	BASIC ELECTRICAL ENGINEERING	L	T	P	C
	Total Contact Hours - 30	2	0	0	2
	Prerequisite				
	Nil				

PURPOSE

This course provides comprehensive idea about circuit analysis, working principles of machines and common measuring instruments.

INSTRUCTIONAL OBJECTIVES

1.	Understand the basic concepts of magnetic circuits, AC & DC circuits.
2.	Explain the working principle, construction, applications of DC & AC machines and measuring instruments.
3.	Gain knowledge about the fundamentals of wiring and earthing

UNIT I – FUNDAMENTALS OF DC CIRCUITS (6 hours)

Introduction to DC and AC circuits, Active and passive two terminal elements, Ohms law, Voltage-Current relations for resistor, inductor, capacitor , Kirchhoff's laws, Mesh analysis, Nodal analysis, Ideal sources –equivalent resistor, current division, voltage division

UNIT II – MAGNETIC CIRCUITS (6 hours)

Introduction to magnetic circuits-Simple magnetic circuits-Faraday's laws, induced emfs and inductances

UNIT III – AC CIRCUITS (6 hours)

Sinusoids, Generation of AC, Average and RMS values, Form and peak factors, concept of phasor representation, J operator. Analysis of R-L, R-C, R-L-C circuits. Introduction to three phase systems - types of connections, relationship between line and phase values.

UNIT IV – ELECTRICAL MACHINES & MEASURING INSTRUMENTS (6 hours)

Working principle, construction and applications of DC machines and AC machines (1 - phase transformers, single phase induction motors: split phase, capacitor start and capacitor start & run motors). Basic principles and classification of instruments -Moving coil and moving iron instruments.

UNIT V – ELECTRICAL SAFETY, WIRING &INTRODUCTION TO POWERSYSTEM (6 hours)

Safety measures in electrical system- types of wiring- wiring accessories-staircase, fluorescent lamps & corridor wiring- Basic principles of earthing-Types of earthing- Simple layout of generation, transmission & distribution of power.

TEXT BOOK

1. Dash. S.S. Subramani. C..Vijayakumar. K "*BasicElectrical Engineering*", First edition,Vijay Nicole Imprints Pvt.Ltd,2013.

REFERENCES

1. Smarajt Ghosh, "*Fundamentals of Electrical & Electronics Engineering*", Second edition, PHI Learning, 2007.
2. V.K.Metha, Rohit Metha, "*Basic Electrical Engineering*", Fifth edition, S.Chand & Co, 2012.
3. Kothari D. P and Nagrath IJ, "*Basic Electrical Engineering*", Second edition, Tata McGraw - Hill, 2009.
4. S. K. Bhattacharya, "*Basic Electrical and Electronics Engineering"*, First edition, Pearson Education, 2011.

EE1001 - BASIC ELECTRICAL ENGINEERING												
Course designed by		**Department of Mechanical Engineering**										
1.	Student Outcome	a	b	c	d	e	f	g	h	i	j	k
		x				x						
2.	Mapping of instructional objectives with student outcome	1-3				1						
3.	Category	General (G)	Basic Sciences(B)			Engineering Sciences and Technical Arts (E)					Professional Subjects(P)	
		--	--			x					--	
4.	Approval	23rd meeting of Academic Council, May 2013										

EC1001	BASIC ELECTRONICS ENGINEERING	L	T	P	C
	Total Contact Hours – 30	2	0	0	2
	Prerequisite				
	Nil				

PURPOSE

This course provides comprehensive idea about working principle, operation and characteristics of electronic devices, transducers, Digital Electronics and Communication Systems.

INSTRUCTIONAL OBJECTIVES

At the end of the course students will be able to gain knowledge about the

1. Fundamentals of electronic components, devices, transducers
2. Principles of digital electronics
3. Principles of various communication systems

UNIT I- ELECTRONIC COMPONENTS (4 hours)

Passive components – resistors, capacitors & inductors (properties, common types, I-V relationship and uses).

UNIT II- SEMICONDUCTOR DEVICES (7 hours)

Semiconductor Devices - Overview of Semiconductors - basic principle, operation and characteristics of PN diode, zener diode, BJT, JFET, optoelectronic devices (LDR, photodiode, phototransistor, solar cell, optocouplers)

UNIT III- TRANSDUCERS (5 hours)

Transducers - Instrumentation – general aspects, classification of transducers, basic requirements of transducers, passive transducers - strain gauge, thermistor, Hall-Effect transducer, LVDT, and active transducers – piezoelectric and thermocouple.

UNIT IV- DIGITAL ELECTRONICS (7 hours)

Number systems – binary codes - logic gates - Boolean algebra, laws & theorems - simplification of Boolean expression - implementation of Boolean expressions using logic gates - standard forms of Boolean expression.

UNIT V- COMMUNICATION SYSTEMS (7 hours)

Block diagram of a basic communication system – frequency spectrum - need for modulation - methods of modulation - principles of AM, FM, pulse analog and pulse digital modulation – AM / FM transmitters & receivers (block diagram description only)

TEXT BOOKS

1. Thyagarajan.T SendurChelvi.KP Rangaswamy. TR *"Engineering Basics: Electrical, Electronics and Computer Engineering"*, New Age International, Third Edition, 2007.
2. Somanathan Nair. B Deepa. SR "*Basic Electronics",* I.K. International Pvt. Ltd., 2009.

REFERENCES

1. Thomas L. Floyd, *"Electronic Devices",* Pearson Education, 9th Edition, 2011.
2. R.K. Rajput, *"Basic Electrical and Electronics Engineering"*, Laxmi Publications, First Edition, 2007.

EC1001 BASIC ELECTRONICS ENGINEERING												
Course designed by		**Department of Electronics and Communication Engineering**										
1.	Student Outcome	a	b	c	d	e	f	g	h	i	j	k
		x										
2.	Mapping of instructional objectives with student outcome	1,2, 3										
3.	Category	General (G)	Basic Sciences(B)			Engineering Sciences and Technical Arts (E)				Professional Subjects(P)		
		--	--			x				--		
4.	Approval	23rd meeting of Academic Council, May 2013										

AS1001	**ELEMENTS OF AERONAUTICS**	**L**	**T**	**P**	**C**
	Total contact hours - 30	**2**	**0**	**0**	**2**
	Prerequisite				
	Nil				

PURPOSE

To introduce the students to the basic concepts of Aerospace, their power plants and the Mechanics of its flight

INSTRUCTIONAL OBJECTIVE

1.	To familiarize with the basics of aircraft structures, systems & instruments.
2.	To give exposure to the power plants cased in Aircraft.

UNIT I - AIRCRAFT CONFIGURATIONS (6 hours)

Early flying vehicles – hot air balloons – heavier than air flying machines - Classification of flight vehicles, airplanes and Helicopters – Components of an airplane and their functions.

UNIT II - BASICS OF AERONAUTICS (6 hours)

International Standard Atmosphere, Temperature, pressure and altitude relationships, lift, drag and moment, Basic characteristics of airfoils, NACA nomenclature, propagation of sound, Mach number, subsonic, transonic, supersonic, hypersonic flows.

UNIT III - AIRCRAFT STRUCTURES (6hours)

General types of construction, Monocoque and Semi monocoque - construction, Typical wing and fuselage Structures - Materials used in Aircraft.

UNIT IV - SYSTEMS AND INSTRUMENTS (6 hours)

Conventional control, Powered controls, Basic instruments for flying, typical systems for control actuation.

UNIT V - POWER PLANTS USED IN AIRCRAFTS (6 hours)

Basic ideas about piston, turboprop and jet engines – comparative merits, Principle of operation of rocket, types of rocket and typical applications, Exploration into space.

TEXT BOOKS

1. Kermode,A.C., 'Flight without Formulae', McGraw Hill,1987.
2. Shevell,R.S., Fundamentals of flights, Pearson education 2004.

REFERENCES

1. Anderson.J.D., Introduction to Flight, McGraw Hill,1995.
2. McKinley.J.L. and R.D. Bent, Aircraft Power Plants, McGraw Hill1993.
3. Pallet.E.H.J. Aircraft Instruments & Principles, Pitman & Co 1933.

AS1001 ELEMENTS OF AERONAUTICS												
Course designed by		Department of Aerospace Engineering										
1.	Student Outcome	a	b	c	d	e	f	g	h	i	j	k
		X				X						
2.	Mapping of instructional objectives with student outcome	1-2				1-2						
3.	Category	General (G)	Basic Sciences(B)			Engineering Sciences and Technical Arts (E)					Professional Subjects(P)	
		--	--			x					--	
4.	Approval	23rd meeting of Academic Council, May 2013										

NC1001/ NS1001/ SP1001/ YG1001	NATIONAL CADET CORPS (NCC)/ NATIONAL SERVICE SCHEME (NSS)/ NATIONAL SPORTS ORGANIZATION (NSO) / YOGA	L	T	P	C
	Total Contact Hours – 15 (minimum, but may vary depending on the course)	0	0	1	1
	Prerequisite				
	Nil				

PURPOSE	
To imbibe in the minds of students the concepts and benefits of NCC/NSS/NSO/YOGA and make them practice the same	
INSTRUCTIONAL OBJECTIVES	
1.	To enable the students to gain knowledge about NCC/NSS/NSO/YOGA and put the same into practice

NATIONAL CADET CORPS (NCC)

Any student enrolling as a member of National Cadet Core (NCC) will have to attend sixteen parades out of twenty parades each of four periods over a span of academic year.Attending eight parades in first semester will qualify a student to earn the credits specified in the curriculum. Grading shall be done based on punctuality, regularity in attending the parades and the extent of active involvement.

NATIONAL SERVICE SCHEME (NSS)

A student enrolling as member of NSS will have to complete 60 hours of training / social service to be eligible to earn the credits specified in the curriculum.Grading shall be done by the faculty member handling the course based on punctuality, regularity in attending the classes and the extent of active involvement.

NATIONAL SPORTS ORGANIZATION (NSO)

Each student must select one of the following games/sports events and practice for one hour per week. An attendance of 75% is compulsory to earn the credits specified in the curriculum. Grading shall be done by the faculty member handling the course based on punctuality, regularity in attending the classes and the extent of active involvement.

List of games/sports:

Basket Ball, Football, Volley Ball, Ball Badminton, Cricket, Throw-ball, Track eventsField events or any other game with the approval of faculty member.

YOGA

Benefits of Agnai Meditation -Meditation - Agnai, Asanas, Kiriyas, Bandas, Muthras

Benefits of santhi Meditation - Meditation Santhi Physical Exercises (I & II)

Lecture & Practice - Kayakalpa Yoga Asanas, Kiriyas, Bandas, Muthras

Analysis of Thought - Meditation Santhi Physical Exercises III & IV

Benefits of Thuriyam - Meditation Thuriyam Kayakalpa Asanas, Kiriyas, Bandas, Muthras

Attitude - Meditation Thuriyam Kayakalpa Asanas, Kiriyas, Bandas, Muthras

Importance of Arutkappy & Blessings - Meditation Thuriyam Kayakalpa Asanas, Kiriyas, Bandas, Muthras

Benefits of Blessings - Meditation Santhi Kayakalpa Asanas, Kiriyas, Bandas, Muthras

Assessment

An attendance of 75% is compulsory to earn the credits specified in the curriculum. Grading shall be done by the faculty member handling the course based on punctuality, regularity in attending the classes and the extent of active involvement.

TEXT BOOKS

1. Yogiraj Vethathiri Maharishi, "*Yoga for Modern Age*", Vethathiri Publishers, 1989
2. Vethathiri Maharishi, T., "*Simplified Physical Exercises*", Vethathiri Publishers, 1987.

NC1001/ NS1001/ SP1001/ YG1001	**NATIONAL CADET CORPS (NCC)/ NATIONAL SERVICE SCHEME (NSS)/ NATIONAL SPORTS ORGANIZATION (NSO)/YOGA**											
Course designed by		**NCC/NSS/NSO/YOGA PRACTITIONERS**										
1.	Student Outcome	a	b	c	d	e	f	g	h	i	j	k
					X					X		
2.	Mapping of instructional objectives with student outcome	a	b	c	d	e	f	g	h	i	j	k
3.	Category	General (G)		Basic Sciences(B)			Engineering Sciences and Technical Arts (E)				Professional Subjects(P)	
		X										
4.	Approval	23rd meeting of Academic Council, May 2013										

SEMESTER III

LE1003	**GERMAN LANGUAGE PHASE I**	**L**	**T**	**P**	**C**
	Total Contact Hours – 30	**2**	**0**	**0**	**2**
	Prerequisite				
	Nil				

PURPOSE	
Germany offers infinite opportunities for students of engineering for higher studies, research and employment in Germany. B.Tech Students are offered German Language during their second year. Knowledge of the language will be helpful for the students to adjust themselves when they go for higher studies.	
INSTRUCTIONAL OBJECTIVES	
1.	To introduce the language, phonetics and the special characters in German language
2.	To introduce German culture & traditions to the students.
3.	By the end of Phase – I, the students will be able to introduce themselves and initiate a conversation..
4.	We endeavor to develop the ability among the students to read and understand small texts written in German
5.	To enable the students to elementary conversational skills.

UNIT I (**6 hours)**

Wichtige Sprachhandlungen: Phonetics – Sich begrüßen - Sich und andere vorstellen formell / informell - Zahlen von 1 bis 1 Milliarde - verstehen & sprechen **Grammatik:** regelmäßige Verben im Präsens - "sein" und haben im Präsens - Personalpronomen im Nominativ

UNIT II **(6 hours)**

Wichtige Sprachhandlungen Telefon Nummern verstehen und sprechen Uhrzeiten verstehen und sagen Verneinung "nicht und kein" (formell und informell) **Grammatik** : Wortstellung – Aussagesatz – W-Frage und Satzfrage (Ja/Nein Frage) Nomen buchstabieren und notieren bestimmter und unbestimmter Artikel und Negativartikel im Nom. & Akkusativ

UNIT III **(6 hours)**

Wichtige Sprachhandlungen Tageszeiten verstehen und über Termine sprechen -Verabredungen verstehen - Aufgaben im Haushalt verstehen **Grammatik** Personalpronomen im Akkusativ und Dativ - W-Fragen "wie, wer, wohin,wo, was usw.- Genitiv bei Personennamen - Modalverben im Präsens "können, müssen, möchten"

UNIT IV **(6 hours)**

Wichtige Sprachhandlungen Sich austauschen, was man kann, muss – Bezeichnungen Lebensmittel – Mengenangaben verstehen – Preise verstehen und Einkaufzettel schreiben

Grammatik Wortstellung in Sätzen mit Modalverben – Konnektor "und" – "noch"-kein-------mehr – "wie viel, wie viele, wie alt, wie lange" –Possessivartikel im Nominativ.

UNIT V **(6 hours)**

Wichtige Sprachhandlungen Freizeitanzeigen verstehen – Hobbys und Sportarten Anzeigen für Freizeitpartner schreiben bzw. darauf antworten – Vorlieben und Abneigungen ausdrucken

Grammatik Verben mit Vokalwechsel im Präsens – Modalverben im Präsens " dürfen, wollen und mögen - "haben und sein" im Präteritum – regelmäßige Verben im Perfekt – Konnektoren "denn, oder, aber

TEXT BOOK

1. Studio d A1. Deutsch als Fremdsprache with CD.(Kursbuch und Sprach training).

REFERENCES

1. German for Dummies
2. Schulz Griesbach

LE1003 GERMAN LANGUAGE PHASE I												
Course designed by		**Department of English and Foreign Languages**										
1.	Student Outcome	a	b	c	d	e	f	g	h	i	j	k
								x				
2.	Mapping of instructional objectives with student outcome							1-5				
3.	Category	General (G)	Basic Sciences(B)			Engineering Sciences and Technical Arts (E)					Professional Subjects(P)	
		x	--			--					--	
4.	Approval	23rd meeting of Academic Council, May 2013										

LE1004	FRENCH LANGUAGE PHASE I	L	T	P	C
	Total Contact Hours - 30	2	0	0	2
	Prerequisite				
	Nil				

PURPOSE

To enable the student learners acquire a basic knowledge of the French language and concepts of general French for everyday interactions and technical French at the beginner's level and also to get to know the culture of France.

INSTRUCTIONAL OBJECTIVES

1.	To enable students improve their grammatical competence.
2.	To enhance their listening skills.
3.	To assist students in reading and speaking the language.
4.	To enhance their lexical and technical competence.
5.	To help the students introduce themselves and focus on their communication skills.

UNIT I **(6 hours)**

1. Grammar and Vocabulary: Usage of the French verb "se presenter", a verb of self- introduction and how to greet a person- "saluer"
2. Listening and Speaking – The authentic sounds of the letters of the French alphabet and the accents that play a vital role in the pronunciation of the words.
3. Writing – correct spellings of French scientific and technical vocabulary.
4. Reading -- Reading of the text and comprehension – answering questions.

UNIT II **(6 hours)**

1. Grammar and Vocabulary – Definite articles , "prepositions de lieu" subject pron ouns
2. Listening and Speaking – pronunciation of words like Isabelle, presentez and la liaison – vous etes, vous appelez and role play of introducing each other – group activity
3. Writing – particulars in filling an enrollment / registration form
4. Reading Comprehension – reading a text of a famous scientist and answering questions.

UNIT III **(6 hours)**

1. Grammar and Vocabulary – verb of possession "avoir' and 1st group verbs "er", possessive adjectives and pronouns of insistence- moi, lui..and numbers from 0 to 20
2. Listening and Speaking –nasal sounds of the words like feminine, ceinture , parfum and how to ask simple questions on one's name, age, nationality, address mail id and telephone number.
3. Writing –conjugations of first group verbs and paragraph writing on self – introduction and introducing a third person.
4. Reading Comprehension – reading a text that speaks of one's profile and answering questions

UNIT IV **(6 hours)**

1. Grammar and Vocabulary –negative sentences, numbers from 20 to 69, verb "aimer"and seasons of the year and leisure activities.
2. Listening and Speaking – To express one's likes and dislikes and to talk of one's pastime activities (sports activities), je fais du ping-pong and nasal sounds of words – janvier, champagne
3. Writing- conjugations of the irregular verbs – faire and savoir and their usage. Paragraph writing on one's leisure activity- (passé temps favori)
4. Reading- a text on seasons and leisure activities – answering questions.

UNIT V **(6 hours)**

1. Grammar and Vocabulary – les verbes de direction- to ask one's way and to give directions, verbes- pouvoir and vouloir and 2nd group verbs , a droite, la premiere a gauche and vocabulary relating to accommodation.
2. Listening and Speaking – to read and understand the metro map and hence to give one directions – dialogue between two people.
3. Writing –paragraph writing describing the accommodation using the different prepositions like en face de, derriere- to locate .
4. Reading Comprehension -- a text / a dialogue between two on location and directions- ou est la poste/ la pharmacie, la bibliotheque?.....

TEXT BOOK

1. Tech French

REFERENCES

1. French for Dummies.
2. French made easy-Goyal publishers
3. Panorama

LE1004 FRENCH LANGUAGE PHASE I												
Course designed by		**Department of English and Foreign Languages**										
1.	Student Outcome	a	b	c	d	e	f	g	h	i	j	k
								x				
2.	Mapping of instructional objectives with student outcome							1-5				
3.	Category	General (G)	Basic Sciences(B)			Engineering Sciences and Technical Arts (E)				Professional Subjects(P)		
		x	--			--				--		
4.	Approval	23rd meeting of Academic Council, May 2013										

LE 1005	JAPANESE LANGUAGE PHASE I	L	T	P	C
	Total Contact Hours- 30	2	0	0	2
	Prerequisite				
	Nil				

PURPOSE

To enable students achieve a basic exposure on Japan, Japanese language and culture. To acquire basic conversational skill in the language.

INSTRUCTIONAL OBJECTIVES

1.	To help students learn the Japanese scripts viz. hiragana and a few basic kanji.
2.	To make the students acquire basic conversational skill.
3	To enable students to know about Japan and Japanese culture.
4.	To create an advantageous situation for the students to have better opportunity for employability by companies who have association with Japan.

UNIT I **(8 hours)**

1. Introduction to Japanese language. Hiragana Chart 1 - vowels and consonants and related vocabulary.
2. Self introduction
3. Grammar – usage of particles wa, no, mo and ka and exercises
4. Numbers (1-100)
5. Kanji – introduction and basic kanjis – naka, ue, shita, kawa and yama
6. Greetings, seasons, days of the week and months of the year
7. Conversation – audio
8. Japan – Land and culture

UNIT II (**8 hours)**

1. Hiragana Chart 1 (contd.) and related vocabulary
2. Grammar – usage of kore, sore, are, kono, sono, ano, arimasu and imasu. Particles – ni (location) and ga. Donata and dare.
3. Numbers (up to 99,999)
4. Kanji – numbers (1-10, 100, 1000, 10,000 and yen)
5. Family relationships and colours.
6. Conversation – audio
7. Festivals of Japan

UNIT III (**5 hours)**

Hiragana Charts 2&3, double consonants, vowel elongation and related vocabulary
Lesson 3
Grammar - particles ni (time), kara, made and ne. Koko, soko, asoko and doko.
Time expressions (today, tomorrow, yesterday, day before, day after)
Kanji – person, man, woman, child, tree and book
Directions – north, south, east and west

UNIT IV **(5 hours)**

Grammar - directions,-kochira, sochira, achira and dochira. Associated vocabulary (mae, ushiro, ue, shita, tonari, soba, etc.)
Conversation – audio
Japanese art and culture like ikebana, origami, etc.

UNIT V **(4hours)**

Kanji – hidari, migi, kuchi
Japanese sports and martial arts

TEXT BOOK

1. First lessons in Japanese, ALC Japan

REFERENCES

1. Japanese for dummies. Wiley publishing co. Inc., USA.
2. Kana workbook, Japan foundation

LE1005 JAPANESE LANGUAGE PHASE I												
Course designed by		Department of English and Foreign Languages										
1.	Student Outcome	a	b	c	d	e	f	g	h	i	j	k
								x				
2.	Mapping of instructional objectives with student outcome							1 - 4				
3.	Category	General (G)	Basic Sciences(B)			Engineering Sciences and Technical Arts (E)				Professional Subjects(P)		
		x	--			--				--		
4.	Approval	23rd meeting of Academic Council, May 2013										

LE1006	KOREAN LANGUAGE PHASE I	L	T	P	C
	Total Contact Hours-30	2	0	0	2
	Prerequisite				
	Nil				

PURPOSE

To enable students achieve a basic exposure on Korea, Korean language and culture. To acquire basic conversational skill in the language.

INSTRUCTIONAL OBJECTIVES

1.	To help students learn the scripts.
2.	To make the students acquire basic conversational skill.
3	To enable students to know about Korean culture.
4.	To create an advantageous situation for the students to have better opportunity for employability by companies who have association with Korea.

UNIT I **(6 hours)**

Lesson 1 < Introduction to Korean Language >, Lesson2 < Consonants and Vowels >, <Basic Conversation, Vocabularies and Listening >

UNIT II **(10 hours)**

Lesson 3 < Usage of "To be" >, Lesson 4 < Informal form of "to be" >, Lesson 5 <Informal interrogative form of "to be" >, Lesson 6 < To be, to have, to stay >, < Basic Conversation, Vocabularies and Listening >

UNIT III **(10 hours)**

Lesson 7 < Interrogative practice and Negation >, < Basic Conversation, Vocabularies and Listening >

UNIT IV **(4 hours)**

Lesson 8 < Korean Culture and Business Etiquette >, < Basic Conversation, Vocabularies and Listening

TEXT BOOK

1. Korean Through English 1 (Basic Korean Grammar and Conversation).

REFERENCES

1. Bharati Korean (Intermediate Korean Grammar).
2. Hand-outs.
3. Various visual mediums such Movie CD, Audio CD.
4. Collection of vocabularies for engineering field.

LE1006 KOREAN LANGUAGE PHASE I												
Course designed by		Department of English and Foreign Languages										
1.	Student Outcome	a	b	c	d	e	f	g	h	i	j	k
								x				
2.	Mapping of instructional objectives with student outcome							1 - 4				
3.	Category	General (G)	Basic Sciences(B)			Engineering Sciences and Technical Arts (E)					Professional Subjects(P)	
		x	--			--					--	
4.	Approval	23rd meeting of Academic Council, May 2013										

LE1007	CHINESE LANGUAGE PHASE I	L	T	P	C
	Total contact hours- 30	2	0	0	2
	Prerequisite				
	NIL				

PURPOSE

To enable students achieve a basic exposure on China, Chinese language and culture. To acquire basic conversational skill in the language.

INSTRUCTIONAL OBJECTIVES

1.	To help students learn the Chinese scripts.
2.	To make the students acquire basic conversational skill.
3	To enable students to know about China and Chinese culture.
4.	To create an advantageous situation for the students to have better opportunity for employability by companies who have association with china.

UNIT I

Introduction of Chinese Language

UNIT II

Phonetics and Notes on pronunciation

a) 21 Initials:

b p m f d t n l g k h j q x z c s zh ch sh r

b) 37 Finals:

a	o	e	i	u	ü
ai	ou	ei	ia	ua	üe
an	ong	en	ian	uai	üan
ang		eng	iang	uan	ün
ao		er	iao	uang	
			ie	uei(ui)	
			in	uen(un)	
			ing	ueng	
			iong	uo	
			iou(iu)		

c) The combination of Initials and Finals - Pinyin

UNIT III

Introduction of Syllables and tones

a) syllable=initial+final+tone
b) There are four tones in Chinese: the high-and-level tone, the rising tone, the falling-and-rising tone, and the falling tone. And the markers of the different tones.

UNIT IV

A. Tones practice

B. the Strokes of Characters

Introduction of Chinese Characters

1. The eight basic strokes of characters

UNIT V

1. **Learn to read and write the Characters:**
   八(eight) 不(not) 马(horse) 米(rice) 木(wood).
2. **classes are organized according to several Mini-dialogues.**

TEXT BOOK

1. A New Chinese Course 1- Beijing Language and Culture University Press.

REFERENCES

1. New Practical Chinese Reader Textbook (1) – Beijing Language and Culture University Press.
2. 40 Lessons For Basic Chinese Course I – Shanghai Translation Press.
3. My Chinese Classroom - East China Normal University Press.

LE1006 KOREAN LANGUAGE PHASE I												
Course designed by		Department of English and Foreign Languages										
1.	Student Outcome	a	b	c	d	e	f	G	h	i	j	k
								X				
2.	Mapping of instructional objectives with student outcome							1 - 4				
3.	Category	General (G)	Basic Sciences(B)			Engineering Sciences and Technical Arts (E)					Professional Subjects(P)	
		x	--			--					--	
4.	Approval	23rd meeting of Academic Council, May 2013										

PD1003	APTITUDE-I	L	T	P	C
	Total Contact Hours - 30	1	0	1	1
	Prerequisite				
	Nil				

PURPOSE

To enhance holistic development of students and improve their employability skills.

INSTRUCTIONAL OBJECTIVES

1.	To improve aptitude, problem solving skills and reasoning ability of the student.
2.	To collectively solve problems in teams & group.

UNIT I – (6 hours)

Types and Properties of Numbers, LCM, GCD, Fractions and decimals, Surds

UNIT II - ARITHMETIC – I (6 hours)

Percentages, Profit & Loss, Simple Interest & Compound Interest, Clocks & calendars

UNIT III - ALGEBRA - I **(6 hours)**
Logarithms, Problems on ages

UNIT IV - MODERN MATHEMATICS - I **(6 hours)**
Permutations, Combinations, Probability

UNIT V - REASONING **(6 hours)**
Logical Reasoning, Analytical Reasoning

ASSESSMENT
1. Objective type – Paper based / Online – Time based test

REFERENCES

1. Agarwal.R.S – Quantitative Aptitude for Competitive Examinations, S.Chand Limited 2011
2. Abhijit Guha, Quantitative Aptitude for Competitive Examinations, Tata McGraw Hill, 3rd Edition, 2011
3. Edgar Thrope, Test Of Reasoning for Competitive Examinations, Tata McGraw Hill, 4th Edition, 2012
4. Other material *related to quantitative aptitude*

PD1003 – APTITUDE-I												
Course designed by		**Career Development centre**										
1.	Student Outcome	a	b	c	d	e	f	g	H	i	j	k
		X			X							
2.	Mapping of instructional objectives with student outcome	1			2							
3.	Category	General (G)	Basic Sciences(B)			Engineering Sciences and Technical Arts (E)				Professional Subjects(P)		
		x	--			--				--		
4.	Approval	23rd meeting of Academic Council, May 2013										

	FOURIER SERIES, PARTIAL DIFFERENTIAL EQUATIONS & ITS APPLICATIONS	**L**	**T**	**P**	**C**
MA1013	Total contact hours = 60 hours	**4**	**0**	**0**	**4**
	(Common to Auto, Aero, Mech, Nano, Civil & Chemical)				
PURPOSE:					
To inculcate the problem solving ability in the minds of students so as to apply the theoretical knowledge to the respective branches of Engineering.					

INSTRUCTIONAL OBJECTIVES:	
1	To know to formulate and solve partial differential equations
2	To have thorough knowledge in Fourier series
3	To learn to solve boundary value problems
4	To be familiar with applications of PDE in two dimensional heat equation
5	To gain good knowledge in the application of Fourier transform

UNIT I-PARTIAL DIFFERENTIAL EQUATIONS (12 hours)

Formation - Solution of standard types of first order equations - Lagrange's equation - Linear Homogeneous partial differential equations of second and higher order with constant coefficients.

UNIT II-FOURIER SERIES (12 hours)

Dirichlet's conditions - General Fourier series - Half range sine and cosine series- Parseval's identity - Harmonic analysis.

UNIT III-BOUNDARY VALUE PROBLEMS (12 hours)

Classification of second order linear partial differential equations - Solutions of one-dimensional wave equation - one-dimensional heat equation

UNIT IV-TWO DIMENSIONAL HEAT EQUATION (12 hours)

Steady state solution of two-dimensional heat equation - Fourier series solutions in Cartesian coordinates & Polar coordinates.

UNIT V-FOURIER TRANSFORMS (12 hours)

Statement of Fourier integral theorem (without proof) - Fourier transform pairs - Fourier Sine and Cosine transforms - Properties - Transforms of simple functions - Convolution theorem - Parseval's identity.

TEXT BOOKS

1. Kreyszig.E, Advanced Engineering Mathematics, 10th edition, John Wiley & Sons. Singapore,2012.
2. Grewal, B, S., Higher Engineering Mathematics, 42nd edition, Khanna Publishers, New Delhi, 2012.

REFERENCES

1. Sivaramakrishna Das P. and Vijayakumari.C, A text book of Engineering Mathematics-III,Viji's Academy,2010
2. Kandasamy, P., etal., Engineering Mathematics, Vol. II & Vol. III (4th revised edition), S.Chand & Co., New Delhi, 2000
3. Narayanan, S., Manickavachagom Pillay, T.,. and Ramanaiah,G., Advanced Mathematics for Engineering students, Volume II & III (2nd edition), S,Viswanathan Printers and Publishers, 1992
4. Venkataraman, M, K., Engineering Mathematics - Vol.III - A & B (13th edition), National Publishing Co., Chennai, 1998.
5. Sankara Rao, "Introduction to Partial Differential Equations", 2nd Edition, PHI Learning Pvt. Ltd., 2006.

MA 1013 - FOURIER SERIES, PDE & ITS APPLICATIONS												
Course designed by		**Department of Mathematics**										
1.	Student Outcome	a	b	c	d	e	f	g	h	i	j	k
		X				X						
2.	Mapping of instructional objectives with student outcome	1-5				1-5						
3.	Category	General (G)	Basic Sciences(B)			Engineering Sciences and Technical Arts (E)					Professional Subjects(P)	
		--	x			--					--	
4.	Approval	23rd meeting of Academic Council, May 2013										

IC1051	**ELECTRONICS AND INSTRUMENTATION**	**L**	**T**	**P**	**C**
	Total Contact Hours-45	**3**	**0**	**0**	**3**
	Prerequisite				
	Nil				

PURPOSE

The aim of this course is to familiarize the student with the principle of operation, capabilities and limitation of Electronics and instrumentation so that he will be able to use this knowledge effectively.

INSTRUCTIONAL OBJECTIVES

1.	To study the basics of Electronics.
2.	To study the Characteristics of Semiconductor action and Transistor.
3.	To study the application of Semiconductor Devices like UJT, MOSFET, SCR, UJT.
4.	To study the Basic of Measurement.
5.	To study the use of Primary sensing element and Signal Conditioning Unit.

UNIT I - SEMICONDUCTOR DIODE (9 hours)

Semiconductor diode - Crystal diode as a rectifier - Equivalent circuit of a Crystal Diode - Half Wave Rectifier - Efficiency of Half Wave Rectifier - Full wave Rectifier - Center tap Full Wave Rectifier - Full Wave Bridge Rectifier Efficiency of Full Wave Rectifier - Zener Diode - Equivalent Circuit of Zener Diode - Zener Diode as Voltage Stabilizer.

UNIT II - TRANSISTOR & ITS BIASING (9 hours)

Transistor Symbols - Transistor as an Amplifier - Connections - CB, CE, &CC - Characteristics - Comparison of Transistor Connection. Transistor as an Amplifier in CE arrangement - Transistors Load Line analysis, Operating Point - CE Circuit - Performance of Transistor Amplifier - Cut Off and Saturation points - Transistor biasing: Methods of transistor Biasing - Base resistor method - Biasing with feedback resistor - Voltage divider bias method.

UNIT III - FET, SCR & UJT (9 hours)

Types of Field Effect Transistor - JFET - Working Principles of JFET - JFET as an Amplifier and its Output Characteristics - JFET Applications - MOSFET Working Priniciples, SCR - Equivalent Circuit and V-I Characteristics. SCR as a half wave and full wave rectifier - Application of SCR - Triac and Diac characteristics and its applications. UJT - Equivalent Circuit of a UJT and its Characteristics.

UNIT IV - MEASUREMENT SYSTEM (9 hours)

Measurements and its Significance, Methods of Measurements, Classification of Instruments and application, Elements of a Generalized Measurement System, Static and Dynamic Characteristics of an Instruments, Errors in Measurement Systems - Units, System, Dimension and standards.

UNIT V - PRIMARY SENSING ELEMENTS AND SIGNAL CONDITIONING (9 hours)

Introduction - Transducers - Advantage of Electric Transducers, Classification Based upon Principle of Transduction, Primary and Secondary transducer, Passive and Active transducers, Analog and Digital transducers, Transducers and inverse transducers and examples for each. Characteristics and Choice of transducers, Input, Transfer and output Characteristics and its application. Operational Amplifier, Characteristics of Operational Amplifier, Basic Filters, A/D Converters. Simple Types

TEXT BOOKS

1. Sawhney, A. K., "*A Course in Electrical and Electronic Measurement and Instrumentation"*, Dhanpat Rai & Sons, New Delhi, 2012.
2. V.K, Mehta., and Rohit Metha, "*Principles of Electronics"*, S.chand & Company Ltd., First Edition, 2010.

REFERENCES

1. Millman, and Halkias, "*Electronic devices and Circuits"*, Tata McGraw Hill International Edition, 2010.
2. Mithal, G. K., "*Electronic Devices and Circuits"*, Khanna Publishers, New Delhi, 2008.
3. Salivahanan, S., Sureshkumar, N., and Vallavaraj, A., "*Electronic Devices and Circuits"*, Tata McGraw - Hill, New Delhi, 2011.
4. Sze, S. M., "*Semiconductor Devices - Physics and Technology"*, 2nd Edtion, John Wiley & Sons, New York, 2006.
5. Ben G. Streetman and Sanjay Banerjee, "*Solid State Electronic Devices"*, Pearson Education, 2009.
6. Ernest O. Doebelin, "*Measurement Systems - Application and Design"*, Tata McGraw-Hill, New Delhi, 2011.

IC1051 ELECTRONICS AND INSTRUMENTATION												
Course designed by		**Department of Electrical and Electronics Engineering**										
1.	Student Outcome	a	b	c	d	e	f	g	h	i	j	k
		x	x	x		x		x				x
2.	Mapping of instructional objectives with student outcome	1,2	1-5	1-5		1-5		1-5				5
3.	Category	General (G)	Basic Sciences(B)			Engineering Sciences and Technical Arts (E)					Professional Subjects(P)	
		--	--			x					--	
4.	Approval	23rd meeting of Academic Council, May 2013										

AS1002	**AERO THERMODYNAMICS**	**L**	**T**	**P**	**C**
	Total Contact Hours-75	**3**	**2**	**0**	**4**
	Prerequisite				
	Nil				

PURPOSE

This course provides the basic knowledge about thermodynamic laws and relations, and their application to various processes.

INSTRUCTIONAL OBJECTIVE	
1.	To Understand the thermodynamic laws and their applications
2.	To Know the concept of entropy and availability
3.	To Know the gas power cycles
4.	To Know the gas mixture behavior and chemical reactions

UNIT I - INTRODUCTION AND BASIC CONCEPTS (15 hours)

SI units- dimensional homogeneity in equations – systems and control volumes - temperature and zeroth law – forms of energy - first law of thermodynamics- energy conversion efficiencies- mechanisms of heat transfer (basic concepts) - pure substance and its phases- ideal gas equation of state- compressibility factor -real equations of state (only introductory information)

UNIT II- ENERGY ANALYSES OF SYSTEMS (15 hours)

Closed systems: Moving boundary work - Energy Balance for closed systems - Internal energy, enthalpies and specific heats of ideal gases, solids and liquids.
Open systems: Conservation of mass, flow work, conservation of energy, steady flow energy equation.

UNIT III- SECOND LAW AND ENTROPY (15 hours)

Second law - thermal efficiency of heat engines – Kelvin-Planck statement and Clausius statement - perpetual motion machines - reversible and irreversible processes- Carnot cycle. Entropy: increase of entropy principle- isentropic process - T-ds relations and entropy change of ideal gases - isentropic efficiencies of steady flow devices - Exergy (only introductory information)

UNIT IV- GAS POWER CYCLES (15hours)

The Carnot cycle and its value in engineering - Otto cycle- Diesel cycle- Stirling and Ericsson cycle- Brayton cycle - ideal jet propulsion cycles – modifications to turbojet engines

UNIT V- GAS MIXTURES AND CHEMICAL REACTIONS (15 hours)

Mass fraction and mole fraction – p-v-t behavior of ideal gas mixtures – properties of ideal gas mixtures
Chemical reactions: fuels in combustion- enthalpy of formation and enthalpy of combustion- first law analysis of reacting systems (steady flow systems and closed systems) – adiabatic flame temperature – entropy change of reacting systems – complex chemical equilibrium composition (basic concept)

TEXT BOOKS

1. Yunus A. Cengel and Michael A. Boles, *Thermodynamics an engineering approach*, seventh edition, Mc Graw Hill Higher education, 2011.
2. Nag, P. K, *Engineering Thermodynamics*, 6 th Edition, Tata McGraw Hill, New Delhi, 1995.

REFERENCES

1. Michael Moran, J., and Howard Shapiro, N., *Fundamentals of Engineering Thermodynamics*, 4th Edition, John Wiley & Sons, New York, 2000
2. Rayner Joel, *Basic Engineering Thermodynamics*, 5th Edition, Addison Wesley, New York, 1996
3. Holman, J. P., *Thermodynamics*, 4th Edition Tata McGraw Hill, New Delhi, 1998
4. Rathakrishnan. E, *Fundamentals of Engineering Thermodynamics*, Prentice – Hall, India, 2000.

AS1002 AERO THERMODYNAMICS												
Course designed by		**Department of Aerospace Engineering**										
1.	Student Outcome	a	b	c	d	e	f	g	h	I	J	K
		X				X						
2.	Mapping of instructional objectives with student outcome	1-4				1-4						
3.	Category	General (G)		Basic Sciences(B)		Engineering Sciences and Technical Arts (E)					Professional Subjects(P)	
		--		--		x					--	
4.	Broad Area	Aerodynamics		Propulsion		Aircraft Structures					General	
		--		X		--					--	
5.	Approval	23rd meeting of Academic Council, May 2013										

AS1003	**AERO FLUID MECHANICS**	**L**	**T**	**P**	**C**
	Total Contact Hours-75	**3**	**2**	**0**	**4**
	Prerequisite				
	Nil				

PURPOSE

To be familiar with all the basic concepts of fluids and fluid flow phenomenon, conservation equations and their applications to simple problems.

INSTRUCTIONAL OBJECTIVES

1.	To familiarize with conservation laws and dimensional analysis to fluid flow problems.
2.	To familiarize flow through closed conduits and hydrodynamics.

UNIT I-FLUID PROPERTIES AND FUNDAMENTALS OF FLOW (15 hours)

Brief history of fluid mechanics - Fluids and their properties - Continuum, density, viscosity, surface tension, compressibility and bulk modulus, concept of pressure. Fluid statics - Pascal's law, Hydrostatic law - Piezometric head – Manometry.

UNIT II-LAWS OF CONSERVATION (15 hours)

Lagrangian and Eulerian description of fluid flow, types of fluid flow, streamlines, pathlines, and streaklines, System and Control volume concept - Continuity, Momentum and Energy equations and its applications, velocity potential function and stream function, vortex flow, Bernoulli's equation – Application through various examples including flow measuring devices –Orifice meter, venturi meter, pitot – tube.

UNIT III-DIMENSIONAL ANALYSIS AND FLUID FLOW IN CLOSED CONDUICTS (15 hours)

Dimensional Analysis -, Buckingham Pi - theorem, Derivations and applications of important dimensionless numbers, basic modeling and similitude.

Viscous fluid flow - Laminar and turbulent flow, Hagen - Poiseuille flow in circular pipes, Development of flow in pipes, Pipe friction, Darcy-Weisbach equation and chezy's formula, Pipe losses - Major and Minor losses - Problems of parallel, series and branched pipes.

UNIT IV-FLUID FLOW OVER BODIES (15 hours)

Boundary layer theory - boundary layer development on a flat plate, displacement thickness, momentum thickness, Energy thickness, momentum integral equation, drag on flat plate - Nature of turbulence, Separation of flow over bodies - streamlined and bluff bodies, Lift and Drag on cylinder and Aerofoil.

UNIT V-HYDRODYNAMICS (15 hours)

Stream function, velocity potential, relation between stream function and velocity potential, Basic elementary flows – Source, sink, free and forced vortex, uniform parallel flow and their combinations, pressure and velocity distributions on bodies with and without circulation in ideal and real fluid flows.

TEXT BOOKS

1. Kumar, K.L., *Fluid Mechanics*, 2nd Edition, Tata McGraw-Hill, New Delhi, 2000.
2. Irving H. Shames, *Fluid Mechanics*, 3rd Edition, McGraw-Hill.
3. Robert W. Fox and Alan T. McDonald*, Introduction to Fluid Mechanics*, 5th Edition, John Willey and Sons, Inc., U.K.

REFERENCES

1. Douglas.J. F., Gasiorek and Swaffield, "*Fluid Mechanics"*, 3rd Edition, ELBS/ Pitman.U. K., 1995.
2. Potter, M.C. and Wiggert, D.C.*, "Mechanics of Fluids"*, 2nd Edition, Prentice Hall, New Delhi, 1997.
3. Streeter, Victor, Bedford, K.W. and Wylie, E. Benjamin, "*Fluid Mechanics"*, 2nd Edition, Tata McGraw Hill, New Delhi, 1997.

AS 1003 AERO FLUID MECHANICS												
Course designed by		**Department of Aerospace Engineering**										
1.	Student Outcome	a	b	c	d	e	f	g	h	i	j	k
		x				x						
2.	Mapping of instructional objectives with student outcome	1-2				1-2						
3.	Category	General (G)	Basic Sciences(B)			Engineering Sciences and Technical Arts (E)						Professional Subjects(P)
												x
4.	Broad Area	Aerodynamics			Propulsion		Aircraft Structures					General
		x			--		--					--
5.	Approval	23rd meeting of Academic Council, May 2013										

ME1008	**MANUFACTURING TECHNOLOGY**	**L**	**T**	**P**	**C**
	Total Contact Hours-45	**3**	**0**	**0**	**3**
	Prerequisite				
	Nil				

PURPOSE

To make the students aware of different manufacturing processes like casting, metal forming, metal cutting and gear manufacturing.

INSTRUCTIONAL OBJECTIVES

1.	Concepts of casting Technology.
2.	Mechanical working of metals.
3.	Theory of metal cutting.
4.	Gear manufacturing process.
5.	Surface finishing processes.
6.	Milling machine & other machine tools.

UNIT I - CASTING **(8 hours)**

Introduction to casting - Patterns - Types - Pattern materials - Allowances. Moulding - types - Moulding sand - Gating and Risering - Core making. Special Casting Process – Shell- Investment - Die casting - Centrifugal Casting - Design of Casting, defects in casting.

UNIT II - MECHANICAL WORKING OF METALS **(9 hours)**

Hot and Cold Working: Rolling, Forging, Wire Drawing, Extrusion - types – Forward-backward and tube extrusion.

Sheet Metal Operations: Blanking - blank size calculation, draw ratio, drawing force, Piercing, Punching, Trimming, Stretch forming, Shearing, Bending - simple problems - Bending force calculation, Tube forming - Embossing and coining, Types of dies: Progressive, compound and combination dies, defects in forming.

UNIT III - THEORY OF METAL CUTTING **(9 hours)**

Orthogonal and oblique cutting - Classification of cutting tools: single, multipoint - Tool signature for single point cutting tool - Mechanics of orthogonal cutting - Force relations : Merchant circle – Determination of Shear angle - Chip formation- Cutting tool materials - Tool wear and tool life - Machinability - Cutting Fluids - Simple problems.

UNIT IV - GEAR MANUFACTURING AND SURFACE FINISHING PROCESS **(9 hours)**

Gear manufacturing processes: Extrusion, Stamping, and Powder Metallurgy. Gear Machining: Forming, Gear generating process - Gear shaping, Gear hobbing. Surface Finishing Process: Grinding process, various types of grinding machine, Grinding Wheel - types - Selection of Cutting speed and work speed, dressing and truing. Fine Finishing - Lapping, Buffing, Honing, and Super finishing.

UNIT V - MACHINE TOOLS **(10 hours)**

Milling Machine - Types, Types of cutters, operations, Indexing methods. Shaping, Planing and Slotting Machine – Operations and quick return mechanisms, Work and tool holding devices. Boring machine - Operations, Jig boring machine. Broaching machine - operations, Tool nomenclature-Simple Problems.

TEXT BOOKS

1. Sharma, P.C., "*Production Technology : Manufacturing Processes",* 7th Edition, S. Chand Publisher, 2008.
2. Rao, P.N., "*Manufacturing Technology, Vol I and II",* Tata McGraw Hill Publishing Co., 2nd edition, 2009.

REFERENCES

1. Hajra Choudhary, S. K. and Hajra Choudhary, A. K., *Elements of Manufacturing Technology*, Vol II, Media Publishers, Bombay, 2007
2. Jain. R. K., *Production Technology : Manufacturing Processes, Technology and Automation*, 17th Edition, Khanna Publishers,2011
3. Kalpakjian, *Manufacturing Engineering and Technology*, 4th edition, Addison Wesley Congmen Pvt. Ltd., Singapore, 2009.
4. Chapman W. A. J., *Workshop Technology Vol. I and II*, Arnold Publisher, New Delhi, 2001.

ME1008 – MANUFACTURING TECHNOLOGY												
Course designed by		**Department of Mechanical Engineering**										
1.	Student outcomes	a	b	C	d	e	f	g	h	i	j	K
		x		X							x	
2.	Mapping of instructional objectives with student outcome	1-6		1-6								
3.	Category	General (G)		Basic Sciences(B)		Engineering Sciences and Technical Arts(E)				Professional Subjects(P)		
						X						
4.	Approval	23rd meeting of Academic Council, May 2013										

AS1004	**AERO-FLUID DYNAMICS LABORATORY**	**L**	**T**	**P**	**C**
	Total Contact Hours-30	**0**	**0**	**2**	**1**
AS1003	Prerequisite				
	AERO-FLUID MECHANICS				

PURPOSE

To enable the students to acquire knowledge of flow meters and flow visualization. Give student insight in to working of various fluid machines and be able to compare performance of fluid machines under different working conditions.

INSTRUCTIONAL OBJECTIVES

1.	To gain the knowledge of various flow meters and the concept of fluid mechanics.
2.	Gain knowledge on different forms of energy of flowing fluids.
3.	Able to compare performance of various machines at different operating points.
4.	Gain knowledge on working of Reciprocating air compressors, centrifugal blowers and wind tunnel (flow visualization).

LIST OF EXPERIMENTS

1. Determination of coefficient of discharge of orifice meter.
2. Determination of coefficient of discharge of venturi-meter.
3. Verification of Bernoulli's theorem.
4. Major loss due to friction in pipe flow.
5. Minor losses due to pipe fittings in pipes.
6. Effect of water jet on vane.
7. Determination of type of flow by Reynolds apparatus.
8. Determination of viscosity using Red wood viscometer.
9. Determination of surface tension by using capillary tube.
10. Flow visualization using smoke, dye and Hele Shaw apparatus
11. Performance test on centrifugal blower with different impellers
12. Performance test on reciprocating air compressor
13. Aerodynamic studies on isolated airfoil in wind tunnel.

REFERENCE

1. Laboratory manual

AS1004 AERO-FLUID DYNAMICS LABORATORY												
Course designed by		**Department of Aerospace Engineering**										
1.	Student Outcome	a	b	c	d	e	f	g	h	i	j	k
		X	X			X						
2.	Mapping of instructional objectives with student outcome	1-4	1-4			1-4						
3.	Category	General (G)	Basic Sciences(B)			Engineering Sciences and Technical Arts (E)						Professional Subjects(P)
												x
4.	Broad Area	Aerodynamics		Propulsion		Aircraft Structures						General
		x		--		--						--
5.	Approval	23rd meeting of Academic Council, May 2013										

ME1014	**MANUFACTURING PROCESS LABORATORY**	**L**	**T**	**P**	**C**
	Total Contact Hours-30	**0**	**0**	**2**	**1**
	Prerequisite				
	Nil				

PURPOSE

To expose hands-on training to the students on various machines like Lathe, Shaper, Slotter, Milling, Gear hobbing, Grinding machines.

INSTRUCTIONAL OBJECTIVES

1.	Various types of lathe operations.
2.	Production of flat surface and contour shapes on the given component.
3.	Gear making processes.
4.	Surface finishing process.

LIST OF EXPERIMENTS

1. Introduction- lathe machine, plain turning, Step turning & grooving (Including lathe mechanisms, simple problems).
2. Taper turning-compound rest/offset method & Drilling using lathe (Including Drilling feed mechanism, Twist drill nomenclature, and Different types of taper turning operations).
3. External threading-Single start (Including Thread cutting mechanism-simple problems).
4. Eccentric turning-Single axis.
5. Shaping-V-Block (Including Shaper quick return mechanism).
6. Grinding-Cylindrical /Surface/Tool & cutter.
7. Slotting-Keyways (Including Broaching tool nomenclature and Slotter mechanism).
8. Milling-Polygon /Spur gear (Including Milling mechanism, simple problems).
9. Gear hobbing-Helical gear.
10. Drilling, reaming, counter boring.
11. Planning/Capstan lathe/Burnishing process (Planner Mechanism, Description of capstan and turret lathe).
12. Mini Project work- Application oriented products using above experiments.

TOTAL 30

REFERENCES

1. Laboratory Manual.
2. Chapman W. A. J., "*Workshop Technology",* Vol. I and II, Arnold Publisher, 2001.
3. Hajra Choudhary, S. K. and Hajra Choudhary, A. K., "*Elements of Manufacturing Technology Vol II"*, Media Publishers, 2007.

<table>
<tr><th colspan="14">ME1014 MANUFACTURING PROCESS LABORATORY</th></tr>
<tr><td colspan="2">Course designed by</td><td colspan="12">Department of Aerospace Engineering</td></tr>
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<tr><td rowspan="2">4.</td><td rowspan="2">Broad Area</td><td colspan="3">Aerodynamics</td><td colspan="3">Propulsion</td><td colspan="4">Aircraft Structures</td><td colspan="2">General</td></tr>
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<tr><td>5.</td><td>Approval</td><td colspan="12">23rd meeting of Academic Council, May 2013</td></tr>
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SEMESTER IV

LE1008	**GERMAN LANGUAGE PHASE II**	**L**	**T**	**P**	**C**
	Total Contact Hours- 30	**2**	**0**	**0**	**2**
	Prerequisite				
	LE1003-German Language Phase I				

PURPOSE

Familiarity in German language will be helpful for the students in preparing their resumes in German. Proficiency in the language will be an added asset for the students to have an edge in the present day highly competitive and global job market.

INSTRUCTIONAL OBJECTIVES

1.	To enable the students to speak and understand about most of the activities in the day to day life.
2.	The students will be able to narrate their experiences in Past Tense.
3.	The students will be able to understand and communicate even with German Nationals.
4.	By the end of Phase – II the students will have a reasonable level of conversational skills.

UNIT I **(6 hours)**

Wichtige Sprachhandlungen: Zimmersuche, Möbel

Grammatik: Verben mit trennbaren Vorsilben im Präsens und Perfekt. Verben mit trennbaren Vorsilben und Modalverben imPräsens. Verben mit untrennbaren Vorsilben im Perfekt. Unregelmäßige und gemischte Verben im Perfekt.

UNIT II **(6 hours)**

Wichtige Sprachhandlungen: Kleidung ,Farben , Materialien.

Grammatik : formelle Imperativsätze mit "Sie" informelle Imperativsätze Vorschläge mit "wir" – "sollen/wollen wir"—Soll ich? Modalpartikeln "doch" "mal" "doch mal.

UNIT III **(6 hours)**

Wichtige Sprachhandlungen : Sehenswürdigkeite (Prater, Brandenburger Tör,Kolossium, Eifeltürm)

Grammatik : Ortsangaben mit Akk. und Dativ "alle","man" Indefinitepronomen "etwas", "nichts",

UNIT IV **(6 hours)**

Wichtige Sprachhandlungen : Wegbeschreibung/ Einladung interkulturelle Erfahrung.

Grammatik : Verwendung von Präsens für zukünftigen Zeitpunkt.

UNIT V **(6 hours)**

Wichtige Sprachhandlungen: Essen und Trinken im Restaurant , Partyvorbereitung und Feier

Grammatik: Nomen aus Adjektiven nach "etwas"und "nichts" Nomen aus dem Infinitiv von Verben, zusammegesetzte Nomen und ihre Artikel. Adjektive im Nom. und Akk. nach unbestimmten Artikel, Negativartikel und Possessivartikel.

TEXT BOOK

1. Studio d A1. Deutsch als Fremdsprache with CD.(Kursbuch und Sprachtraining).

REFERENCES

1. German for Dummies
2. Schulz Griesbach

LE01008 GERMAN LANGUAGE PHASE II												
Course designed by		**Department of English and Foreign Languages**										
1.	Student outcomes	a	b	c	d	e	f	g	h	i	j	k
								x				
2.	Mapping of instructional objectives with student outcome							1-4				
3.	Category	General (G)		Basic Sciences(B)			Engineering Sciences and Technical Arts(E)				Professional Subjects(P)	
		x		--			--				--	
4.	Approval	23rd meeting of Academic Council, May 2013										

LE1009	**FRENCH LANGUAGE PHASE II**	**L**	**T**	**P**	**C**
	Total Contact Hours- 30	**2**	**0**	**0**	**2**
	Prerequisite				
	LE1004- French Language Phase I				

PURPOSE

To enable the students communicate effectively with any French speaker and have a competitive edge in the international market.

INSTRUCTIONAL OBJECTIVES	
1.	To enable students access information on the internet
2.	To receive and send e mails
3	To assist students in gaining a certain level of proficiency to enable them to give the level 1 exam conducted by Alliance Française de Madras.
4.	To enhance their lexical and technical competence.

UNIT I **(6 hours)**

1. Grammar and Vocabulary: The second group verbs: Finir, rougir, grossir, grandir . "Les preposition de temps": à, en, le, de 7h à 8h, jusqu' à, vers.
2. Listening and Speaking – the semi- vowels: Voilà, pollutant. Writing –the days of the week. Months, technical subjects, time, "les spécialités scientifiques et l' année universitaire, paragraph writing about time table.
3. Reading -- Reading of the text and comprehension – answering questions

UNIT II **(6 hours)**

Grammar and Vocabulary – The adjectives, the nationality, feminine & masculine noun forms "les métiers scientifiques".
Listening and Speaking – Vowels: soirée, année, près de, très.
Writing – Countries name, nationality, "les métiers scientifiques", numbers from: 69 to infitive and some measures of unit.
Reading Comprehension – reading a text.

UNIT III **(6 hours)**

Grammar and Vocabulary – near future, The demonstrative adjectives, Express the aim by using the verb, Listening and Speaking –"La liaison interdite – en haut". Writing – some scientific terms, French expressions to accept an invitation. Sentence framing. Reading Comprehension – reading a text.

UNIT IV **(6 hours)**

Grammar and Vocabulary –the verbs: manger, boire , the partitive articles
Listening and Speaking – "le 'e' caduc Writing- the food, the ingredients, fruits, vegetables, expression of quantity, paragraph writing about food habits. Reading – reading a text.

UNIT V **(6 hours)**

Grammar and Vocabulary – " les prepositions de lieu": au à la, à l', chez, the reflexives verbs, verbs to nouns. Listening and Speaking – "le 'e' sans accents ne se prononce pas. C'est un "e" caduc. Ex: quatre, octobre. " les sons (s) et (z)- salut , besoin. Writing –paragraph writing about one's everyday life, French culture. Reading Comprehension -- reading a text or a song.....

TEXT BOOK

1.Tech French

REFERENCES

1. French for Dummies
2. French made easy: Goyal publishers
3. Panorama

LE1009 FRENCH LANGUAGE PHASE II												
Course designed by		**Department of English and Foreign Languages**										
1.	Student outcomes	a	b	c	d	e	f	g	h	i	j	k
								x				
2.	Mapping of instructional objectives with student outcome							1-4				
3.	Category	General (G)		Basic Sciences(B)		Engineering Sciences and Technical Arts(E)				Professional Subjects(P)		
		x		--		--				--		
4.	Approval	23rd meeting of Academic Council, May 2013										

LE 1010	JAPANESE LANGUAGE PHASE II	L	T	P	C
	Total Contact Hours- 30	2	0	0	2
	Prerequisite				
	LE1005- Japanese Language Phase I				

PURPOSE

To enable students to learn a little advanced grammar in order to improve their conversational ability in Japanese.

INSTRUCTIONAL OBJECTIVES

1.	To help students learn Katakana script (used to write foreign words)
2.	To improve their conversational skill.
3	To enable students to know about Japan and Japanese culture.
4.	To improve their employability by companies who are associated with Japan.

UNIT I **(8 hours)**

Introduction to Verbs; Ikimasu, okimasu, nemasu, tabemasu etc.
Grammar – usage of particles de, o, to, ga(but) and exercises
Common daily expressions and profession.
Katakana script and related vocabulary.
Religious beliefs, Japanese housing and living style.
Conversation – audio

UNIT II **(8 hours)**

Grammar :Verbs –Past tense, negative - ~mashita, ~masen deshita..
i-ending and na-ending adjectives - introduction
Food and transport (vocabulary)
Japanese food, transport and Japanese tea ceremony.
Kanji Seven elements of nature (Days of the week)
Conversation – audio

UNIT III **(6 hours)**

Grammar - ~masen ka, mashou
Adjectives (present/past – affirmative and negative)
Conversation – audio

UNIT IV **(4 hours)**

Grammar – ~te form
Kanji – 4 directions
Parts of the body
Japanese political system and economy
Conversation – audio

UNIT V **(4 hours)**

Stationery, fruits and vegetables
Counters – general, people, floor and pairs

TEXT BOOK

1.First lessons in Japanese, ALC Japan

REFERENCES

1. Japanese for dummies. Wiley publishing co. Inc., USA.
2. Kana workbook, Japan foundation

Le1010 japanese language phase ii												
Course designed by		**Department of english and foreign languages**										
1.	Student outcomes	A	B	C	D	E	F	G	H	I	J	K
								X				
2.	Mapping of instructional objectives with student outcome							1 - 4				
3.	Category	General (g)		Basic sciences(b)			Engineering sciences and technical arts(e)				Professional subjects(p)	
		X		--			--				--	
4.	Approval	23rd meeting of academic council, may 2013										

LE1011	KOREAN LANGUAGE PHASE II	L	T	P	C
	Total Contact Hours-30	2	0	0	2
	Prerequisite				
	LE1006-Korean Language Phase I				

PURPOSE

To enable students achieve a basic exposure on Korea, Korean language and culture. To acquire basic conversational skill in the language.

INSTRUCTIONAL OBJECTIVES

1.	To help students learn the scripts.
2.	To make the students acquire basic conversational skill.
3	To enable students to know about Korean culture.
4.	To create an advantageous situation for the students to have better opportunity for employability by companies who have association with Korea.

UNIT I (**9 hours)**

Lesson 1 <Review of Vowels and Consonants>, Lesson2 < Various Usages of "To be">, Lesson3 < Informal form of "to be"> <Basic Conversation, Vocabularies and Listening>

UNIT II (**9 hours)**

Lesson 4 < Informal interrogative form of "to be">, Lesson 5 < To be, to have, to stay>, Lesson 5 < Advanced Interrogative practice>, Lesson 6 < Types of Negation>, <Basic Conversation, Vocabularies and Listening>

UNIT III (**9 hours)**

Lesson 7 < Honorific forms of noun and verb2>, Lesson8 < Formal Declarative2>, Lesson 9 < Korean Business Etiquette>, <Basic Conversation, Vocabularies and Listening>

UNIT IV (**3 hours)**

Lesson 10 <Field Korean as an Engineer1>, <Field Korean as an Engineer2> <Basic Conversation, Vocabularies and Listening>

TEXT BOOK

1. Korean through English 2 (Basic Korean Grammar and Conversation)

REFERENCES

1. Bharati Korean (Intermediate Korean Grammar)
3. Hand-outs
4. Various visual media such as Movie CD, Audio CD, and music
5. Collection of vocabularies for engineering field.

LE1011 KOREAN LANGUAGE PHASE II												
Course designed by		Department of English and Foreign Languages										
1.	Student outcomes	a	b	c	d	e	f	g	h	i	j	K
								X				
2.	Mapping of instructional objectives with student outcome							1-4				
3.	Category	General (G)	Basic Sciences(B)			Engineering Sciences and Technical Arts(E)				Professional Subjects(P)		
		x	--			--				--		
4.	Approval	23rd meeting of Academic Council, May 2013										

LE1012	CHINESE LANGUAGE PHASE II	L	T	P	C
	Total Contact Hours-30	2	0	0	2
	Prerequisite				
	LE1007-Chinese Language Phase I				

PURPOSE

To enable students achieve a basic exposure on China, Chinese language and culture. To acquire basic conversational skill in the language.

NSTRUCTIONAL OBJECTIVES

1.	To help students learn the Chinese scripts.
2.	To make the students acquire basic conversational skill.
3	To enable students to know about China and Chinese culture.
4.	To create an advantageous situation for the students to have better opportunity for employability by companies who have association with china.

UNIT I

A) Greetings

Questions and answers about names
Introducing oneself
Receiving a guest
Making corrections

New words: 你ˆyouˇ 好ˆgood 'well ˇ
工作ˆwork 'job ˇ人员ˆpersonnel 'staff member ˇ 请问ˆMay I ask… ˇ 贵ˆexpensive 'valuable ˇ 姓ˆone's family name is ˇ

B) Questions and answers about the number of people in a family
Expressing affirmation/negation
Questions and answers about the identity of a person same or not.

New words: 家ˆfamily 'homeˇ 有ˆhaveˇ 几ˆseveralˇ
爸爸 (fatherˇ 妈妈 (mother) 哥哥 (elderly brotherˇ

UNIT II

A. About places
B. About numbers
C. if one knows a certain person
D. Expressing apology
E. Expressing affirmation/negation
F. Expressing thanks.

New Words:

客人ˆguest,visitorˇ这儿ˆhereˇ中文ˆChineseˇ 对ˆright, correctˇ
学生ˆstudentˇ 多ˆmany, a lotˇ

Grammar: Sentences with a verbal predicate

UNIT III

Introducing people to each other

A. Exchanging amenities
B. Making/Negating conjectures
C. Questions and answers about nationality

Grammar: Sentences with an adjectival predicate

UNIT IV

A) About places to go
Indicating where to go and what to do
Referring to hearsay.
Saying good-bye

B) Making a request
Questions and answers about postcodes and telephone numbers
Reading dates postcodes and telephone numbers
Counting Renmibi

Grammar: Sentences with a subject-verb construction as its predicate
Sentences with a nominal predicate

UNIT V

A. Asking and answering if someone is free at a particular time
B. Making proposals
C. Questions and answers about time
D. Making an appointment
E. Telling the time
F. Making estimations

TEXT BOOK

1. A New Chinese Course 1- Beijing Language and Culture University Press

REFERENCES

1. New Practical Chinese Reader Textbook (1) – Beijing Language and Culture University Press
2. 40 Lessons For Basic Chinese Course I – Shanghai Translation Press
3. My Chinese Classroom - East China Normal University Press

LE1012 CHINESE LANGUAGE PHASE II												
Course designed by		**Department of English and Foreign Languages**										
1.	Student outcomes	a	b	c	d	e	f	g	h	i	j	k
								X				
2.	Mapping of instructional objectives with student outcome							1 - 4				
3.	Category	General (G)		Basic Sciences(B)		Engineering Sciences and Technical Arts(E)				Professional Subjects(P)		
		x		--		--				--		
4.	Approval	23rd meeting of Academic Council, May 2013										

PD1004	APTITUDE-II	L	T	P	C
	Total Contact Hours - 30	1	0	1	1
	Prerequisite				
	Nil				
PURPOSE					
To enhance holistic development of students and improve their employability skills.					
INSTRUCTIONAL OBJECTIVES					
1.	To improve verbal aptitude, vocabulary enhancement and reasoning ability of the student.				

UNIT I **(6 hours)**
Critical Reasoning – Essay Writing

UNIT II **(6 hours)**
Synonyms – Antonyms - Odd Word - Idioms & Phrases

UNIT III **(6 hours)**
Word Analogy - Sentence Completion

UNIT IV **(6 hours)**
Spotting Errors - Error Correction - Sentence Correction

UNIT V **(6 hours)**
Sentence Anagram - Paragraph Anagram - Reading Comprehension

ASSESSMENT
1. Objective type – Paper based /Online – Time based test

TEXT BOOK
1. Personality Development -Verbal Work Book, Career Development Centre, SRM Publications

REFERENCES

1. Green Sharon Weiner M.A & Wolf Ira K.*Barron's New GRE*, *19th Edition*.Barron's Educational Series, Inc, 2011.
2. Lewis Norman, *Word Power Made Easy*, Published by W.R.Goyal Pub, 2011.
3. Thorpe Edgar and Thorpe Showich, *Objective English.* Pearson Education 2012.
4. Murphy Raymond, *Intermediate English Grammar*, (Second Edition), Cambridge University Press, 2012.

<table>
<tr><th colspan="14">PD1004 - APTITUDE-II</th></tr>
<tr><td colspan="2">Course designed by</td><td colspan="12">Career Development Centre</td></tr>
<tr><td rowspan="2">1.</td><td rowspan="2">Student outcomes</td><td>a</td><td>b</td><td>c</td><td>d</td><td>e</td><td>f</td><td>g</td><td>h</td><td>i</td><td>j</td><td>K</td></tr>
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<tr><td>2.</td><td>Mapping of instructional objectives with student outcome</td><td></td><td></td><td></td><td></td><td></td><td></td><td>1</td><td></td><td></td><td></td><td></td></tr>
<tr><td rowspan="2">3.</td><td rowspan="2">Category</td><td colspan="2">General (G)</td><td colspan="3">Basic Sciences(B)</td><td colspan="4">Engineering Sciences and Technical Arts(E)</td><td colspan="2">Professional Subjects(P)</td></tr>
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<tr><td>4.</td><td>Approval</td><td colspan="12">23rd meeting of Academic Council, May 2013</td></tr>
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MA1004	NUMERICAL METHODS	L	T	P	C
	Total Contact Hours - 60	4	0	0	4
	(Common to Auto, Aero, Mech, Mechatronics, EEE, Civil , Chemical, ICE & EIE)				

PURPOSE

To impart analytical ability in solving mathematical problems as applied to the respective branches of Engineering.

INSTRUCTIONAL OBJECTIVES

1.	To familiarise with numerical solution of equations
2.	To get exposed to finite differences and interpolation
3.	To be thorough with the numerical Differentiation and integration
4.	To find numerical solutions of ordinary differential equations
5.	To find numerical solutions of partial differential equations

UNIT I - CURVE FITTING AND NUMERICAL SOLUTION OF EQUATIONS (12 hours)

Method of Least Squares – Fitting a straight line – Fitting a parabola – Fitting an exponential curve – Fitting a curve of the form $y = ax^b$ – Calculation of the sum of the squares of the residuals.- Newton-Raphson method – Gauss Elimination method – Gauss Jacobi method – Gauss Seidel method.

UNIT II - FINITE DIFFERENCES AND INTERPOLATION (12 hours)

First and Higher order differences – Forward differences and backward differences and Central Differences – Differences of a polynomial – Properties of operators – Factorial polynomials – Shifting operator E – Relations between the operators. Interpolation – Newton-Gregory Forward and Backward Interpolation formulae - Divided differences – Newton's Divided difference formula – Lagrange's Interpolation formula – Inverse interpolation

UNIT III - NUMERICAL DIFFERENTIATION AND INTEGRATION (12 hours)

Newton's forward and backward differences formulae to compute first and higher order derivatives – The Trapezoidal rule – Simpson's one third rule and three eighth rule.

UNIT IV - NUMERICAL SOLUTIONS OF ORDINARY DIFFERENTIAL EQUATIONS (12 hours)

Solution by Taylor's series – Euler's method – Improved and modified Euler method – Runge-Kutta methods of fourth order (No proof) – Milne's Method - Adam's Bashforth method.

UNIT V - NUMERICAL SOLUTIONS OF PARTIAL DIFFERENTIAL EQUATIONS

(12 hours)

Classification of Partial differential equations of the second order - Difference quotients – Laplace's equation and its solution by Liebmann's process – Solution of Poisson's equation – Solutions of Parabolic and Hyperbolic equations.

TEXT BOOKS

1. B.S. Grewal, "*Numerical Methods in engineering and science"*, Khanna Publishers, 42nd edition, 2012.
2. S.S. Sastry, "*Introductory Methods of Numerical Analysis",* 4th edition, 2005.

REFERENCES

1. Dr. M.K. Venkataraman*, "Numerical Methods in Science and Engineering"*, National Publishing Co., 2005.
2. E. Balagurusamy, "*Computer Oriented Statistical and Numerical Methods"* – Tata McGraw Hill., 2000.
3. M.K.Jain, SRK Iyengar and R.L.Jain, "*Numerical Methods for Scientific and Engineering Computation"*, Wiley Eastern Ltd., 4th edition, 2003.
4. M.K.Jain, "*Numerical Solution of Differential Equations"*, 2nd edition (Reprint), 2002.
5. P.Kandasamy etal., "*Numerical Methods"*, S.Chand & Co., New Delhi, 2003.

MA1004 NUMERICAL METHODS												
Course designed by		Department of Mathematics										
1.	Student outcomes	a	b	c	d	e	f	g	h	i	j	K
		x				x						
2.	Mapping of instructional objectives with student outcome	1-5				1-5						
3.	Category	General (G)		Basic Sciences(B)		Engineering Sciences and Technical Arts(E)				Professional Subjects(P)		
		--		x		--				--		
4.	Approval	23rd meeting of Academic Council, May 2013										

ME1010	MECHANICS OF SOLIDS	L	T	P	C
	Total Contact Hours-60	2	2	0	3
	Prerequisite				
	Nil				
PURPOSE					
To familiarize the students with the fundamentals of deformation, stresses, strains in structural elements.					

INSTRUCTIONAL OBJECTIVES	
1.	Know the concepts of stress and strain.
2.	Analyze the beam of different cross sections for shear force, bending moment, slope and deflection.
3.	Understand the concepts necessary to design the structural elements and pressure vessels.

UNIT I - CONCEPT OF STRESSES AND STRAINS (12 hours)

Concept of stress and strain, Hooke's law - Tension, Compression, and Shear, stress-strain diagram - Poisson's ratio, elastic constants and their relationship - Deformation of simple and compound bars. Thermal stresses – simple and Composite bars. Principal plane, principal stress, maximum shearing stress - Uniaxial, biaxial state of stress - Mohr's circle for plane stresses.

UNIT II - ANALYSIS OF BEAMS (12 hours)

Types of beams and loads - shear force and bending moment diagrams for cantilevers, simply supported and over hanging beams. Theory of pure bending - Bending stresses in simple and composite beams. Shear stress distribution in beams of different sections.

UNIT III - TORSION OF SHAFTS (12 hours)

Theory of pure torsion, torsion of circular shafts and composite shafts.

UNIT IV - DEFLECTION OF BEAMS (12 hours)

Slope and deflection of cantilever, simply supported beam by double integration method - Macaulay's method - Moment area method - Castigliano's theorem.

UNIT V - COLUMNS AND CYLINDERS (12 hours)

Columns and struts: Member subjected to combined bending and axial loads, Euler's theory, Crippling load, Rankine's theory. **Cylinders And Shells:** Thin cylinder, thin spherical shells under internal pressure - Thick cylinders - Lame's equation - Shrink fit and compound cylinders.

TEXT BOOKS

1. Bansal, R.K.,"*A Text Book of Strength of Materials"*, Lakshmi Publications Pvt. Limited, New Delhi, 2010.
2. Prabhu, T.J.,"*Mechanics of solids"*, Private Publication, 2002.
3. R.K.Rajput.,"*Strength of materials"*, Fourth Edition ,S. Chand Limited, 2007.
4. Ferdinand P.Beer, and Rusell Johnston, E.,"*Mechanics of Materials"*, SI Metric Edition, McGraw Hill, 2011(Hard cover).

REFERENCES

1. William A. Nash,"*Theory and Problems of Strength of Materials"*, Schaum's Outline Series, McGraw Hill International Edition, 3rd Edition, 2007.
2. Srinath, L. S.,"*Advanced Mechanics of Solids"*, Tata McGraw Hill Publishing Company Ltd., New Delhi, 2009.
3. Egor P. Popov.,"*ENGINEERING MECHANICS of SOLIDS"*, 2nd edition, Prentice Hall of India Private Limited, New Delhi, 2009.
4. James M. Gere,"*Mechanics of Materials*", Eighth Edition, Brooks/Cole, USA, 2013.
5. Shigley, J. E.,"*Applied Mechanics of Materials"*, International Student Edition, McGraw Hill Koyakusha Limited, 2000.

ME1010 MECHANICS OF SOLIDS												
Course designed by		**Department of Mechanical Engineering**										
1.	Student outcomes	a	b	c	d	e	f	g	h	i	j	K
		x				x					x	
2.	Mapping of instructional objectives with student outcome	1-3				1-3						
3.	Category	General (G)	Basic Sciences(B)			Engineering Sciences and Technical Arts(E)				Professional Subjects(P)		
										X		
4.	Approval	23rd meeting of Academic Council, May 2013										

ME1012	**MACHINES AND MECHANISMS**	**L**	**T**	**P**	**C**
	Total Contact Hours-60	**2**	**2**	**0**	**3**
	Prerequisite				
	Nil				

PURPOSE

To expose the students to learn the fundamentals of various laws governing rigid bodies and its motions.

INSTRUCTIONAL OBJECTIVES

1.	Basic mechanisms, velocity and acceleration of simple mechanisms
2.	Drawing the profile of cams and its analysis
3.	Gear train calculations , Gyroscopes
4.	Inertia force analysis and flywheels
5.	Balancing of rotating and reciprocating masses

UNIT I- MECHANISMS (14 hours)

Introduction - Links - Pairs - Chain - Mechanism - Machine structure - Degrees of freedom - Fodur bar chains - Terminology and definition - Planer, Spherical and Spatial Mechanisms - Grashoff's law - Kutzback criterion - Grubler's criterion for plane mechanism. Inversion of mechanisms - Four bar, single slider crank and double slider crank mechanisms - Simple problems - Instantaneous centre - Kennedy's theorem - Velocity and Acceleration of Four bar and single slider crank mechanisms by relative velocity Method.

UNIT II - CAMS (10 hours)

Types of cams and followers - Follower motion - Uniform, Parabolic, SHM and cycloidal. Cam terminology - Cam profiles construction for roller, flat faced and knife edge follower types - pressure angle - Derivatives of Follower motion - High speed cams - circular arc and tangent cams – Standard cam motion - Pressure angle and undercutting.

UNIT III - GEAR TRAINS AND CONTROL MECHANISMS (12 hours)

Spur gear terminology and definition - Gear trains: simple, compound, reverted and epicyclic - Velocity ratio and torque calculation in gear trains - Automobile differential. Gyroscopes: Gyroscopic forces and couple - Forces on bearing due to gyroscopic action - Gyroscopic effect in ship, motor cycle, car and aircraft.

UNIT IV - FORCE ANALYSIS (12 hours)

Inertia force and inertia torque calculations – D'Alembert's principle – The principle of super position – Dynamic analysis in reciprocating engines – Gas forces – Equivalent masses – Bearing loads – crank shaft torque. Turning moment diagrams: Fly wheels - Application of flywheel - Punching presses.

UNIT V - BALANCING (12 hours)

Static and dynamic Balancing: Balancing of rotating masses - Balancing of single cylinder engine - Balancing of multi cylinder engine –partial balancing in locomotive engines – Hammer blow – Swaying couple – Tractive force - Balancing machines.

TEXT BOOKS

1. Ratan, S.S.,"*Theory of Machines"*, Tata McGraw Hill Publishing company Ltd., 2nd Edition, 2005.
2. Thomas Bevan,"*Theory of Machines"*, CBS Publishers and Distributors, 3rd Edition, 1984.

REFERENCES

1. Shigley, J. E., and Uicker, J. J.,"*Theory of Machines and Mechanisms"*, McGraw Hill, 1995.
2. Ghosh, A., and Mallick, A. K.,"*Theory of Mechanisms and Machines"*, Affiliated East-West Pvt Ltd., New Delhi, 1988.
3. Rao, J. S., and Dukkipati, R.V.,"*Mechanism and Machine Theory"*, Wiley-Eastern Ltd., New Delhi, 1995.

ME1012 MACHINES AND MECHANISMS												
Course designed by		**Department of Mechanical Engineering**										
1.	Student Outcome	a	b	c	d	e	f	g	h	i	j	K
		x		x		x					x	
2.	Mapping of instructional objectives with student outcome	1-4		1-5		1-5						
3.	Category	General (G)		Basic Sciences(B)		Engineering Sciences and Technical Arts (E)					Professional Subjects(P)	
											x	
4.	Broad Area	Manufacturing		Design		Thermal					General	
		--		X		--					--	
5.	Approval	23rd meeting of Academic Council, May 2013										

AS1005	**AERODYNAMICS – I**	**L**	**T**	**P**	**C**
	Total Contact Hours-75	**3**	**2**	**0**	**4**
AS1003	Pre requisite				
	Aero-Fluid Mechanics				

PURPOSE

To study incompressible flow over airfoils, wings, and bodies – and to be able to estimate the interaction effects when such bodies are combined.

INSTRUCTIONAL OBJECTIVES

At the end of the course the students will be able to

1.	Calculate forces and moments acting on aero foils and wings under ideal flow conditions.
2.	Determine the aero foil and wing characteristics.
3.	Design a propeller and determine aerodynamic interaction effects between different components of aircraft.

UNIT I-INTRODUCTORY TOPICS FOR AERODYNAMICS (15 hours)

Vortex motions – vortex line, vortex tube- vortex sheet – circulation – Kelvin and Helmhotz theorem- Biot – Savarts' law – applications, Rankine's Vortex - Kutta – Joukowski theorem.

UNIT II-AEROFOIL THEORY (15 hours)

Aero foil nomenclature – aerodynamic characteristics – centre of pressure and aerodynamic centre- wing of finite aspect ratio – C_L-α - diagram for a wing of finite aspect ratio. Generation of lift - starting and bound vortices - Kutta's trailing edge condition – thin aerofoil theory- method of singularities – elements of panel method.

UNIT III-THEORY OF PROPELLERS (15 hours)

Axial momentum theory – influence of wake rotation – blade-element theory – combined blade element and momentum theories- tip correction – performance of propellers.

UNIT IV-WING THEORY (15 hours)

Flow past finite wings - vortex model of the wing - induced drag – Prandtl's lifting line theory - elliptic wing –influence of taper and twist applied to wings – effect of sweep back – delta wings- elements of lifting surface theory.

UNIT V-FLOW PAST NON-LIFTING BODIES AND INTERFERENCE EFFECTS (15 hours)

Flow past non lifting bodies- method of singularities – wing – body interference- effect of propeller on wings and bodies and tail unit –flow over airplane as a whole.

TEXT BOOKS

1. Houghton, E, L., and Carruthers, N,B., "*Aerodynamics for Engineering Students"*, Edward Arnold Publishers Ltd.,London,1989.
2. Anderson, J,D., "*Fundamentals of Aerodynamics"*, McGraw Hill Book Co., New York, 1985

REFERENCES

1. Clancy, L,J., *Aerodynamics*, Pitman, 1986.
2. Milne, L.H., Thomson, *Theoretical Aerodynamics*, Dover, 1985.

AS1005 AERODYNAMICS – I												
Course designed by		Department of Aerospace Engineering										
1.	Student Outcome	a	b	c	d	e	f	g	h	i	j	K
		x				x						
2.	Mapping of instructional objectives with student outcome	1-3				1-3						
3.	Category	General (G)		Basic Sciences(B)		Engineering Sciences and Technical Arts (E)					Professional Subjects(P)	
											x	
4.	Broad Area	Aerodynamics		Propulsion		Aircraft Structures					General	
		X		--		--					--	
5.	Approval	23rd meeting of Academic Council, May 2013										

AS1006	AERODYNAMICS LABORATORY – I	L	T	P	C
	Total Contact Hours-30	0	0	2	1
AS1005	Prerequisite				
	Aerodynamics-I				

PURPOSE

To expose the students about the lift and drag forces over different bodies.

INSTRUCTIONAL OBJECTIVES

1.	To understand the fluid flow, pressure distribution and forces on two-dimensional and three-dimensional models.

LIST OF EXPERIMENTS

1. Study of flow over bluff bodies by flow visualization technique.
2. Study of flow over streamlined bodies with different angle of attack by flow visualization technique.
3. Study of flow over a tapered finite wing with and without wingtip by flow visualization technique.
4. Study of flow over an aircraft model by flow visualization technique.
5. Study of flow over a car model by flow visualization technique.
6. Calibration of subsonic wind tunnel
7. Estimation of drag over a smooth cylinder
8. Estimation of drag over a rough cylinder
9. Estimation of drag over a sphere model
10. Estimation of drag over a car model
11. Estimation of drag over a sphere model by force balance method
12. Estimation of drag over a streamlined body by force balance method

REFERENCE

Laboratory Manual

AS1006 AERODYNAMICS LABORATORY – I												
Course designed by		Department of Aerospace Engineering										
1.	Student Outcome	a	b	c	d	e	f	g	h	i	j	k
			X			X						X
2.	Mapping of instructional objectives with student outcome		1			1						1
3.	Category	General (G)	Basic Sciences(B)			Engineering Sciences and Technical Arts (E)						Professional Subjects(P)
												X
4.	Broad Area	Aerodynamics		Propulsion		Aircraft Structures						General
		X		--		--						--
5.	Approval	23rd meeting of Academic Council, May 2013										

AS1007	**AIRCRAFT COMPONENT DRAWING**	**L**	**T**	**P**	**C**
	Total Contact Hours-60	**0**	**1**	**3**	**2**
	Prerequisite				
ME1005	**Engineering graphics**				
AS1001	**Elements of aeronautics**				

PURPOSE

To introduce the concept of design of basic structural components using drafting & modeling package.

INSTRUCTIONAL OBJECTIVES

1.	To familiarize with basic aircraft and its components
2.	To familiarize 3-Dimensional Design of typical aircraft & its components.
3.	To familiarize assembly of aircraft components

LIST OF EXPERIMENTS:

1. Layout of simple structural components.
2. Layout of typical wing structure.
3. Layout of typical fuselage structure.
4. Layout of landing gear structure.
5. 3 Dimensional Design of typical aircraft.
6. 3 Dimensional Design of blower components.
7. 3 Dimensional Design of radial engine components.
8. Blower assembly.
9. Radial piston engine assembly.
10. Drafting of typical aircraft.

REFERENCE

1. Laboratory manual.

AS1007 AIRCRAFT COMPONENT DRAWING													
Course designed by		**Department of Aerospace Engineering**											
1.	Student Outcome	a	b	c	d	e	f	g	h	i	j	k	
				x				x				x	
2.	Mapping of instructional objectives with student outcome			1-5				1-5				1-5	
3.	Category	General (G)		Basic Sciences(B)		Engineering Sciences and Technical Arts (E)						Professional Subjects(P)	
												x	
4.	Broad Area	Aerodynamics		Propulsion		Aircraft Structures						General	
		--		--		x						--	
5.	Approval	23rd meeting of Academic Council, May 2013											

SEMESTER V

PD1005	**APTITUDE-III**	**L**	**T**	**P**	**C**
	Total Contact Hours - 30	**1**	**0**	**1**	**1**
	Prerequisite				
	Nil				

PURPOSE
To enhance holistic development of students and improve their employability skills.

INSTRUCTIONAL OBJECTIVES	
1.	Understand the importance of effective communication in the workplace.
2.	Enhance presentation skills – Technical or general in nature.
3.	Improve employability scope through Mock GD, Interview

UNIT I **(6 hours)**
Video Profile

UNIT II **(6 hours)**
Tech Talk / Area of Interest / Extempore / Company Profile

UNIT III **(6 hours)**
Curriculum Vitae

UNITIV **(6 hours)**
Mock Interview

UNIT V **(6 hours)**
Group Discussion / Case Study

ASSESSMENT
1. Objective type – Paper based / Online – Time based test
2. 50% marks based on test, 50 % based on Continuous Communication assessment

REFERENCES

1. Bovee Courtland and Throill John, *Business Communication Essentials: A skills-Based Approach to Vital Business English*. Pearson Education Inc., 2011
2. Dhanavel, S.P., *English & Communication Skills for Students of Science and Engineering*. Orient Black Swan, 2009
3. Rizvi M. Ashraf *Effective Technical Communication*, Tata McGraw-Hill Publishing Company Limited, 2006.

PD1005 – APTITUDE-III													
Course designed by		Career Development Centre											
1.	Student outcomes	a	b	c	d	e	f	g	h	i	j	k	
								X		X	X		
2.	Mapping of instructional objectives with student outcome							1,2, 3		1,2		2,3	
3.	Category	General (G)	Basic Sciences(B)		Engineering Sciences and Technical Arts(E)					Professional Subjects(P)			
		X											
4.	Approval	23rd meeting of Academic Council, May 2013											

MA 1005	PROBABILITY AND STATISTICS	L	T	P	C
	Total contact hours = 60 hours	4	0	0	4
	(Common to Auto, Aero, Mech, Mectr, Civil , Chemical, ICE & EIE)				

PURPOSE

To develop an understanding of the methods of probability and statistics which are used to model engineering problems.

INSTRUCTIONAL OBJECTIVES

1.	To apply the basic rules and theorems of probability theory such as Baye's Theorem, to determine probabilities that help to solve engineering problems and to determine the expectation and variance of a random variable from its distribution.
2.	To appropriately choose, define and/or derive probability distributions such as the Binomial, Poisson and Normal etc to model and solve engineering problems.
3.	To learn how to formulate and test hypotheses about means, variances and proportions and to draw conclusions based on the results of statistical tests.
4.	To understand how regression analysis can be used to develop an equation that estimates how two variables are related and how the analysis of variance procedure can be used to determine if means of more than two populations are equal.
5.	To understand the fundamentals of quality control and the methods used to control systems and processes.

UNIT I-PROBABILITY AND RANDOM VARIABLES (12 hours)

Sample space, Random experiments and random variables, Concept of probability, Conditional probability, Addition and multiplication laws, Baye's theorem - One dimensional Random Variables- Expectation, Variance, Covariance, and Moments.

UNIT II-THEORETICAL DISTRIBUTIONS (12 hours)

Discrete: Binomial, Poisson, Geometric, Negative Binomial; Continuous: Exponential and Normal Distributions, their properties and applications to industrial problems.

UNIT III-TESTING OF HYPOTHESIS (12 hours)

Introduction – Large sample tests based on normal distribution - Test for single mean, difference between means, proportion, difference between proportions - Small sample tests based on t, F distributions- Test for single mean, difference between means, standard deviation, difference between standard deviation - Chisquare test for goodness of fit - Independence of attributes.

UNIT IV-CORRELATION, REGRESSION AND ANALYSIS OF VARIANCE (12 hours)

Pearson's Correlation coefficient- Spearman's Rank correlation coefficient. Regression-Concepts – Regression lines – Multiple correlation and regression. Analysis of Variance- One-way classification and two way classification.

UNIT V-STATISTICAL QUALITY CONTROL (12 hours)

Introduction – Process control – control charts for variables - X and R, X and S charts control charts for attributes: p chart, np chart, c chart and their applications in process control.

TEXT BOOKS

1. S.C. Gupta and V.K. Kapoor, Fundamentals of Mathematical Statistics, 11th extensively revised edition, Sultan Chand & Sons, 2007.
2. Veerarajan T., Probability, Statistics and Random Processes, Tata McGraw Hill,3rd edition, 2008.

REFERENCES

1. Ross. S., "A first Course in Probability", Fifth Edition, Pearson Education, Delhi 2002.
2. Johnson. R. A., "Miller & Freund's Probability and Statistics for Engineers", Sixth Edition, Pearson Education, Delhi, 2000.
3. Walpole, R. E., Myers, R. H. Myers R. S. L. and Ye. K, "Probability and Statistics for Engineers and Scientists", Seventh Edition, Pearsons Education, Delhi, 2002.
4. Lipschutz. S and Schiller. J, "Schaum's outlines - Introduction to Probability and Statistics", McGraw-Hill, New Delhi, 1998.

MA 1005 - PROBABILITY AND STATISTICS												
Course designed by		Department of Mathematics										
1.	Student outcomes	a	b	c	d	e	f	g	h	i	j	k
		x				x						
2.	Mapping of instructional objectives with student outcome	1-5				1-5						
3.	Category	General (G)	Basic Sciences(B)			Engineering Sciences and Technical Arts(E)				Professional Subjects(P)		
			x									
4.	Approval	23rd meeting of Academic Council, May 2013										

AS1008	AIRCRAFT SYSTEMS AND INSTRUMENTS	3	0	0	3
	Total Contact Hours-45				
AS1001	Prerequisite				
	Elements of Aeronautics				

PURPOSE

The course intend to deal with various instruments used to control the aircraft system

INSTRUCTIONAL

To give knowledge about

1.	Hydraulic and pneumatic control system
2.	Concept of air conditioning, fire safety and aircraft instruments

UNIT I-AIRCRAFT SYSTEM (9 hours)

Hydraulic systems-study of typical workable system-components-hydraulic system controllers- modes of operation-pneumatic systems-advantages-working principles-typical air pressure system – brake system- typical pneumatic power system- components, landing gear systems-classification- shock absorbers- Retractive mechanism.

UNIT II-AIRPLANE CONTROL SYSTEMS (9 hours)

Conventional systems- power assisted and fully powered flight controls- power actuated systems- engine control systems- push pull rod systems, flexible push pull rod system- components- modern control systems- Digital fly by wire systems- auto pilot system, active control technology, communication and navigation systems, instrument landing systems.

UNIT III-ENGINE SYSTEMS (9 hours)

Fuel systems- for Piston and Jet engines – Components of multi engines. Lubricating systems for piston and jet engines-Starting and Ignition systems typical examples for piston and jet engines.

UNIT IV-AIRCONDITIONING AND PRESSURIZATION SYSTEM (9 hours)

Basic air cycle systems- vapour cycle systems-Boost-Strap air cycle system-Evaporative vapour cycle systems- Evaporative air cycle systems–Oxygen systems- Fire protection systems, Deicing and anti-icing systems.

UNIT V-AIRCRAFT INSTRUMENTS (9 hours)

Flight instruments and Navigation instruments- Accelerometer, Air speed Indicator – Mach meter- Altimeter- Principles and operation- Study of various types of engine instruments- Tachometer- Temperature gauges- Pressure gauges- Operation and principles.

TEXT BOOKS

1. Mekinley.J.L, and Bent.R.D, "*Aircraft Power Plants",* McGraw Hill, 1993.
2. Pallet.E.H.J, "*Aircraft instruments and principles"* , Pitman and co., 1993.

REFERENCES

1. Treager, S., "*Gas Turbine Technology"* McGraw hill, 1997
2. McKinley, J. L., "*Aircraft Maintenance and Repair"*, McGraw Hill, 1993.
3. *"General hand books of Air Frame and Power Plant Mechanics"*, U. S. Dept .of transportation, Federal Aviation Administration, The English store, New Delhi.1995.

AS1008 AIRCRAFT SYSTEMS AND INSTRUMENTATION												
Course designed by		**Department of Aerospace Engineering**										
1.	Student Outcome	a	b	c	d	e	f	g	h	i	j	k
				x				x				x
2.	Mapping of instructional objectives with student outcome			1-5				1-5				1-5
3.	Category	General (G)		Basic Sciences(B)		Engineering Sciences and Technical Arts (E)					Professional Subjects(P)	
											X	
4.	Broad Area	Aerodynamics		Propulsion		Aircraft Structures					General	
		--		--		--					X	
5.	Approval	23rd meeting of Academic Council, May 2013										

AS1009	**FLIGHT DYNAMICS- I**	**L**	**T**	**P**	**C**
	Total Contact Hours-45	**3**	**0**	**0**	**3**
	Prerequisite				
AS1005	**Aerodynamics -I**				
AS1012	**Air breathing propulsion**				

PURPOSE

To expose the students to the different forces acting on the flight vehicle and its effect on its performance.

INSTRUCTIONAL OBJECTIVES

1.	To study the different forces acting on a vehicle in flight, drag, variation of thrust, performance during different conditions, and flight testing.

UNIT I-FORCE AND DRAG (9 hours)

Forces and moments acting on a vehicle in flight. Equations of motion of a rigid flight vehicle, Various types of drags. Drag polar of vehicles from low speeds to hypersonic speeds.

UNIT II-AIR BREATHING ENGINES AND ROCKETS (9 hours)

Review of the variation of thrust/power and SFC with altitude and velocity, for various air breathing engines and rockets.

UNIT III-UNACCELERATED FLIGHT (9 hours)

Performance of airplane in level flight, range, endurance. glide, climb,

UNIT IV-ACCELERATED FLIGHT (9 hours)

Accelerated flight, turn, maneuvers, take-off and landing. Flight limitations.

UNIT V-FLIGHT TESTING (9 hours)

Flight - testing: Altitude definitions, Speed definitions, Air speed, altitude and temperature measurements. Errors and calibration. Measurement of engine power, charts and corrections. Flight determination of drag polar.

TEXT BOOKS

1. Perkins, C. D., and Hage, R, E., "*Airplane Performance, Stability and Control*," Wiley Toppan, 1974.
2. Babister, A.W., "*Aircraft Stability and Response"*, Pergamon Press, 1980.

REFERENCES

1. McCormik, B. W., "*Aerodynamics, Aeronautics and Flight Mechanics"*, John Wiley, 1995.
2. Nelson, R.C., "*Flight Stability and Automatic Control"*, McGraw Hill, 1989.

AS1009 FLIGHT DYNAMICS- I												
Course designed by		**Department of Aerospace Engineering**										
1.	Student Outcome	a	b	c	d	e	f	g	h	i	j	k
		x				x						
2.	Mapping of instructional objectives with student outcome	1				1						
3.	Category	General (G)	Basic Sciences(B)	Engineering Sciences and Technical Arts (E)	Professional Subjects(P)							
					x							
4.	Broad Area	Aerodynamics	Propulsion	Aircraft Structures	General							
		x	--	--	--							
5.	Approval	23rd meeting of Academic Council, May 2013										

		L	T	P	C
AS1010	**AIRCRAFT STRUCTURES**				
	Total Contact Hours-45	**3**	**0**	**0**	**3**
	Prerequisite				
ME1010	**Mechanics of solids**				
ME1002	**Engineering mechanics**				

PURPOSE

This course provides the basic knowledge about shear flow in open closed section and buckling effects of plates.

INSTRUCTIONAL OBJECTIVES

To study the,

1.	Concepts of shear flow.
2.	Buckling stress of thin walled sections.
3.	Stress analysis of wing and fuselage.

UNIT I-UNSYMMETRICAL BENDING (9 hours)

Bending stresses in beams of unsymmetrical sections-bending of symmetric sections with skew loads.

Beam columns and failure theories:

Various loading and end conditions. Theories of failure – Maximum Principal Stress, Maximum Strain,
Maximum Shear Stress, Strain Energy theories.

UNIT II-SHEAR FLOW IN OPEN SECTIONS (9 hours)

Thin walled beams – concept of shear flow – the shear centre and its determination – shear flow distribution in symmetrical and unsymmetrical thin-walled sections – structural idealization – shear flow variation in idealized sections.

UNIT III-SHEAR FLOW IN CLOSED SECTIONS (9 hours)

Bredt - Batho theory – single-cell and multi-cell tubes subject to torsion – shear flow distribution in thin-walled single & multi-cell structures subject to combined bending torsion – with walls effective and ineffective in bending – shear centre of closed sections.

UNIT IV-BUCKLING OF PLATES (8 hours)

Bending of thin plates – rectangular sheets under compression - local buckling stress of thin walled sections – crippling strength estimation – thin-walled column strength –load carrying capacity of sheet stiffener panels – effective width.

UNIT V-STRESS ANALYSIS OF WING AND FUSELAGE (10 hours)

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).

TEXT BOOKS

1. Megson T M G , 'Aircraft Structures for Engineering Students', Edward Arnold,1995.
2. Bruhn. E.H., 'Analysis and Design of Flight Vehicles Structures', Tri-state off-set company, USA, 1985.
3. Howard D Curtis, 'Fundamentals of Aircraft Structural Analysis', WCB-McGraw Hill, 1997.

REFEENCES

1. Rivello, R.M., Theory and Analysis of Flight Structures, McGraw Hill, 1993.
2. Peery, D.J., and Azar, J.J., Aircraft Structures, 2nd edition, McGraw – Hill, N.Y., 1999.

AS1010 AIRCRAFT STRUCTURES												
Course designed by		Department of Aerospace Engineering										
1.	Student Outcome	a	b	c	d	e	f	g	h	i	j	k
		x				x						
2.	Mapping of instructional objectives with student outcome	1-3				1-3						
3.	Category	General (G)	Basic Sciences(B)			Engineering Sciences and Technical Arts (E)					Professional Subjects(P)	
											x	
4.	Broad Area	Aerodynamics	Propulsion			Aircraft Structures					General	
		--	--			x					--	
5.	Approval	23rd meeting of Academic Council, May 2013										

	AERO DYNAMICS – II	L	T	P	C
AS1011	Total Contact Hours-60	3	1	0	3
	Prerequisite				
AS1005	Aerodynamics -I				

PURPOSE

To study the principles of compressible flow, that has wide application in aerospace engineering.

INSTRUCTIONAL OBJECTIVES

1.	To have exposure in recent advances made in transonic, supersonic and hypersonic flows.
2.	To familiarize with numerical method of characteristics.

UNIT I-CONCEPTS OF COMPRESSIBLE FLOW (12 hours)

Introduction to isentropic flow-Scope of compressible flow-Review of continuity, momentum and steady flow energy equations and entropy considerations- Energy and momentum equations for compressible fluid flow- reference velocities-stagnation states-velocity of sound-critical states-mach number-critical mach number. Types of waves- mach cones mach angle-effect of Mach number on compressibility flow regimes.

UNIT II-SHOCKS AND ITS APPLICATIONS (12 hours)

Development of normal shocks-governing equations-Stationery and moving normal shock waves-applications, applications to supersonic wind tunnel. Shock tubes, supersonic pitot probes. Oblique shock- Reflection of flow.

UNIT III-EXPANSION WAVES AND FLOW OVER NOZZLES (12 hours)

Prantl-Meyer expansion flow and related problems. Under and over expanded nozzles, shock expansion method for flow over airfoils.

UNIT IV-FLOW IN CONSTANT AREA DUCT WITH FRICTION AND HEAT TRANSFER (12 hours)

Fanno flow- fanno flow equations and solutions- variation of flow properties-variation of Mach number with duct length-tables and charts for fanno flow. Rayleigh line, Rayleigh flow equations-variation of flow properties, tables and charts for Rayleigh flow.

UNIT V-BRIEF INTRODUCTION TO THE METHODS OF CHARACTERISTICS (12 hours)

Method of characteristics -Prandtl-Glauert and Goethert rules. Ackeret's supersonic airfoil theory. Small perturbation equations for subsonic, transonic, supersonic and hypersonic flow. Experimental characteristics of airfoils in compressible flow.

TEXT BOOK

1. Radhakrishnan, E., "*Gas Dynamics"*, Prentice Hall of India, 1995.
2. Yahya, S. M., "*Fundamentals of compressible flow with aircraft and rocket propulsion"*, Wiley Eastern, 1993.

REFERENCES

1. Shapiro, A.H., "*The Dynamics and Thermodynamics of Compressible Fluid Flow (Vol I and II)"*, Ronald Press,1953.
2. Anderson J. D., Jr., "*Modern Compressible Flow with Historical Perspective*," McGraw Hill Publishing Co., 1990.
3. Miles, E.R.C., "*Supersonic Aerodynamics"*, Dover, New York, 1950.

AS1011 AERO DYNAMICS – II												
Course designed by		Department of Aerospace Engineering										
1.	Student Outcome	a	b	c	d	e	f	g	h	i	j	K
		X				X						
2.	Mapping of instructional objectives with student outcome	1-2				1-2						
3.	Category	General (G)		Basic Sciences(B)		Engineering Sciences and Technical Arts (E)					Professional Subjects(P)	
											x	
4.	Broad Area	Aerodynamics		Propulsion		Aircraft Structures					General	
		X		--		--					--	
5.	Approval	23rd meeting of Academic Council, May 2013										

AS1012	**AIR BREATHING PROPULSION**	**L**	**T**	**P**	**C**
	Total Contact Hours-45	**3**	**0**	**0**	**3**
	Prerequisite				
AS1002	**Aero Thermodynamics**				

PURPOSE

It will improve the students' ability to analyze Engineering concepts of air breathing propulsion systems.

INSTRUCTIONAL OBJECTIVES

1.	To understand the working principles of gas turbine and ramjet propulsion systems, the design principles of inlets, combustion chambers, nozzles used in them.
2.	To learn the operation of compressors and turbines in gas turbine propulsion systems.
3.	To understand the principle and performance of ramjet propulsion.

UNIT I-THERMODYNAMICS OF AIRBREATHING PROPULSION SYSTEMS (9 hours)

Introduction – Thrust and efficiency – The ramjet – Turbojet engines – Turbofan engines – Turboprop and turboshaft engines – Typical engine performance – Engine-aircraft matching (introductory information) – Numerical problems.

UNIT II-INLETS, COMBUSTORS, AND NOZZLES (9 hours)

Introduction - Subsonic inlets –Supersonic inlets – Gas turbine combustors – Afterburners and ramjet combustors – Supersonic combustion – Exhaust nozzle – Numerical problems.

UNIT III-AXIAL COMPRESSORS (9 hours)

Angular momentum – Work and compression – Characteristic performance of a single compressor stage – Characteristic performance of a multistage axial compressor – Boundary layer limitation – Compressor efficiency – Degree of reaction – Radial equilibrium – Design of a subsonic axial compressor – Transonic fan stage – Numerical problems.

UNIT IV-AXIAL TURBINES (9 hours)

Introduction - The axial turbine stage – Stage efficiency – Rotor blade and disc stresses – Blade cooling – Turbine performance – Turbine and compressor matching – Turbine stage design – Numerical problems.

UNIT V-CENTRIFUGAL COMPRESSOR (9hours)

Introduction – Centrifugal compressor stage dynamics – The inducer and impeller - The diffuser – Performance characteristics – Centrifugal compressor stage design – Numerical problems.

TEXT BOOKS

1. Hill, P. G., and Peterson, C. R., Mechanics and Thermodynamics of Propulsion, 2nd Edition, Addison-Wesley Publishing Company, Singapore, 1992.
2. Cohen. H. Rogers. G.F.C. and Saravanamuttoo. H.I.H.: Gas turbine theory. 4th edition. Pearson education.

REFERENCES

1. Rolls-Roycs, Jet Engine, 3rd edition, 1983.
2. Oats, G.C., Aerothermodynamics of Aircraft Engine Components, AIAA Education Series, New York, 1985.
3. Cohen, H Rogers., G.F.C. and Saravanamutto, H.I.H., Gas Turbine Theory, Longman, 1989.
4. Mattingly, J.D., Heiser, W.H., and Pratt, D.T., Aircraft Engine Design, AIAA Education Series, New York, 2002.

AS1012 AIR BREATHING PROPULSION												
Course designed by		Department of Aerospace Engineering										
1.	Student Outcome	a	b	c	d	e	f	g	h	i	j	k
		x				x						
2.	Mapping of instructional objectives with student outcome	1-3				1-3						
3.	Category	General (G)		Basic Sciences(B)			Engineering Sciences and Technical Arts (E)				Professional Subjects(P)	
											x	
4.	Broad Area	Aerodynamics			Propulsion			Aircraft Structures			General	
		--			x			--			--	
5.	Approval	23rd meeting of Academic Council, May 2013										

AS1013	PROPULSION LABORATORY	L	T	P	C
	Total Contact Hours-30	0	0	2	1
	Prerequisite				
AS1002	Aero Thermodynamics				
PURPOSE					
To expose the students to the working of jet engines and its different working conditions					
INSTRUCTIONAL OBJECTIVES					
1.	To understand how to do the heat transfer analysis over the surface of the aircraft structure, the working of different jet engines, study of propellants etc.				

LIST OF EXPERIMENTS

1. Study of jet engines.
2. Study of free convective heat transfer over a flat plate.
3. Study of forced convective heat transfer over a flat plate.
4. Ignition studies of solid and liquid propellants.
5. Operation of a ramjet engine.
6. Study of free jet.
7. Study of wall jet.
8. Study of hybrid propulsion system.
9. Preparation of fuel grain for hybrid rocket.
10. Burning rate measurement of solid propellants in a strand burner.

REFERENCE

Laboratory Manual

AS1013 PROPULSION LABORATORY												
Course designed by		**Department of Aerospace Engineering**										
1.	Student Outcome	a	b	c	d	e	f	g	h	i	j	k
			x			x						x
2.	Mapping of instructional objectives with student outcome		1			1						1
3.	Category	General (G)	Basic Sciences(B)			Engineering Sciences and Technical Arts (E)						Professional Subjects(P)
												x
4.	Broad Area	Aerodynamics			Propulsion		Aircraft Structures					General
		--			x		--					--
5.	Approval	23rd meeting of Academic Council, May 2013										

AS1014	**AERODYNAMICS LABORATORY - II**	**L**	**T**	**P**	**C**
	Total Contact Hours-30	**0**	**0**	**2**	**1**
	Prerequisite				
AS1005	**Aerodynamics-I**				
AS1011	**Aerodynamics-II**				

PURPOSE

To provide the knowledge of pressure distribution in 3-D bodies, with different angles of attacks, Calibration of supersonic wind tunnels and supersonic flow studies

INSTRUCTIONAL OBJECTIVES

At the end of the course students will be able

1. To analyze pressure distribution in 3-D objects
2. To calibrate a supersonic wind tunnel

LIST OF EXPERIMENTS

1. Estimation of forces acting over a symmetrical airfoil with different angle of attack
2. Estimation of forces acting over an unsymmetrical airfoil with different angle of attack
3. Study of forces acting on the finite wing with washin angle of 10□
4. Study of forces acting on the finite wing with washout angle of 10□
5. Study of forces acting on the finite wing with movable flap.
6. Calibration of supersonic wind tunnel
7. Study of supersonic flow over a diamond shape airfoil with half wedge angle of 8□ by flow visualization.
8. Study of supersonic flow over a diamond shape airfoil with half wedge angle of 35□ by flow visualization.
9. Study of supersonic flow over a cone by flow visualization.
10. Study of supersonic flow over a cylinder by flow visualization.

REFERENCE

Laboratory Manual

AS1014 AERODYNAMICS LABORATORY – II												
Course designed by		**Department of Aerospace Engineering**										
1.	Student Outcome	a	b	c	d	e	f	g	h	i	j	k
			x			x						x
2.	Mapping of instructional objectives with student outcome		1-2			1-2						1-2
3.	Category	General (G)	Basic Sciences(B)	Engineering Sciences and Technical Arts (E)	Professional Subjects(P)
					x
4.	Broad Area	Aerodynamics	Propulsion	Aircraft Structures	General
		x	--	--	--
5.	Approval	23rd meeting of Academic Council, May 2013			

	INDUSTRIAL TRAINING I (Training to be undergone after IV semester)	**L**	**T**	**P**	**C**
AS1045	2 week practical training in industry	**0**	**0**	**1**	**1**
	Prerequisite				
	Nil				
PURPOSE					
To provide hands-on experience at industry, site / planning or design office where aerospace engineering projects are carried out					

INSTRUCTIONAL OBJECTIVES	
1.	Students have to undergo two – week practical training in aerospace engineering related industry / project site or design / planning office so that they become aware of the practical application of theoretical concepts studied in the class rooms.

Assessment process

This course is mandatory and the student has to pass the course to become eligible for the award of degree. The student shall make a presentation before a committee constituted by the department which will assess the student based on the report submitted and the presentation made. Marks will be awarded out of 100 and appropriate grades assigned as per the regulations.

AS1045 INDUSTRIAL TRAINING I												
Course designed by		Department of Aerospace Engineering										
1.	Student outcomes	a	b	c	d	e	f	g	h	i	j	k
					x	x	x					
2.	Mapping of instructional objectives with student outcome				1	1	1					
3.	Category	General (G)		Basic Sciences(B)		Engineering Sciences and Technical Arts(E)				Professional Subjects(P)		
										x		
4.	Approval	23rd meeting of Academic Council, May 2013										

SEMESTER V1

PD1006	APTITUDE-IV	L	T	P	C
	Total Contact Hours - 30	1	0	1	1
	Prerequisite				
	Nil				

PURPOSE

To enhance holistic development of students and improve their employability skills.

INSTRUCTIONAL OBJECTIVES

1.	To improve aptitude, problem solving skills and reasoning ability of the student.
2.	To collectively solve problems in teams & group.

UNIT I - ARITHMETIC - II **(6 hours)**

Ratios & Proportions, Averages, Mixtures & Solutions

UNIT II - ARITHMETIC – III **(6 hours)**

Time, Speed & Distance, Time & Work

UNIT III - ALGEBRA – II **(6 hours)**

Quadratic Equations, Linear equations & inequalities

UNIT IV– GEOMETRY **(6 hours)**

2D Geometry, Trigonometry, Mensuration

UNIT V – MODERN MATHEMATICS – II **(6 hours)**

Sets & Functions, Sequences & Series, Data Interpretation, Data Sufficiency

ASSESSMENT

1. Objective type – Paper based / Online – Time based test

REFERENCES

1. Agarwal.R.S – *Quantitative Aptitude for Competitive Examinations,* S Chand Limited 2011
2. Abhijit Guha*, Quantitative Aptitude for Competitive Examinations,* Tata Mcgraw Hill, 3rd Edition
3. Edgar Thrope*, Test Of Reasoning For Competitive Examinations,* Tata Mcgraw Hill, 4th Edition
4. *Other material related to quantitative aptitude*

PD1006 - APTITUDE-IV												
Course designed by		**Career Development Centre**										
1.	Student outcomes	a	b	c	d	e	f	g	h	i	j	k
		x			x							
2.	Mapping of instructional objectives with student outcome	1			2							
3.	Category	General (G)	Basic Sciences(B)		Engineering Sciences and Technical Arts(E)		Professional Subjects(P)					
		x										
4.	Approval	23rd meeting of Academic Council, May 2013										

	INTRODUCTION TO SPACE TECHNOLOGY	L	T	P	C
AS1015	Total Contact Hours-45	**3**	0	**0**	3
	Prerequisite				
	Nil				

PURPOSE

This course is designed to provide a broad overview of the space technology with regard to rocket propulsion.

INSTRUCTIONAL OBJECTIVES

1.	To develop a basic knowledge about satellite orbits, satellite dynamics and orbital elements.
2.	To learn the different cases of satellite orbit transfer, orbit perturbations.
3.	Basic of rocket flight dynamics, and ballistic missile trajectories.

UNIT I-ORBITAL MECHANICS (9 hours)

Fundamentals of orbital dynamics, two body problem, circular and escape velocities, motion in circular, elliptical, parabolic and hyperbolic orbits, different space missions, applications, types of satellite orbits, two body problem, equation of motion, orbit equation.

UNIT II-ORBITS IN THREE DIMENSIONS (9hours)

Different coordinate frames, coordinate transformation, Orbital elements, , relations between position and time, Effects of the earth's oblateness, Orbit perturbation due to third body, orbit decay and life time.

UNIT III-ORBITAL MANEUVER (9hours)

Impulsive maneuvers, Hohmann transfer, one tangent burn transfer, bi-elliptic Hohmann transfer, Phasing maneuvers, Plane change maneuvers

UNIT IV-ROCKET MOTION IN FREE SPACE AND GRAVITATIONAL FIELD(9hours)
Multistage Rocket systems- rocket performance, restricted staging in field-free space, One dimensional and two dimensional rocket motions in free space and homogeneous gravitational fields - Description of vertical, inclined and gravity turn trajectories.

UNIT V-BALLISTIC MISSILE TRA JECTORIES (9 hours)
Free-flight range equation, flight-path angle equation, maximum range trajectory, time of free-Flight, effect of earth rotation, effect of launching errors on range.

TEXT BOOK
1. Howard D. Curtis., "*Orbital Mechanics for Engineering Students*" Elsevier Butterworth-Heinemann, 2005
2. Cornelisse, J.W, Schoyer H F R, and Wakker K F, "*Rocket Propulsion and Space Dynamic*", Pitman Publishing Co., 1979.

REFERENCES
1. Martin J L Turner, "*Rocket and Spacecraft Propulsion",* Springer Praxis Publishing Co, Chichster, UK, 2001.
2. Bate R R, Mueller D D and White J E *"Fundamentals of Astrodynamics"* Dover Publications, New York, 1972

AS1015 INTRODUCTION TO SPACE TECHNOLOGY												
Course designed by		**Department of Aerospace Engineering**										
1.	Student Outcome	a	b	c	d	e	f	g	h	i	j	k
		x				x						
2.	Mapping of instructional objectives with student outcome	1-3				1-3						
3.	Category	General (G)		Basic Sciences(B)		Engineering Sciences and Technical Arts (E)					Professional Subjects(P)	
											x	
4.	Broad Area	Aerodynamics		Propulsion		Aircraft Structures					General	
		--		--		--					x	
5.	Approval	23rd meeting of Academic Council, May 2013										

AS1016	FLIGHT DYNAMICS - II	L	T	P	C
	Total Contact Hours-45	3	0	0	3
	Prerequisite				
AS1008	FLIGHT DYNAMICS – I				

PURPOSE

To impart the students on the basic concepts of stability control, maneuverability and flight tests.

INSTRUCTIONAL OBJECTIVES

	To familiarize with,
1.	Static longitudinal, directional and lateral stability and control
2.	Effect of maneuvers
3.	Neutral points and maneuver point in flight tests.

UNIT I-BASIC CONCEPTS (9 hours)

Basic concepts of stability and control, static longitudinal, directional and lateral stability control. Equations of equilibrium and stability- contribution of various components.

UNIT II-LONGITUDINAL DYNAMIC STABILITY AND CONTROL (9 hours)

Stick - fixed stability, control effectiveness, hinge moment, tabs, aerodynamic balancing, effects of freeing the stick. Control forces and force gradients. Critical conditions for stability and control.

UNIT III-MANEUVERABILITY (9 hours)

Effect of maneuvers. Longitudinal dynamic stability, equations of motion of a disturbed aircraft, stability derivatives, characteristic equation for stick fixed case, modes and stability criterion, effect of freeing the stick.

UNIT IV-DYNAMIC STABILITY (9 hours)

Brief description of lateral and directional dynamic stability- spiral, divergence and dutch roll. Response, automatic control, autorotation and spin.

UNIT V-FLIGHT TESTS (9 hours)

Determination of neutral points and maneuver point in flight tests.

TEXT BOOKS

1. Perkins, C, D., and Hage, R,E., "*Airplane Performance, Stability and Control*," Wiley Toppan, 1974.
2. Babister, A, W.,"*Aircraft Stability and Response"*, Pergamon Press,1980.

REFERENCES

1. McCormic, B, W., "*Aerodynamics, Aeronautics and Flight Mechanics"*, John Wiley, 1995.
2. Nelson, R,C.,"*Flight Stability and Automatic Control"*, McGraw Hill, 1989.

AS 1016 FLIGHT DYNAMICS – II												
Course designed by		**Department of Aerospace Engineering**										
1.	Student Outcome	a	b	c	d	e	f	g	h	i	j	k
		x				x						
2.	Mapping of instructional objectives with student outcome	1-4				1-4						
3.	Category	General (G)	Basic Sciences(B)			Engineering Sciences and Technical Arts (E)						Professional Subjects(P)
												x
4.	Broad Area	Aerodynamics			Propulsion		Aircraft Structures					General
		x			--		--					--
5.	Approval	23rd meeting of Academic Council, May 2013										

AS1017	**HEAT TRANSFER**	**L**	**T**	**P**	**C**
	Total Contact Hours-45	**3**	**0**	**0**	**3**
	Prerequisite				
AS1002	**Aero Thermodynamics**				
AS1003	**Aero Fluid Mechanics**				

PURPOSE

To familiarize the student in the area of conduction, convection and radiation.

INSTRUCTIONAL OBJECTIVES

1.	To familiarize on the various modes of heat transfer
2.	To solve the heat transfer problem related to Aerospace Engineering

UNIT I-FUNDAMENTALS OF HEAT TRANSFER (9 hours)

Different modes of heat transfer and general principles. Steady and unsteady state heat conduction in solids - Effect of variation of thermal conductivity on heat transfer in solids - Heat transfer problems in infinite and semi-infinite solids - Extended surfaces - Application of numerical techniques.

UNIT II-FREE CONVECTIVE HEAT TRANSFER (9 hours)

Fundamentals of Free convection; Governing equation; Boundary layer in free convection; Boussinesque approximation; Empirical relations.

UNIT III-FORCED CONVECTIVE HEAT TRANSFER (9 hours)

Forced convention - Laminar and turbulent convective heat transfer analysis in flows between parallel plates, over a flat plate and in a circular pipe. Empirical relations; application of numerical techniques in problem solving.

UNIT IV-RADIATIVE HEAT TRANSFER (9 hours)

Introduction to physical mechanism - Radiation properties - Radiation shape factors - Heat exchange between non-black bodies - Radiation shields.

UNIT V-HEAT TRANSFER PROBLEMS IN AEROSPACE ENGINEERING(9 hours)

Heat transfer problems in gas turbine combustion chambers - Rocket thrust chambers - Aerodynamic heating -Ablative heat transfer.

TOTAL 45 Hours

TEXT BOOKS

1. Yunus A. Cengel & Afshin J. Ghajar, "*Heat & Mass Transfer*", Fourth Edition, McGraw-Hill, 2011.
2. Incropera, F. P., and Dewitt, D.P., "*Fundamentals of Heat and Mass Transfer"*, 5th Edition, John Wiley and Sons, New York, 2002.
3. Sutton, G. P., "*Rocket Propulsion Elements*,*"* John Wiley and Sons, 5th Edn.1 986.

REFERENCES

1. Lienhard, J. H., "*A Heat Transfer Text Book*," Prentice Hall Inc., 1981.
2. Holman, J. P., "*Heat Transfer"*, McGraw Hill Book Co., Inc., New York, 6th Edn., 1991.
3. Mathur, M., and Sharma, R.P., "*Gas Turbine and Jet and Rocket Propulsion"*, Standard Publishers, New Delhi 1988.

AS1017 HEAT TRANSFER												
Course designed by		**Department of Aerospace Engineering**										
1.	Student Outcome	a	b	c	d	e	f	g	h	i	j	k
		x				x						
2.	Mapping of instructional objectives with student outcome	1-2				1-2						
3.	Category	General (G)		Basic Sciences(B)		Engineering Sciences and Technical Arts (E)					Professional Subjects(P)	
											x	
4.	Broad Area	Aerodynamics		Propulsion		Aircraft Structures					General	
		--		x		--					--	
5.	Approval	23rd meeting of Academic Council, May 2013										

AS1018	ROCKET PROPULSION	L	T	P	C
	Total Contact Hours-60	3	1	0	3
	Prerequisite				
AS1002	Aero Thermodynamics				
AS1011	Aerodynamics-II				

PURPOSE

1. To familiarize the students on the fundamental concepts of rocket propulsion and some advanced rocket propulsion techniques.
2. To understand chemical rocket system hardware and its functions.

INSTRUCTIONAL OBJECTIVES

1.	To study the basic principles and applications of rocket propulsion.
2.	To know the choice of propellants and basic performance parameters in chemical propellants and propulsion systems.
3.	To know the electric rocket propulsion and advanced rocket propulsion techniques.

UNIT I-FUNDAMENTALS OF ROCKET PROPULSION (12hours)

History and evolution of rockets. Rocket equation, Definitions. Performance parameters, Staging and Clustering, Classification of rockets. Rocket nozzle and performance, Nozzle area ratio, conical nozzle and contour nozzle, Under and over expanded nozzles. Flow separation in nozzles, unconventional nozzles. Mass flow rate, Characteristic velocity, Thrust coefficient, Efficiencies, Specific impulse. Numerical problems.

UNIT II-CHEMICAL PROPELLANTS (12 hours)

Molecular mass, specific heat ratio, Energy release during combustion, Stoichiometry & mixture ratio, Criterion for choice of propellant, Solid propellants, requirement, composition and processing. Liquid propellants, energy content, storability, Types and classifications. Numerical problems

UNIT III-SOLID PROPULSION SYSTEMS (12 hours)

Classifications- Booster stage and upper stage rockets. Hardware components and functions. Propellant grain configuration and applications. Burn rate, burn rate index for stable operation, mechanism of burning, ignition and igniter types. Action time and burn time. Factors influencing burn rates. Thrust vector control. Numerical problems.

UNIT IV-LIQUID PROPULSION SYSTEMS (12 hours)

Classifications- Booster stage and upper stage rockets. Hardware components and functions. Thrust chamber and its cooling, injectors and types, Propellant feed systems. Turbo pumps. Bi - propellant rockets. Mono propellant thrusters, Cryogenic propulsion system, special features of cryogenic systems. Numerical problems.

UNIT V-ADVANCE PROPULSION TECHNIQUES (12 hours)

Hybrid propellants and gelled propellants. Electrical rockets, types and working principle. Nuclear rockets, Solar sail, Concepts of some advance propulsion systems. Numerical problems.

TEXT BOOKS

1. Ramamurthi.K:Rocket propulsion. Macmillan Publishing Co, India. First edition. 2010.
2. Hill.P.G. and Peterson.C.R: Mechanics and thermodynamics of propulsion. 2nd edition .Pearson Education.1999.

REFERENCE

1. Sutton.G.P.and Biblarz.O.: Rocket propulsion elements. Wiley India Pvt Ltd.7th edition 2003.

AS1018 ROCKET PROPULSION												
Course designed by		**Department of Aerospace Engineering**										
1.	Student Outcome	a	b	c	d	e	f	g	h	i	j	k
		x				x						
2.	Mapping of instructional objectives with student outcome	1-3				1-3						
3.	Category	General (G)		Basic Sciences(B)		Engineering Sciences and Technical Arts (E)					Professional Subjects(P)	
											x	
4.	Broad Area	Aerodynamics		Propulsion		Aircraft Structures					General	
		--		x		--					--	
5.	Approval	23rd meeting of Academic Council, May 2013										

ME1188	TQM AND RELIABILITY ENGINEERING	L	T	P	C
	Total Contact Hours-45	3	0	0	3
	Prerequisite				
	Nil				

PURPOSE

To provide knowledge about Total Quality Management (TQM), TQM tools and techniques applied to Manufacturing and also about reliability and maintainability of different systems.

INSTRUCTIONAL OBJECTIVES

1.	Meaning of TQM and Theories about TQM.
2.	Planning and manufacturing for quality its tools and techniques.
3.	Human involvement to improve quality and the development and transformation due to such involvement.
4.	About failure models, component reliability & system reliability.
5.	About mean down time, maintainability of systems & condition monitoring.

UNIT I - BASIC CONCEPTS (9 hours)

Evolution of total quality Management - Definition of quality - Comparison between traditional approach and TQM, Deming - Crosby - Juran - Taguchi, Ishikawa theories - Quality costs - Product quality Vs Service quality Strategic planning - Goal setting - Steps involved in strategic planning - TQM implementation.

UNIT II - TQM PRINCIPLES & BASIC TOOL (9 hours)

Customer Satisfaction - Types of customers, customer supplier chain, Customer perception of quality customer feed back - Customer complaints - Customer retention - Service quality.Employee involvement - Employee motivation - Maslow's hierarchy of needs - Herzberg theory - Empowerment and team work.

Basic Tools: Introduction to seven basic tools - Check sheets, histograms - Control charts, Pareto diagram - Cause and effect diagram - Stratification - Scatter diagrams.

UNIT III - NEW SEVEN MANAGEMENT TOOLS & ADVANCED TOOLS (9 hours)

Affinity diagram - Relations diagram - Tree diagram - Matrix diagram - Matrix data analysis diagram - Process decision program chart - Arrow diagram.

Advanced QC tools: Advanced QC tools like QFD - Root cause analysis - Taguchi method - Mistake proofing (poka-yoke) - Failure mode and effects analysis (FMEAs), failure mode and effects criticality analysis (FMECAs) and Fault tree analysis (FTAs) etc. - Quality Management Systems.

UNIT IV - RELIABILITY **(9 hours)**

Definition - Probabilistic nature of failures - Mean failure rate - Meantime between failures - Hazard rate - Hazard models, Weibull model - System reliability improvement - Redundancy - Series - Parallel and Mixed configurations.

UNIT V - MAINTAINABILITY **(9 hours)**

Introduction - Choice of maintenance strategy - Mean time- to repair (MTTR) - Factors contributing to Mean Down Time (MDT) - Fault diagnosis, and routine testing for unrevealed faults - Factors contributing to Mean Maintenance Time - (MMT) on condition maintenance - Periodic condition monitoring - Continuous condition monitoring - Economics of maintenance.

TEXT BOOKS

1. Joel E. Rose,"*Total Quality Management"*, 2nd Edition, Kogan Page Ltd., USA 1993.
2. Srinath, L. S.,"*Reliability Engineering"*, Affiliated East West Press, New Delhi 1995.

REFERENCES

1. Balagurusamy, E.,"*Reliability Engineering",* Tata McGraw Hill publishing Co., New Delhi, 1984.
2. Greg Bound, et.al,"*Beyond Total Quality Management towards the emerging paradigm"*, McGraw Hill Inc., 1994.
3. Zeiri,,"*Total Quality Management for Engineers"*, Wood Head Publishers, 1991.

ME1188 – TQM AND RELIABILITY ENGINEERING												
Course designed by		**Department of Mechanical Engineering**										
1.	Student Outcome	a	B	c	d	e	f	g	h	i	j	k
							x	x	x			x
2.	Mapping of instructional objectives with student outcome						1-5	1-5	1-5			1-5
3.	Category	General (G)		Basic Sciences(B)		Engineering Sciences and Technical Arts (E)						Professional Subjects(P)
												x
4.	Broad Area	Manufacturing		Design		Thermal						General
		x		--		--						--
5.	Approval	23rd meeting of Academic Council, May 2013										

AS1019	AIRCRAFT DESIGN PROJECT I	L	T	P	C
	Total Contact Hours-30	0	0	2	1
	Prerequisite				
AS1005	Aerodynamics-I				
AS1009	Flight Dynamics-I				

PURPOSE

To familiarize the students on the design of airplane to the given preliminary specifications.

INSTRUCTIONAL OBJECTIVES

1.	To enable the students to have a preliminary idea of different types of airplanes and their performance details.

TASKS

Students in a group of maximum five are assigned the design of an Airplane (or Helicopter or any other flight vehicle), to the given preliminary specifications. The following are the assignments to be carried out:

1. Comparative studies of different types of airplanes and their specifications and performance details.
2. Preliminary weight estimations, selection of main parameters, Power plant selection, Aerofoil selection, Wing, tail and control surfaces.
3. Preparation of lay outs of balance diagram and three view drawings.
4. Drag estimation, Detailed performance, Calculations and stability estimates. V-n diagram.

REFERENCE

1. Laboratory Manual

AS1019 AIRCRAFT DESIGN PROJECT I												
Course designed by		Department of Aerospace Engineering										
1.	Student Outcome	a	b	c	d	e	f	g	h	i	j	k
		x	x			x						
2.	Mapping of instructional objectives with student outcome	1	1			1						
3.	Category	General (G)	Basic Sciences(B)			Engineering Sciences and Technical Arts (E)					Professional Subjects(P)	
											x	
4.	Broad Area	Aerodynamics		Propulsion		Aircraft Structures					General	
		x		--		--					--	
5.	Approval	23rd meeting of Academic Council, May 2013										

AS1020	**AIRCRAFT STRUCTURES LABORATORY**	**L**	**T**	**P**	**C**
	Total Contact Hours-30	**0**	**0**	**2**	**1**
	Prerequisite				
AS1010	**Aircraft structures**				

PUROPOSE	
To Study the bending and torsion in beams under static and dynamic conditions and fabrication of composite laminates.	
INSTRUCTIONAL OBJECTIVES	
1.	To familiarize with
2.	Bending and shear stresses in beams
3.	Free and Forced vibration of beams

LIST OF EXPERIMENTS

1. Tensile testing using UTM, mechanical and optical extensometers, stress-strain curves and strength test for various engineering materials.
2. Bending tests, Stress and deflections of beams for various end conditions, verification of Maxwell's theorem.
3. Compression tests on long and short columns, Critical buckling loads, south well plot.
4. Unsymmetrical Bending of a Beam
5. Combined bending and Torsion of a Hollow Circular Tube
6. Material Fringe Constant of a Photo-elastic Model
7. Shear Centre of an open Section beam
8. Shear Centre of an closed Section beam
9. Free Vibration of a Cantilever Beam
10. Forced Vibration of Beams
11. Wagner beam – Tension field beam
12. Experiments on constant strength beams
13. Experiments on thin walled pressure vessels
14. Fabrication of a Composite Laminate

REFERENCE

1. Laboratory Manual

AS1020 AIRCRAFT STRUCTURES LABAROTRY												
Course designed by		**Department of Aerospace Engineering**										
1.	Student Outcome	a	b	c	d	e	f	g	h	i	j	k
			x			x						x
2.	Mapping of instructional objectives with student outcome		1-2			1-2						1-2
3.	Category	General (G)		Basic Sciences(B)		Engineering Sciences and Technical Arts (E)						Professional Subjects(P)
												x
4.	Broad Area	Aerodynamics		Propulsion		Aircraft Structures						General
		--		--		x						--
5.	Approval	23rd meeting of Academic Council, May 2013										

	MINOR PROJECT	L	T	P	C
AS1049	Total Contact Hours – 30	**0**	**0**	**2**	**1**
	Prerequisite				

PURPOSE

To carry out a design project in one of the specializations of Aerospace engineering with substantial multidisciplinary component.

INSTRUCTIONAL OBJECTIVES

1. To guide the students in such a way so that they carry out a work on a topic as a forerunner to the full-fledged project work to be taken subsequently in VIII semester. The project work shall consist of substantial multidisciplinary component.

The students will carry out a project in one of the following Aerospace engineering areas but with substantial multidisciplinary component involving Mechanical engg. , Instrumentation and control Engg,

- Aerodynamics
- Propulsion
- Structures

Student groups will be formed (6 in a group) and a faculty member will be allocated to guide them. There will be three reviews . First review will not carry any marks but the project topic will be finalized in it. Of remaining 2 reviews one will be carried out in the mid-semester and the last one by the end of semester.
Assessment:

Marks	Awarded by	Criteria
30	**Guide**	**For regularity, systematic progress, extent of work and quality of w**
20	**Review committee during II review**	**Presentation, contents and viva**
20	**Review committee during III review**	**Quality of project report**
10	**Review committee during III review**	Multidisciplinary component
20	**Review committee during III review**	**Presentation, contents and viva**

AS1049 MINOR PROJECT												
Course designed by		**Department of Aerospace Engineering**										
1.	Student Outcome	a	b	c	d	e	f	g	h	i	j	k
		x	x	x	x	x	x	x	x	x	x	x
2.	Mapping of instructional objectives with student outcome						1					
3.	Category	General (G)	Basic Sciences(B)			Engineering Sciences and Technical Arts (E)						Professional Subjects(P)
												x
4.	Broad Area	Aerodynamics			Propulsion		Aircraft Structures					General
		x			x		x					x
5.	Approval	23rd meeting of Academic Council, May 2013										

SEMESTER VII

ME1034	ECONOMICS AND PRINCIPLES OF MANAGEMENT	L	T	P	C
	Total Contact Hours-45	3	0	0	3
	Prerequisite				
	Nil				

PURPOSE	
niliarize the concepts of Engineering Economics and Principles of Management.	
INSTRUCTIONAL OBJECTIVES	
1.	The different engineering economic principles and strategies .
2.	Principles of organizational management .
3.	Behavior of human at organizations with modern management concepts.

UNIT I - ENGINEERING ECONOMICS **(9 hours)**

Introduction - Economics - Scope and Definition - Importance of Economics in Engineering - Economic optimization- Demand and Revenue Analysis - Law of Demand - Demand Forecasting -Methods of Demand Forecasting - Demand curves - Factors affecting Demand - Demand Elasticity - Production Analysis - simple problems.

UNIT II - SUPPLY, COST AND OUTPUT **(9 hours)**

Supply - Supply schedule - Law of Supply - Elasticity of Supply - Cost and Supply Analysis - Types of Costs - Price and output Determination - Price Fixation - Pricing methods - Pricing Policies - Factors governing Pricing Policies - Break-Even analysis - Estimation of Break-Even Point - Usefulness of BEP - Limitations - simple problems.

UNIT III - MANAGEMENT AND ITS ENVIRONMENT **(9 hours)**

Management - Definition - Functions - Evolution of Modern Management movement - Different Schools of Management - Types and Forms of Business Organization - Designing effective organizations - Individual ownership - Partnership - Joint stock companies - Cooperative enterprises - Public Sector Undertakings.

UNIT IV - MANAGEMENT OF HUMAN AT WORK **(9 hours)**

Human Resource Development - Motivating individuals and workgroups - Leadership for Managerial Effectiveness - Team working and Creativity - Managerial Communication - Time Management - Performance Appraisal- Career Planning.

UNIT V - MODERN MANAGEMENT CONCEPTS **(9 hours)**

Management by Objectives (MBO) - Principles and Steps - Advantages and Disadvantages - Management by Exception (MBE) - Strategic management - SWOT analysis - Enterprise Resource Planning (ERP) - Supply Chain Management (SCM) - Activity Based Management (ABM).

TEXT BOOKS

1. Sasmita Mishra*, "Engineering Economics and Costing' Eastern economy Edition", 2009.*
2. Chandran, J. S., "*Organizational Behaviours"*, Vikas Publishing House Pvt. Ltd., New Delhi, 1994.
3. Ernest Dale, "*Management Theory and Practice"*, International Student Edition, McGraw Hill Publishing Co., New Delhi, 1973.

REFERENCES

1. Richard Pettinger, "*Mastering Organizational Behaviour"*, Macmillan Press, London, 2000.
2. Chaiger, N. A., "*Energy Consumption and Environment"*, McGraw Hill Publishing Co., New Delhi, 1981.
3. Gail Freeman - Bell and Janes Balkwill, "*Management in Engineering* - Principles and Practive", Prentice Hall of India Pvt.Ltd., 1998.
4. R.R. Barathwal, "*Engineering Economics*", McGraw Hill, 1997.

ME1034 ECONOMICS AND PRINCIPLES OF MANAGEMENT												
Course designed by		**Department of Mechanical Engineering**										
1.	Student Outcome	a	b	c	d	e	f	g	h	i	j	k
				x		x			x			
2.	Mapping of instructional objectives with student outcome			1,2		1			1-5			
3.	Category	General (G)		Basic Sciences(B)		Engineering Sciences and Technical Arts (E)					Professional Subjects(P)	
											x	
4.	Broad Area	Manufacturing		Design		Thermal					General	
											x	
5.	Approval	23rd meeting of Academic Council, May 2013										

	VIBRATIONS AND ELEMENTS OF AEROELASTICITY	L	T	P	C
AS1021	Total Contact Hours- 60	2	2	0	3
	Prerequisite				
AS1010	Aircraft structures				
AS1011	Aerodynamics				

PURPOSE

To study the dynamic behavior of different aircraft components and the interaction among the aerodynamic, elastic and inertia forces.

INSTRUCTIONAL OBJECTIVES

1.	Know the concepts of vibration and single degree of freedom systems.
2.	Analyze the two Degree and Multi degree of Freedom Systems.
3.	Understand the interaction among the aerodynamic, elastic and inertia forces.

UNIT I BASIC MOTIONS (12 hours)

Simple harmonic motion – Terminologies – Newton's Law – D' Alembert's principle –Energy Methods

UNIT II - SINGLE DEGREE OF FREEDOM SYSTEMS (12 hours)

Free vibrations – Damped vibrations – Forced Vibrations, with and without damping –support excitation – Vibration measuring instruments.

UNIT III - MULTI DEGREE OF FREEDOM SYSTEMS (12 hours)

Two degrees of freedom systems – Static and Dynamic couplings vibration absorber-Principal co- ordinates, Principal modes and orthogonal condition – Eigen value problems. Hamilton's principle-Lagrangean equation and application – Vibration of elastic bodies-Vibration of strings- Longitudinal, Lateral and Torsional vibrations.

UNIT IV - APPROXIMATE METHODS (12 hours)

Rayleigh's and Holzer Methods to find natural frequencies.

UNIT V - ELEMENTS OF AEROELASTICITY (12 hours)

Aeroelastic problems-collar's triangle of forces-wing divergence-aileron control reversal-flutter.

TEXT BOOKS

1. Timoshenko S., "Vibration Problems in Engineering"– John Wiley and Sons, New York, 1993.
2. Fung Y.C., "An Introduction to the Theory of Aero elasticity" – John Wiley & Sons, New York, 1995.

REFERENCES

1. Bisplinghoff R.L., Ashley H and Hoffman R.L., "Aero elasticity" – Addision Wesley Publication, New York, 1983.
3. Tse. F.S., Morse, I.F., Hinkle, R.T., "Mechanical Vibrations", – Prentice Hall, New York, 1984.
4. Scanlan R.H. & Rosenbaum R., "Introduction to the study of Aircraft Vibration & Flutter", John Wiley and Sons. New York, 1982.
5. Tongue. B. H., "Principles of Vibration", Oxford University Press, 2000.

AS1021 VIBRATIONS AND ELEMENTS OF AEROELASTICITY												
Course designed by		Department of Aerospace Engineering										
1.	Student Outcome	a	b	c	d	e	f	g	h	i	j	k
		x				x						x
2.	Mapping of instructional objectives with student outcome	1-3	1-3			1-3						1-3
3.	Category	General (G)	Basic Sciences(B)			Engineering Sciences and Technical Arts (E)						Professional Subjects(P)
												x
4.	Broad Area	Manufacturing		Design		Thermal						General
		x		--		x						--
5.	Approval	23rd meeting of Academic Council, May 2013										

AS1022	AIRCRAFT DESIGN PROJECT II	L	T	P	C
	Total Contact Hours-30	0	0	2	1
	Prerequisite				
	Nil				

PURPOSE

To make the students to design and analyze an aircraft wing, fuselage and landing gear. To study the design of wing root attachments. To make the students to work out the bending stress and shear flow calculations and prepare

INSTRUCTIONAL OBJECTIVES

At the end of the course students will be able

1.	To design the aircraft wing
2.	To design and analyze aircraft fuselage
3.	To know about the design of Landing gear

Students in a group of maximum five are assigned the continuation of the Aircraft Design Project–I or any other, as the case may be. The following are the **assignments** to be carried out.

1. Preliminary design of an Aircraft wing – Shrenck's curve, structural load distribution, shear force, bending moment and torque diagrams
2. Detailed design of an aircraft wing – design of spars and stringers, bending stress and shear flow
3. calculations – buckling analysis of wing panels.
4. Preliminary design of an aircraft fuselage – load distribution on an aircraft fuselage.
5. Detailed design of an aircraft fuselage – design of bulkheads and longerons – bending stress and shear flow calculations – buckling analysis of fuselage panels.
6. Design of control surfaces – balancing and maneuvering loads on the tail plane and aileron, rudder loads.
7. Design of wing – root attachment.
8. Landing gear system.
9. Preparation of a detailed design report with CAD drawings.

REFERENCE

1. Laboratory Manual

AS1022 AIRCRAFT DESIGN PROJECT II												
Course designed by		**Department of Aerospace Engineering**										
1.	Student Outcome	a	b	c	d	e	f	g	h	i	j	k
		x	x			x						
2.	Mapping of instructional objectives with student outcome	1-3	1-3			1-3						
3.	Category	General (G)		Basic Sciences(B)		Engineering Sciences and Technical Arts (E)					Professional Subjects(P)	
											x	
4.	Broad Area	Aerodynamics		Propulsion		Aircraft Structures					General	
		x		--		--					--	
5.	Approval	23rd meeting of Academic Council, May 2013										

AS1023	AEROSPACE COMPUTATIONAL ANALYSIS LABORATORY	L	T	P	C
	Total Contact Hours-30	0	0	2	1
	Prerequisite				
AS1017	Heat transfer				
AS1005	Aerodynamics-I				
AS1010	Aircraft Structures				

PURPOSE

To provide hands-on training to the students on various software to perform static, dynamic, thermal & flow analysis.

INSTRUCTIONAL OBJECTIVES

To familiarize with

1. Structural analysis
2. Flow analysis
3. Thermal analysis

LIST OF EXPERIMENTS:

1. Static & Dynamic analysis of beams.
2. Structural analysis of wing structure
3. 2D design and flow analysis of subsonic and supersonic wind tunnels
4. 2D design and flow analysis of subsonic and supersonic flow over bluff body and streamlined body.
5. 3D design and flow analysis of subsonic and supersonic wind tunnels
6. 3D design and analysis of subsonic flow over bluff body and streamlined body.
7. 3D design and analysis of supersonic flow over blunt body and slender body.
8. Thermal analysis of structural components.
9. Simulation of combustion process
10. Simulation of heat transfer process

REFERENCE

Laboratory manual

AS1023 AEROSPACE COMPUTATIONAL ANALYSIS LABORATORY													
Course designed by		**Department of Aerospace Engineering**											
1.	Student Outcome	a	b	c	d	e	f	g	h	i	j	k	
			x			x						x	
2.	Mapping of instructional objectives with student outcome		1-3			1-2						1-3	
3.	Category	General (G)		Basic Sciences(B)			Engineering Sciences and Technical Arts (E)					Professional Subjects(P)	
												x	
4.	Broad Area	Aerodynamics		Propulsion			Aircraft Structures					General	
		--		--			--					x	
5.	Approval	23rd meeting of Academic Council, May 2013											

AS1046	INDUSTRIAL TRAINING II (Training to be undergone after VI semester)	L	T	P	C
	2 week practical training in industry	0	0	2	1
	Prerequisite				
	Nil				

PURPOSE

To provide hands-on experience at industry, site / planning or design office where Aerospace engineering projects are carried out

INSTRUCTIONAL OBJECTIVES

1.	Students have to undergo two – week practical training in Aerospace Engineering related industry / project site or design / planning office so that they become aware of the practical application of theoretical concepts studied in the class rooms.

Assessment process

This course is mandatory and the student has to pass the course to become eligible for the award of degree. The student shall make a presentation before a committee constituted by the department which will assess the student based on the report submitted and the presentation made. Marks will be awarded out of 100 and appropriate grades assigned as per the regulations.

AS1046 INDUSTRIAL TRAINING II													
Course designed by		**Department of Aerospace Engineering**											
1.	Student Outcome	a	b	c	d	e	f	g	h	i	j	k	
					x	x	x						
2.	Mapping of instructional objectives with student outcome				1	1	1						
3.	Category	General (G)		Basic Sciences(B)			Engineering Sciences and Technical Arts (E)					Professional Subjects(P)	
												x	
4.	Broad Area	Aerodynamics		Propulsion			Aircraft Structures					General	
		--		--			--					x	
5.	Approval	23rd meeting of Academic Council, May 2013											

SEMESTER VIII

AS1050	PROJECT WORK	L	T	P	C
		0	0	24	12

PURPOSE

To apply the knowledge obtained in the theoretical and laboratory courses. To design and fabricate various components and instruments related to Aerospace Engineering and to analyze various problems related to Aerospace Engineering

INSTRUCTIONAL OBJECTIVES

1.	Students have to do a project work either single or in a group for a period of one semester and submit a project report.

Hardware/ Numerical /Theoretical research and development work is to be allotted. A maximum number of three students may be involved in each project. However the contribution of the individuals in the project should be clearly brought out. The combined project report is to be submitted as per the university regulations. A seminar has to be presented on the allotted topic. All the students involved in the project will be examined for their contribution.

AS1050 PROJECT WORK												
Course designed by		Department of Aerospace Engineering										
1.	Student Outcome	a	b	c	d	e	f	g	h	i	j	k
				x	x	x						
2.	Mapping of instructional objectives with student outcome			1	1	1						
3.	Category	General (G)		Basic Sciences(B)		Engineering Sciences and Technical Arts (E)					Professional Subjects(P)	
											x	
4.	Broad Area	Aerodynamics		Propulsion		Aircraft Structures					General	
		--		--		--					x	
5.	Approval	23rd meeting of Academic Council, May 2013										

Department Electives

AS1101	HELICOPTER AERODYNAMICS	L	T	P	C
	Total Contact Hours-45	3	0	0	3
	Prerequisite				
AS1011	Aerodynamics-I				

PURPOSE

To familiarize on the elements of helicopter aerodynamics and ground Effect machines.

INSTRUCTIONAL OBJECTIVES

1.	To become familiarize on major helicopter components, characteristics and configurations.
2.	To become familiar with major issues involved in forward flight rotor theory.
3.	To become familiar with special power estimates.

UNIT I-ELEMENTS OF HELICOPTER AERODYNAMICS (9 hours)

Configurations based on torque reaction-Jet rotors and compound helicopters-Methods of control — Collective and cyclic pitch changes - Lead - Lag and flapping hinges.

UNIT II-IDEAL ROTOR THEORY (9 hours)

Hovering performance - Momentum and simple blade element theories - Figure of merit - Profile and induced power estimation - Constant chord and ideal twist rotors.

UNIT III -POWER ESTIMATES (9 hours)

Induced, profile and parasite power requirements in forward flight-Performance curves with effects of altitude- Preliminary ideas on helicopter stability

UNIT IV-LIFT, PROPULSION AND CONTROL OF VISTOL AIRCRAFT (9 hours)

Various configuration - Propeller, rotor, ducted fan and jet lift - Tilt wing and vectored thrust - Performance of VTOL and STOL aircraft in hover, transition and forward motion.

UNIT V-GROUND EFFECT MACHINES (9 hours)

Types - Hover height, lift augmentation and power calculations for plenum chamber and peripheral jet machine - Drag of hovercraft on land and water. Applications of hovercraft.

TEXTBOOKS

1. Gessow, A., and Myers, G,C., "*Aerodynamics of Helicopter"*, Macmillan & Co., N.Y. 1987.
2. McCormick, B,W., "*Aerodynamics of V/STOL Flight"*, Academic Press, 1987

REFERENCES

1. Johnson, W., "*Helicopter Theory*," Princeton University Press, 1980.
2. McCormick, B,W., "*Aerodynamics, Aeronautics and Flight Mechanics"* John Wiley, 1995.
3. Gupta, L., "*Helicopter Engineering"*, Himalayan Books, 1996.

AS1101 – HELICOPTER AERODYNAMICS												
Course designed by		**Department of Aerospace Engineering**										
1.	Student Outcome	a	b	c	d	e	f	g	h	i	j	k
		x				x						
2.	Mapping of instructional objectives with student outcome	1-3				1-3						
3.	Category	General (G)	Basic Sciences(B)			Engineering Sciences and Technical Arts (E)						Professional Subjects(P)
												x
4.	Broad Area	Aerodynamics			Propulsion		Aircraft Structures					General
		x			--		--					--
5.	Approval	23rd meeting of Academic Council, May 2013										

AS1102	**ROCKETS AND MISSILES**	**L**	**T**	**P**	**C**
	Total Contact Hours-45	**3**	**0**	**0**	**3**
	Prerequisite				
AS1011	**Aerodynamics-II**				
AS1018	**Rocket Propulsion**				

PURPOSE

To provide the design basics of rockets and missiles, their construction and functions. To focus on design principles, performance, materials selection and testing of rockets and missiles. To understand aerodynamics, flight dynamics, optimization of performance of multi-stage rockets and separation dynamics of rockets and missiles.

INSTRUCTIONAL OBJECTIVES	
At the end of the course students will be able	
1.	To compute and analyze the various forces and moments acting on a rocket.
2.	To formulate the equations of motions for flight and separation phases
3.	To understand the combustion and propulsion systems in rocket
4.	To select suitable materials for the rockets and missiles
5.	To understand the design, performance and testing aspects.

UNIT I-ROCKET DYNAMICS (9 hours)

Classification of launch vehicles and missiles – Rocket systems - Airframe components - Forces and moments acting on a rocket – Propulsion, aerodynamics, gravity – inertial and non-inertial frames - coordinate transformation – Equations of motion for three dimensional motion through atmosphere and vacuum, earth's atmosphere, numerical problems

UNIT II-SOLID PROPULSION AND PYROTECHNICS (9 hours)

Solid propellant rockets - classification, components and their design considerations, propellant grain design - grain mechanical properties, ballistics and burn rate design issues - igniter design - types of nozzles and thrust vector control, pyrotechnic devices and systems-classification, mechanisms and application of pyrotechnic devices in rockets and missiles. Design problems in rocket systems.

UNIT III-LIQUID PROPULSION AND CONTROL SYSTEMS (9 hours)

Liquid propellant rockets – classification and components - thrust chamber, feed systems, propellant tanks, turbo-pumps, types of valves and applications- their design considerations. Different bipropellant systems like cryogenics and their characteristics, pogo and slooh engine gimbal systems and thrusters for control. Spacecraft propulsion and control systems-Design problems.

UNIT IV-MULTI-STAGING OF ROCKET AND SEPARATION DYNAMICS (9 hours)

Navigation and guidance systems in rockets and missiles - aerodynamic control systems of missiles- multi-staging of rockets - vehicle optimization techniques - stage separation system – dynamics, separation techniques - rocket flight dispersion, numerical problems.

UNIT V-DESIGN, MATERIALS AND TESTING OF ROCKETS (9 hours)

Design requirements and selection, performance evaluation and assessment, space environment on the selection of materials for rockets and spacecraft, material selection for specific requirements, advance materials-super alloys and composite materials. Qualification of rocket and missile systems, types of testing and evaluation of design and function.

TEXT BOOKS

1. Ramamurthi.K.: Rocket Propulsion. Macmillan Publishers India first edition. 2010.
2. Sutton.G.P. and Biblarz.O.: Rocket Propulsion Elements.7th edition.Wiley India Pvt Ltd.2010.
3. Cornelisse, J.W, Schoyer H F R, and Wakker K F, "Rocket Propulsion and Space Dynamic", Pitman Publishing Co., 1979.

REFERENCES

1. Ronald Humble, Henry and Larson.Space Propulsion Analysis and Design. McGraw-Hill. 1995
2. George M. Siouris, Missile Guidance and Control Systems, Springer-Verlag New York, 2000.

AS1102 – ROCKETS AND MISSILES												
Course designed by		**Department of Aerospace Engineering**										
1.	Student Outcome	a	b	c	d	e	f	g	h	i	j	k
		x				x						
2.	Mapping of instructional objectives with student outcome	1-5				1-5						
3.	Category	General (G)		Basic Sciences(B)		Engineering Sciences and Technical Arts (E)					Professional Subjects(P)	
											x	
4.	Broad Area	Aerodynamics		Propulsion		Aircraft Structures					General	
		--		x		--					--	
5.	Approval	23rd meeting of Academic Council, May 2013										

AS1103	AIRCRAFT ENGINE AND INSTRUMENT SYSTEMS	L	T	P	C
	Total Contact Hours-45	3	0	0	3
	Prerequisite				
AS1008	Aircraft systems and instruments				

PURPOSE

To study about aircraft engines, instruments and electrical systems.

INSTRUCTIONAL OBJECTIVES

1. To Know about Location, visibility and groping of Instrument, Panels, Basic Instrument elements and Mechanism.
2. To study about basic electrical system, communication and navigating system in aircraft.

UNIT I-RECIPROCATING ENGINES (9 hours)

Ignition and starting – Fuels and their characteristics for IC engines, contamination of fuels and prevention – Instruments for reciprocating engines.

UNIT II-GAS TURBINE ENGINES (9 hours)

Fuels – Characteristics – Fuel Systems – Lubricant and Lubricant systems – Ignition and starting system – Electronic Engine controls – Full Authority Digital Control (FADEC) – engine Indicating, warning and control systems – Instruments for gas turbine engine – Fire warning systems – Aircraft Instruments systems.

UNIT III-FLIGHT INSTRUMENTS (9 hours)

Location, visibility and grouping of Instruments, Panels, Basic Instrument elements and Mechanism, Instruments Panels – Displays – Layouts – Grouping details of:

i. Pitot instrument and systems.
ii. Primary flight instruments.
iii. Heading indicating instruments.
iv. Remote indicating systems.
v. Synchronous data transmission systems.
vi. Flight director and Flight data recording systems.
vii. ECAM/EICA/EFIS – Their concepts, detailed description maintenance and practices.

ECAM – Electronic Central Aircraft Monitor.
EICAS – Engine Indicator Crew Alert Systems.
EFIS – Electronic flight Instruments Systems.

UNIT IV-COMMUNCATION AND NAVIGATIONS SYSTEMS (9 hours)

Basic Principles Equipment – Power Sources – Airborne Navigational Equipment – VHF – ILS – DME – ADF – Radar and Doppler Navigation – Inertial Navigation, VOR MLS (Microwave Landing Systems) Cockpit Voice Recorder (CVR),ELT (Emergency Locator Transmitter).

UNIT V-BASIC AIRCRAFT ELECTRICAL SYSTMES (9 hours)

Source of power – DC and AC generator – Inverters, rectifiers, transformers, batteries – Airplane lighting – Power utilization in airplanes.

TEXT BOOKS

1. Bent, R.D. Mickinely., Aircraft Maintenance and Repair, 2nd Edition – McGraw Hill Inc ., NowYork, 1978.
2. Adams, H.W., Afrcwlt Hydraulic, McGraw Hill Book Co. Inc., New York, 1943.

REFEREMCE

1. Casamassa, J.V., and Bent R., Jet Aircraft Power Systems, McGraw Hill Book Co., New York,1975

AS1103 – AIRCRAFT ENGINE AND INSTRUMENT SYSTEMS												
Course designed by		**Department of Aerospace Engineering**										
1.	Student Outcome	a	b	c	d	e	f	g	h	i	j	k
		x				x						x
2.	Mapping of instructional objectives with student outcome	1-2				1-2						1-2
3.	Category	General (G)		Basic Sciences(B)		Engineering Sciences and Technical Arts (E)						Professional Subjects(P)
												x
4.	Broad Area	Aerodynamics		Propulsion		Aircraft Structures						General
		--		x		--						x
5.	Approval	23rd meeting of Academic Council, May 2013										

AS1104	**COMBUSTION ENGINEERING**	**L**	**T**	**P**	**C**
	Total Contact Hours-45	**3**	**0**	**0**	**3**
	Prerequisite				
AS1002	**Aero Thermodynamics**				

PURPOSE

To familiarize the students in the area of combustion in various engines.

INSTRUCTIONAL OBJECTIVES

To know the

1. Concepts in combustion
2. To make combustion calculations
3. To know supersonic combustion

UNIT I-FUNDAMENTAL CONCEPTS IN COMBUSTION (9 hours)

Thermo - chemical equations - Heat of reaction first order, second order and third order reactions — premixed flames - Diffusion flames

UNIT II-CHEMICAL KINETICS AND FLAMES (9 hours)

Measurement of burning velocity - Various methods - Effect of various parameters on burning velocity - Flame stability - Detonation - Deflagration - Rankine – Hugoniot curve - Radiation by flames.

UNIT III-COMBUSTION IN GAS TURBINE ENGINES (9 hours)

Combustion in gas turbine combustion chambers - Re-circulation – Combustion efficiency - Factors affecting combustion efficiency - Fuels used for gas turbine combustion chambers - Combustion stability - Flame holder types – Numerical problems.

UNIT IV-COMBUSTION IN ROCKETS (9 hours)

Solid propellant combustion - Double base and composite propellant combustion - Various combustion models - Combustion in liquid rocket engines - Single fuel droplet combustion model - Combustion in hybrid rockets.

UNIT V-SUPERSONIC COMBUSTION (9 hours)

Introduction - Supersonic combustion controlled by mixing, diffusion and heat convection - Analysis of reaction and mixing processes - Supersonic burning with detonation shocks.

TEXT BOOKS

1. Sharma, S.P., and Chandra Mohan, "*Fuels and Combustion"*, Tata McGraw Hill Publishing Co., Ltd., New Delhi 1987.
2. Loh, W.H.T., Jet Rocket, "*Nuclear, Ion and Electric Propulsion Theory and Design"*, Springer Verlag, New York 1982.

REFERENCES

1. Beer, J.M. and Chigier, N.A., *Combustion Aerodynamics*, Applied Science Publishers Ltd., London, 1981.
2. Chowdhury, R., *Applied Engineering Thermodynamics*, Khanna Publishers, New Delhi, 1986.
3. Sutton, G.P., and Biblarz, 0., *Rocket Propulsion Elements*, 7th Edition John Wiley and Sons, Inc., New York, 2001.
4. Mathur, M., and Sharma, R.P., *Gas Turbines and Jet and Rocket Propulsion*, Standard Publishers,New Delhi, 1988.
5. Turns, S.R., *An Introduction to Combustion Concepts and Applications*, 2nd Edition. McGraw Hill International Editions, New Delhi, 2000.

AS1104 – COMBUSTION ENGINEERING													
Course designed by		Department of Aerospace Engineering											
1.	Student Outcome	a	b	c	d	e	f	g	h	i	j	k	
		x				x							
2.	Mapping of instructional objectives with student outcome	1-3				1-3							
3.	Category	General (G)		Basic Sciences(B)		Engineering Sciences and Technical Arts (E)				Professional Subjects(P)			
										x			
4.	Broad Area	Aerodynamics		Propulsion		Aircraft Structures				General			
		--		x		--				--			
5.	Approval	23rd meeting of Academic Council, May 2013											

	CRYOGENICS	L	T	P	C
AS1105	Total Contact Hours-45	3	0	0	3
	Prerequisite				
AS1002	Thermodynamics				

PURPOSE

To have a detailed study of the basics of cryogenic systems, its cycle and application in aerospace engineering

INSTRUCTIONAL OBJECTIVES

1. To analyze cryogenic systems
2. To calculate the efficiency of cryogenic systems
3. To know cryogenic applications in aerospace engineering

UNIT I-INTRODUCTION (9 hours)

Historical Background - Introduction to cryogenic propellants - Liquid hydrogen, liquid helium, liquid nitrogen and liquid oxygen and their properties

UNIT II-PRODUCTION OF LOW TEMPERATURE (9 hours)

Theory behind the production of low temperature - Expansion engine heat exchangers - Cascade process Joule Thompson Effect - Magnetic effect - Ortho and H2 - Helium4 and Helium 3

UNIT III-EFFICIENCY OF CRYOGENIC SYSTEMS (9 hours)

Types of losses and efficiency of cycles - specific amount of cooling - The fraction liquified - Cooling coefficient of performance - Thermodynamic efficiency – The energy balance Method

UNIT IV-CYCLES OF CRYOGENIC PLANTS (9 hours)

Classification of cryogenic cycles - The structure of cycles - Throttle expansion cycles - Expander cycles - Thermodynamic analysis - Numerical problems

UNIT V-CRYOGENIC IN AEROSPACE APPLICATIONS (9 hours)

Cryogenic liquids in Rocket launching and space simulation Storage of cryogenic liquids - Effect of cryogenic liquids on properties of aerospace materials – Cryogenic loading problems - Zero gravity problems associated with cryogenic propellants - Phenomenon of tank collapse - Elimination of Geysering effect in missiles

TEXT BOOKS

1. Haseldom, G., "*Cryogenic Fundamentals"*, Academic Press, 1971
2. Barron, R. F., "*Cryogenic Systems"*, Oxford University, 1985

REFERENCE

1. Parner, S. F., "*Propellant Chemistry"*, Reinhold Publishing Corpn., New York 1985.

AS1105 – CRYOGENICS												
Course designed by		**Department of Aerospace Engineering**										
1.	Student Outcome	a	b	c	d	e	f	g	h	i	j	k
		x				x						
2.	Mapping of instructional objectives with student outcome	1-3				1-3						
3.	Category	General (G)		Basic Sciences(B)		Engineering Sciences and Technical Arts (E)					Professional Subjects(P)	
											x	
4.	Broad Area	Aerodynamics		Propulsion		Aircraft Structures					General	
		--		x		--					--	
5.	Approval	23rd meeting of Academic Council, May 2013										

AS1106	**THEORY OF PLATES AND SHELLS**	**L**	**T**	**P**	**C**
	Total Contact Hours-45	**3**	**0**	**0**	**3**
	Prerequisite				
ME1010	**Strength of Materials**				
PURPOSE					
This course is aimed at theories of stresses for plates and shells					
INSTRUCTIONAL OBJECTIVES					
1.	To know about the theory of plates, plain stress and strain problems.				
2.	Circular plates, rectangular plates and there stability analysis are studied.				
3.	To study about shells and finite difference methods.				

UNIT I-CLASSICAL PLATE THEORY AND CIRCULAR PLATES (9 hours)

Classical Plato theory Assumptions - Differential equation - Boundary conditions. Governing equation solution for axi-symmetric loading - Annular plates - Plates of other shapes.

UNIT II-RECTANGULAR PLATES (9 hours)

Navier's method of solution for simply supported rectangular plates - Levy's method of solution for rectangular plates under different boundary conditions.

UNIT III-EIGEN VALUE ANALYSIS (9 hours)

Stability and free vibration analysis of rectangular plates.

UNIT IV-APPROXIMATE METHODS (9 hours)

Rayleigh - Ritz - Galorkin - Finite difference method - Application to rectangular plates for static, free vibration and stability analysis.

UNIT V-SHELLS (9 hours)

Basic concepts of shell type of structures - Membrane and bending theories for circular cylindrical shells.

TEXTBOOK

1. Timoshenko, S.P. Winowsky.S., and Kreger, "*Theory of Plates and Shells*," McGraw Hill Book Co.,1989.
2. Flugge, W., "*Stresses in Shells, Springer"* - Verlag, 1980.

REFERENCES

1. Timoshenko, S.P. and Gere, J.M., "*Theory of Elastic Stability"*, McGraw Hill Book Co., 1986.

AS1106 – THEORY OF PLATES AND SHELLS												
Course designed by		**Department of Aerospace Engineering**										
1.	Student Outcome	a	b	c	d	e	f	g	h	i	j	k
		x				x						
2.	Mapping of instructional objectives with student outcome	1-3				1-3						
3.	Category	General (G)	Basic Sciences(B)			Engineering Sciences and Technical Arts (E)						Professional Subjects(P)
												x
4.	Broad Area	Aerodynamics		Propulsion		Aircraft Structures						General
		--		--		x						--
5.	Approval	23rd meeting of Academic Council, May 2013										

AS1107	FATIGUE AND FRACTURE MECHANICS	L	T	P	C
	Total Contact Hours-45	3	0	0	3
	Prerequisite				
ME1010	Mechanics of Solids				

PURPOSE	
To familiarized the students in the area of fatigue and fracture mechanics.	
INSTRUCTIONAL OBJECTIVES	
	To know about
1.	The fracture behaviors
2.	The fatigue design and testing

UNIT I-FATIGUE OF STRUCTURES (9 hours)

S.N. Curves - Endurance limit - Effect of mean stress, Goodman, Gerber and Soderberg relations and diagrams - Notches and stress concentrations - Neuber's stress concentration factors - Plastic stress concentration factors - Notched S.N. curves.

UNIT II-STATISTICAL ASPECTS OF FATIGUE BEHAVIOUR

(9 hours)

Low cycle and high cycle fatigue - Coffin - Manson's relation - Transition life - Cyclic strain hardening and softening - Analysis of load histories - Cycle counting techniques Cumulative damage - Miner's theory — Other theories.

UNIT III-PHYSICAL ASPECTS OF FATIGUE (9 hours)

Phase in fatigue life - Crack initiation - Crack growth - Final fracture - Dislocations - Fatigue fracture surfaces.

UNIT IV-FRACTURE MECHANICS (9 hours)

Strength of cracked bodies - Potential energy and surface energy - Griffith's theory - Irwin - Orwin extension of Griffith's theory to ductile materials - Stress analysis of cracked bodies - Effect of thickness on fracture toughness - Stress intensity factors for typical geometries.

UNIT V-FATIGUE DESIGN AND TESTING (9 hours)

Safe Life and Fail safe design philosophies Importance of Fracture Mechanics in aerospace structure - Application to composite materials and structures.

TEXT BOOKS

1. Barrels, W., and Ripley, E.L., "*Fatigue of Aircraft Structures"*, Pergamon Press, Oxford, 1983.
2. Knott, J.F., "*Fundamentals of Fracture Mechanics"*, Butterworth & Co., (Publishers) Ltd., London, 1983.

REFERENCES

1. Sih, C.G., "*Mechanics of Fracture"*, Vol.1 Sijthoff and Noordhoff International Publishing Co., Netherlands, 1989.

AS1107 – FATIGUE AND FRACTURE MECHANICS												
Course designed by		**Department of Aerospace Engineering**										
1.	Student Outcome	a	b	c	d	e	f	g	h	i	j	k
		x	x			x						
2.	Mapping of instructional objectives with student outcome	1	2			1						
3.	Category	General (G)	Basic Sciences(B)			Engineering Sciences and Technical Arts (E)						Professional Subjects(P)
												x
4.	Broad Area	Aerodynamics		Propulsion		Aircraft Structures						General
		--		--		x						--
5.	Approval	23rd meeting of Academic Council, May 2013										

AS1108	**COMPUTER AIDED DESIGN AND ANALYSIS**	**L**	**T**	**P**	**C**
	Total Contact Hours-45	**3**	**0**	**0**	**3**
	Prerequisite				
ME1005	**Engineering graphics**				
PURPOSE					
To study how computer can be applied in mechanical engineering design					
INSTRUCTIONAL OBJECTIVES					
	To familiarize with				
1.	Concepts of modeling of 2D and 3D geometrical elements				
2.	Concepts of computer graphics				
3.	CAD Packages and its features.				
4.	Theory of analysis and its implementation in CAD				

UNIT I-INTRODUCTION **(9 hours)**

Introduction to CAD - I/O devices - various graphics standards - coordinate systems. Geometric Modeling: Introduction - types of geometric modeling-

wire frame- surface and solid modeling. Wireframe entities- types of curves and its mathematical representation - line- circle- ellipse- parabola- Cubic spline- Bezier and B-spline (Only Basic treatment). Solid modeling entities - Solid modeling techniques- CSG and BREP - Operations performed in CSG and BREP - Extrude- sweep - linear and Nonlinear- revolve

UNIT II-GRAPHIC CONCEPTS (2D and 3D) (9 hours)

Transformations - translation- scaling- reflection- rotation. Concatenated transformation. Inverse transformation..Hidden line removal - Z-Buffer algorithm- brief description of shading and color rendering techniques. Manipulation and editing of entities - selection methods – dragging - clipping- trimming- stretching- offsetting- pattern- copying- deleting - regenerating- measuring. Brief description of animation- types and techniques

UNIT III-SOFTWARE PACKAGES AND RECENT TECHNOLOGY (9 hours)

All about popular commercial solid modeling packages — their salient features- technical comparison- modules and Tools available- brief outline of Data exchange standards. Brief outline of feature technology - classification of features- design by features- applications of features- its advantages- and limitations

UNIT IV-FEM FUNDAMENTALS (9 hours)

Introduction to finite element method - principle- Steps involved in FEA - nodes- element and their types- shape function-constraints, forces and nodal displacements-stiffness matrix- solution techniques. Analysis of spring element. Simple problems involving stepped bars subjected to axial loading and simple structural members for triangular element

UNIT V-ANALYSIS (9 hours)

FEA in a CAD Environment Stages of FEA in a CAD environment - Preprocessor- solver and postprocessor. Preprocessing - FEA modeling - geometry generation- node generation- element generation- boundary constraints- load constraints- - mesh generation and refining. Solving - performing the actual analysis. Post processing - Types of 0/P available- interpretation of results. Demonstration of the above using any one popular commercial package. Other types of analysis: Brief outline of kinematical analysis- manufacturability analysis and simulation.

TEXT BOOKS

1. Ibrahim Zoid., *CAD / CAM — Theory and Practice*, TMH, 2001.
2. Radhakrishnan, P., *CAD / CAM / CIM*- New Age International, 2000.
3. Chairs Mcmahon and Jimmie Browne, *CAD/CAM*, Addision Wesly, Newyork, 2000.

REFERENCES

1. Chandupatla and Bolagundu., "*Introduction to Finite Element Methods in Engineering"*, PHI, 1997.
2. Newman and Sproull, R.F., "*Principles of interactive Computer Graphics"*, TMH,1997,
3. Mikell P. Groover, "*CAD/CAM*," PHI, 1997.

AS1108 – COMPUTER AIDED DESIGN AND ANALYSIS												
Course designed by		Department of Aerospace Engineering										
1.	Student Outcome	a	b	c	d	e	f	g	h	i	j	k
		x				x						x
2.	Mapping of instructional objectives with student outcome	1-4				4						1-3
3.	Category	General (G)		Basic Sciences(B)		Engineering Sciences and Technical Arts (E)					Professional Subjects(P)	
											x	
4.	Broad Area	Aerodynamics		Propulsion		Aircraft Structures					General	
		--		--		x					--	
5.	Approval	23rd meeting of Academic Council, May 2013										

AS1109	AIRFRAME MAINTENANCE AND REPAIR	L	T	P	C
	Total Contact Hours-45	3	0	0	3
	Prerequisite				
AS1008	Aircraft systems and instruments				

PURPOSE

The students will learn various maintenance practices in Aircraft structures.

INSTRUCTIONAL OBJECTIVES

1.	To familiarize in welding technology and sheet metal repair works
2.	To study the use of plastic and composite materials in Aircraft
3.	To study the Hydraulic and Pneumatic systems in Aircraft
4.	To study Safety Practices

UNIT I-WELDING IN AIRCRAFT STRUCTURAL COMPONENTS (9 hours)

Equipments used in welding shop and their maintenance - Ensuring quality welds - Welding jigs and fixtures - Soldering and brazing. Sheet metal Repair and Maintenance: Inspection of damage Classification - Repair or replacement - Sheet metal inspection - N.D.T. testing, riveted repair design, Damage investigation – Reverse technology.

UNIT II-PLASTICS AND COMPOSITES IN AIRCRAFT (9 hours)

Plastics in Aircraft : Review of types of plastics used in airplanes - Maintenance and repair of plastic components - Repair of cracks, holes etc., various repair schemes - Scopes. Advanced composites in Aircraft: Inspection - Repair of composite components — Special precautions - Autoclaves.

UNIT III-AIRCRAFT JACKING, ASSEMBLY AND RIGGING (9 hours)

Airplane jacking and weighing and C.G. Location. Balancing of control surfaces – Inspection and maintenance. Helicopter flight controls. Tracking and balancing of main rotor.

UNIT IV-REVIEW OF HYDRAULIC AND PNEUMATIC SYSTEM (9 hours)

Trouble shooting and maintenance practices - Service and inspection - Inspection and maintenance of landing gear systems. - Inspection and maintenance of air - conditioning and pressurization system, water and waste system. Installation and maintenance of Instruments - handling - Testing - Inspection. Inspection and maintenance of auxiliary systems - Fire protection systems - Ice protection system - Rain removal system - Position and warning system - Auxiliary Power Units (APUs).

UNIT V-SAFETY PRACTICES (9 hours)

Hazardous materials storage and handling, aircraft furnishing practices - Equipments. Trouble shooting-theory and practices.

TEXT BOOK

1. Kroes, Watkins, Delp., "*Aircraft Maintenance and Repair"*, McGraw Hill, New York, 1992.
2. Brimm, D. J., Bogges R. E., "*Aircraft Maintenance"*, Pitman Publishing corp., New York, 1940.

REFERENCE

1. Larry Reithmeir., "*Aircraft Repair Manual"*, Palamar Books, Marquette, 1992.

AS1109 – AIRFRAME MAINTENANCE AND REPAIR												
Course designed by		Department of Aerospace Engineering										
1.	Student Outcome	a	b	c	d	e	f	g	h	i	j	k
		x										x
2.	Mapping of instructional objectives with student outcome	1-4										1-4
3.	Category	General (G)		Basic Sciences(B)		Engineering Sciences and Technical Arts (E)						Professional Subjects(P)
												x
4.	Broad Area	Aerodynamics		Propulsion		Aircraft Structures				General		
		--		--		--				x		
5.	Approval	23rd meeting of Academic Council, May 2013										

AS1110	AIR TRANSPORTATION AND AIRCRAFT MAINTENANCE MANAGEMENT	L	T	P	C
	Total Contact Hours-45	3	0	0	3
	Prerequisite				
	Nil				

PURPOSE

To familiarize the students with the knowledge about Air Transportation, its economic principles and scheduling and monitoring of Aircraft Maintenance.

INSTRUCTIONAL OBJECTIVES

1.	To understand the organization details in Air-Transportation
2.	To study the Principles of Airline Scheduling
3.	To understand the Airline Maintenance Schedule and monitoring Procedures

UNIT I-INTRODUCTION (9 hours)

Development of air transportation, comparison with other modes of transport - Role of IATA, ICAO The general aviation industry airline - Factors affecting general aviation, use of aircraft, airport: airline management and organisation - levels of management, functions of management, Principles of organisation planning the organisation chart, staff departments and line departments.

UNIT II-AIRLINE ECONOMICS (9 hours)

Forecasting Fleet size, Fleet planning, the aircraft selection process, operating cost, passenger capacity, load factor etc. - Passenger fare and tariffs - Influence of geographical, economic and political factors on routes and route

selection. Fleet Planning: The aircraft selection process - Fleet commonality, factors affecting choice of fleet, route selection and Capital acquisition - Valuation and Depreciation - Budgeting, Cost planning - Aircrew evaluation - Route analysis - Aircraft evaluation.

UNIT III-PRINCIPLES OF AIRLINES SCHEDULING (9 hours)

Equipment maintenance, Flight operations and crew scheduling, Ground operations and facility limitations equipments and types of schedule - hub and spoke scheduling, advantages / disadvantages and preparing flight plans - Aircraft scheduling in line with aircraft maintenance practices.

UNIT IV-AIRCRAFT RELIABILITY (9 hours)

Aircraft reliability - The maintenance schedule and its determinations - Condition monitoring maintenance - Extended range operations (EROPS) and ETOPS - Ageing aircraft maintenance production.

UNIT V-TECHNOLOGY IN AIRCRAFT MAINTENANCE (9 hours)

Airlines scheduling (with reference to engineering) - Product support and spares - Maintenance sharing - Equipments and tools for aircraft maintenance - Aircraft weight control - Budgetary control. On board maintenance systems - Engine monitoring - Turbine engine oil maintenance - Turbine engine vibration monitoring in aircraft - Life usage monitoring - Current capabilities of NDT - Helicopter maintenance - Future of aircraft maintenance.

TEXT BOOKS

1. Fedric, J.H., "*Airport Management"*, English Book House, New Delhi-I.
2. Gene Krope., "*Airline Procedures"*, English Book House, New Delhi-I.

REFERENCES

1. Wilson and Bryon, "*Air Transportation"*, English Book House, New Delhi-I.
2. Philip Lockin D, "*Economics of Transportation"*, English Book House, New Delhi-I.
3. *"Indian Aircraft Manual*," Published by DGGA, English Book House, New Delhi-I.
4. Alexander T Wells, "*Air Transportation"*, Wadsworth Publishing Company, California, 1993.
5. Friend, C.H., "*Aircraft Maintenance Management"*, English Book House, New Delhi-I.

AS1110 – AIR TRANSPORTATION AND AIRCRAFT MAINTENANCE MANAGEMENT													
Course designed by		Department of Aerospace Engineering											
1.	Student Outcome	a	b	c	d	e	f	g	h	i	j	k	
				x			x		x				
2.	Mapping of instructional objectives with student outcome			1-3			1-3		1-3				
3.	Category	General (G)		Basic Sciences(B)			Engineering Sciences and Technical Arts (E)				Professional Subjects(P)		
											x		
4.	Broad Area	Aerodynamics		Propulsion			Aircraft Structures				General		
		--		--			--				x		
5.	Approval	23rd meeting of Academic Council, May 2013											

AS1111	AUTOMATIC CONTROL SYSTEMS	L	T	P	C
	Total Contact Hours-45	3	0	0	3
	Prerequisite				
IC1051	ELECTRONICS AND INSTRUMENTATION				

PURPOSE

To provide the basics and fundamental concepts of automatic control systems. This will permit an engineer to exploit time domain and frequency domain tools to design and study automatic linear control systems.

INSTRUCTIONAL OBJECTIVES

1.	At the conclusion of this course, the students will be able to:
2.	Describe the transfer functions for automatic control systems; open-loop and closed-loop systems.
3.	Describe the various time domain and frequency domain tools for analysis and design of linear control systems.
4.	Describe the methods to analyze the stability of systems from transfer function forms. Describe the methods to analyze the stability of systems from transfer function forms.
5.	Describe the methods to analyze the sampled-data control systems

UNIT I-INTRODUCTION TO AUTOMATIC CONTROL SYSTEMS (9 hours)

Historical review, Examples of control systems: simple pneumatic, hydraulic and thermal systems, series and parallel systems, analogies, mechanical and electrical components.

UNIT II-OPEN AND CLOSED LOOP SYSTEMS (9 hours)

Closed loop control versus open loop control, Feedback control systems, Block diagram representation of control systems, reduction of block diagrams, Output to input ratios.

UNIT III-TRANSIENT AND STEADY-STATE RESPONSE ANALYSIS (9 hours)

Laplace transformation, Response of systems to different inputs viz. Step, impulse, pulse, parabolic and sinusoidal inputs, Time response of first and second order systems, steady state errors and error constants of unity feedback circuit.

UNIT IV-STABILITY ANALYSIS (9 hours)

Stability definitions, characteristic equation, location of roots in the s-plane for stability, Routh-Hurwitz criteria of stability, Root locus and Bode techniques, concept and construction, frequency response.

UNIT V- SAMPLED DATA CONTROL SYSTEMS (9 hours)

Sampled data control systems - functional elements-sampling process - z-transforms- properties - inverse z- transforms- response between samples-modified z-transforms - ZOH and First order Hold process- mapping between s and z planes - pulse transfer functions - step response – stability analysis-Jury's stability test.

TEXT BOOKS

1. Katsuhiko Ogata., "*Modern Control Engineering"*, 4th edition, Prentice Hall of India Private Ltd, NewDelhi, 2004.
2. Nagrath, I J and Gopal, .M., "*Control Systems Engineering"*, 4th edition, New Age International Pvt. Ltd., New Delhi, 2006.

RREFERENCES

1. Benjamin, C Kuo., "*Automatic Control System"*, 7th edition, Prentice Hall of India Private Ltd, New Delhi, 1993.
2. Richard, C. Dorf and Robert H. Bishop., "*Modern Control System Engineering"*, Addison Wesley, 1999.

AS1111– AUTOMATIC CONTROL SYSTEMS												
Course designed by		Department of Aerospace Engineering										
1.	Student Outcome	a	b	c	d	e	f	g	h	i	j	k
		x	x									
2.	Mapping of instructional objectives with student outcome	1-4	2-4									
3.	Category	General (G)		Basic Sciences(B)		Engineering Sciences and Technical Arts (E)					Professional Subjects(P)	
											x	
4.	Broad Area	Aerodynamics		Propulsion		Aircraft Structures					General	
		--		--		--					x	
5.	Approval	23rd meeting of Academic Council, May 2013										

AS1112	SPACECRAFT TECHNOLOGY	L	T	P	C
	Total Contact Hours-45	3	0	0	3
	Prerequisite				
AS1015	INTRODUCTION TO SPACE TECHNOLOGY				

PURPOSE

To familiarize the student with space mechanics and space missions.

INSTRUCTIONAL OBJECTIVES

To study the basic concepts of orbital Mechanics with particular emphasis on interplanetary trajectories

UNIT I-BASIC CONCEPTS (9 hours)

The Solar System – References Frames and Coordinate Systems – The Celestial Sphere – The Ecliptic – Motion of Vernal Equinox – Sideral Time – Solar Time – Standard Time – The Earth's Atmosphere.

UNIT II-THE GENERAL N-BODY PROBLEM (9 hours)

The many body Problem – Langrange – Jacobian Identity – The Circular Restricted Three Body Problem – Libration Points – Relative Motion in the N-body Problem – Two – Body Problem – Satellite Orbits – Relations Between Position and Time – Orbital Elements.

UNIT III-SATELLITE INJECTION AND SATELLITE ORBIT PERTURBATIONS (9 hours)

General Aspects of satellite Injections – Satellite Orbit Transfer – Various Cases – Orbit Deviations Due to Injection – Errors – Special and General Perturbations – Cowell's Method – Encke's Method – Method of vibrations of Orbital Elements – General Perturbations Approach.

UNIT IV-INTERPLANETARY TRAJECTORIES (9 hours)

Two Dimensional Interplanetary Trajectories – Fast Interplanetary Trajectories – Three Dimensional Interplanetary Trajectories - Three Dimensional Interplanetary Trajectories – Launch if Interplanetary Spacecraft – Trajectory about the Target Planet.

UNIT V-BALLISTIC MISSILE TRAJECTORIES AND MATERIALS (9 hours)

The Boost Phase – The Ballistic Phase – Trajectory Geometry – Optimal Flights – Time of Flight – Re-entry Phase – The Position of the Impact Point – Influence Coefficients. Space Environment - Peculiarities - Effect of Space Environment on the Selection of Spacecraft Material.

TEXT BOOK

1. Cornelisse, J.W. "*Rocket Propulsion and Space Dynamic",* W.H. Freeman & Co., 1984.

REFERENCES

1. Sutton, G.P., "*Rocket Propulsion Elements*", John Wiley, 1993.
2. Van de Kamp, P., "*Elements of Astromechanics*", Pitman, 1979.
3. Parker E.R., "*Material for Missiles and Spacecraft*", McGraw – Hill Book Co., Inc., 1982.

AS1112 – SPACE CRAFT TECHNOLOGY												
Course designed by		**Department of Aerospace Engineering**										
1.	Student Outcome	a	b	c	d	e	f	g	h	i	j	k
		x				x						
2.	Mapping of instructional objectives with student outcome	1				1						
3.	Category	General (G)		Basic Sciences(B)		Engineering Sciences and Technical Arts (E)					Professional Subjects(P)	
											x	
4.	Broad Area	Aerodynamics		Propulsion		Aircraft Structures					General	
		--		x		--					--	
5.	Approval	23rd meeting of Academic Council, May 2013										

AS1113	**AIRCRAFT MATERIALS**	**L**	**T**	**P**	**C**
	Total Contact Hours-45	**3**	**0**	**0**	**3**
	Prerequisite				
PY1003	**Materials science**				

PURPOSE

On completion of the course, the student will have knowledge about the Mechanical behavior of different aircraft materials and their applications.

INSTRUCTIONAL OBJECTIVES

This course will enable the students to know more about

1.	Different materials with their properties
2.	Various Heat Treatment processes of aircraft metals and alloys
3.	Effects and Protection against Corrosion of Aircraft materials
4.	Characteristics and Applications of Aluminum alloys and Composites
5.	Applications of Composite Materials

UNIT I-ELEMENTS OF MATERIAL SCIENCE (9 hours)

Structure of solid materials - Atomic structure, crystal structure, Imperfections in crystals.

UNIT II-MECHANICAL BEHAVIOUR OF ENGINEERING MATERIALS (9 hours)

Linear and non-linear elastic properties - Mechanism of elastic and inelastic action - Yielding, strain hardening, fracture, Elastic after effect Bauchinger's effect - Notch effect, Testing and flaw detection of material and components.

UNIT III-HEAT TREATMENT OF AND CORROSION (9 hours)

Heat treatment of carbon steel, aluminium alloys, magnesium alloys and titanium alloys used in aircraft. Types of corrosions - Effect of corrosion on mechanical properties - Protection against corrosion - Corrosion resistant materials used in aircraft.

UNIT IV-ALUMINIUM ALLOYS AND COMPOSITES (9 hours)

Introduction - Physical Metallurgy - Wrought Aluminium Alloys - Cast Aluminium Alloys - Production of Semi- fabricated forms - Aerospace Applications - Plastics and Rubber - Introduction to FRP, Glass and Carbon Composites - Fibres and Resins - Characteristics and applications.

UNIT V-SELECTION OF MATERIALS FOR AIRCRAFT AND ROCKETS (9 hours)

Classification of aircraft materials - Materials used for aircraft components - Application of Composite materials - Super alloys, Indigenised alloys. Emerging trends in Aerospace materials.

TEXT BOOKS

1. S.O.Kasap, Principles of Electronic Materials and Devices, Tata McGraw Hill Edition, New Delhi, 2002.
2. Van Vlack, L.H., Material Science for Engineers, 6th edition,. Addison Wesley, 1985.
3. Thiruvadigal, J.D., Ponnusamy,S. and Vasuhi.P.S., Materials Science 5th edition, Vibrant Publications, Chennai, 2007.

REFERENCES

1. Martin, J.W., "Engineering Materials, Their Properties, and Applications ", Wykedham Publications (London) Ltd., 1987.
2. Titterton, G., "Aircraft Materials and Processes ", V Edition, Pitman Publishing Co., 1995.
3. Krishnadas Nair, C.G., "Handbook of Aircraft Materials ", Interline Publishing, 1993.
4. Balram Gupta, "Aerospace Materials ", Vol. I, Vol. II and Vol. III, S.Chand & Company Ltd., New Delhi -1996.

AS1113 AIRCRAFT MATERIALS												
Course designed by		**Department of Aerospace Engineering**										
1.	Student Outcome	a	b	c	d	e	f	g	h	i	j	k
		x				x						
2.	Mapping of instructional objectives with student outcome	1-5				1-5						
3.	Category	General (G)		Basic Sciences(B)		Engineering Sciences and Technical Arts (E)				Professional Subjects(P)		
										x		
4.	Broad Area	Aerodynamics		Propulsion		Aircraft Structures				General		
		--		--		x				--		
5.	Approval	23rd meeting of Academic Council, May 2013										