ANNA UNIVERSITY, CHENNAI

UNIVERSITY DEPARTMENTS

REGULATIONS – 2015

CHOICE BASED CREDIT SYSTEM

B.E. AERONAUTICAL ENGINEERING

This education is meant to prepare our students to thrive, to lead and to prepare them to achieve four **Programme Educational Objectives (PEOs)**

PEO 1: Adaptability to industry: Graduates of the programme will receive adequate academic input to adapt themselves in any aircraft and allied industries

PEO 2: Successful Career Development: Graduates of the programme will have successful technical and professional careers in Aeronautical and allied industries and management.

PEO 3: Contribution to Aeronautical Field: Graduates of the programme will have innovative ideas and potential to contribute for the development and current needs of the aeronautical industries.

PEO 4: Sustainable interest for Lifelong learning: Graduates of the programme will have sustained interest continuously to learn and adapt new technology and development to meet the changing industrial scenarios.

The Technology Program in Aeronautical Engineering attains the following student learning Program Outcomes:

a. Graduate will demonstrate strong basics in mathematics, science and engineering.
b. Graduate will demonstrate the ability to design and conduct experiments, as well as to analyze and interpret data.
c. Graduate will demonstrate the ability to design a system or a component to meet the design requirements with constraints exclusively meant for Aeronautical Engineering.
d. Graduate will become familiar with modern engineering tools and analyze the problems within the domains of Aeronautical Engineering as a member of multidisciplinary teams.
e. Graduate will acquire the capability to identify, formulate and solve complex engineering problems of Aeronautical Engineering.
f. Graduate will demonstrate an understanding of professional and ethical responsibility with reference to their career in the field of Aeronautical Engineering and other professional fields.
g. Graduate will be able to communicate effectively both in verbal and non verbal forms.
h. Graduate will be trained towards developing and understanding the importance of design and development of Airplanes from system integration point of view.

i. Graduate will be capable of understanding the value for life-long learning.

j. Graduate will exhibit the awareness of contemporary issues focusing on the necessity to develop new material, design, testing and solution for environmental problems pertaining to aircraft industry.

k. Graduate will be able to use the techniques, skills and modern engineering tools that are necessary for engineering practice in the field of Aeronautical Engineering.

l. Graduation Graduate will have a firm scientific, technological and communication base that helps them to find a placement in the Aircraft industry and R & D organisations related to Aero Engineering and other professional fields.

m. Graduate will be capable of doing higher studies and research in inter and multidisciplinary areas.

Mapping PEO with POs:

PEO/PO	a	b	c	d	e	f	g	h	i	j	k	l	m
1	√	√	√	√	√	√		√		√	√	√	
2	√	√	√	√	√	√	√	√		√	√	√	√
3			√	√	√			√		√	√	√	
4	√	√	√	√	√		√	√	√	√			√

MAPPING OF COURSE OUTCOMES WITH PROGRAMME OUTCOMES:

Subjects/PO	Cate-gory	Sem/Year	a	b	c	d	e	f	g	h	i	j	k	l	m
Foundational English	HS	I/I							√		√			√	
Mathematics-I	BS	I/I	√		√		√								
Engineering Physics	BS	I/I	√	√	√			√							
Engineering Chemistry	BS	I/I	√	√	√			√							
Engineering Graphics	ES	I/I			√		√								
Basic Sciences Laboratory	BS	I/I	√	√	√			√							
Engineering Practices Laboratory	ES	I/I	√	√											
Technical English	HS	II/I							√		√			√	
Mathematics-II	BS	II/I	√		√		√								
Materials Science	BS	II/I	√	√	√			√							
Computing Techniques	ES	II/I	√	√	√	√	√				√	√		√	
Production Processes	ES	II/I	√	√			√							√	

Subjects/PO	Cate-gory	Sem/Year	a	b	c	d	e	f	g	h	i	j	k	l	m
Engineering Mechanics	ES	II/I	√	√	√		√							√	√
Production Processes Laboratory	ES	II/I	√	√	√	√							√	√	
Computer Practices Laboratory	ES	II/I	√	√			√				√	√			
Numerical Methods	BS	III/II	√		√		√								
Engineering Fluid Mechanics and Machinery	ES	III/II	√	√	√		√							√	√
Aero Engineering Thermodynamics	ES	III/II	√	√	√		√							√	√
Solid Mechanics	ES	III/II	√	√	√		√							√	√
Principles of Flight	PC	III/II	√	√	√									√	√
Basic Electrical and Electronics Engineering	ES	III/II	√	√			√					√			
Electrical and Electronics Engineering Laboratory	ES	III/II	√	√	√	√							√	√	
Mechanical Sciences Laboratory	ES	III/II	√	√	√			√							

Subjects/PO	Cate-gory	Sem/Year	a	b	c	d	e	f	g	h	i	j	k	l	m
Transform Techniques and Partial Differential Equations	BS	IV/II	√		√		√								
Aircraft Systems and Instruments	PC	IV/II		√	√					√					
Aerodynamics-I	PC	IV/II		√	√	√	√			√		√	√	√	√
Propulsion-I	PC	IV/II		√	√	√	√			√		√	√	√	√
Aircraft Structures-I	PC	IV/II		√	√	√	√			√		√	√	√	√
Kinematics and Dynamics of Machines	PC	IV/II	√	√			√					√			
Aerodynamics laboratory	PC	IV/II		√	√	√						√			
Aircraft Component Drawing laboratory	PC	IV/II		√	√	√						√			
Flight Mechanics	PC	V/III		√	√	√	√			√		√	√	√	√
Aerodynamics-II	PC	V/III		√	√	√	√			√		√	√	√	√
Propulsion-II	PC	V/III		√	√	√	√			√		√	√	√	√
Aircraft Structures-II	PC	V/III		√	√	√	√			√		√	√	√	√

Subjects/PO	Cate-gory	Sem/Year	a	b	c	d	e	f	g	h	i	j	k	l	m
Propulsion Laboratory	PC	V/III		√	√	√						√			
Aircraft Structures laboratory	PC	V/III		√	√	√						√			
Aircraft Stability and Control	PC	VI/III		√	√	√	√			√		√	√	√	√
Computational Fluid Dynamics	PC	VI/III		√	√	√						√			
Finite Element Methods	PC	VI/III		√	√	√	√			√		√	√	√	√
Environmental Science and Engineering	HS	VI/III							√		√			√	
Aircraft Design Project –I	EEC	VI/III		√	√	√	√			√		√	√	√	√
Aeromodelling	EEC	VI/III		√	√	√						√			
Experimental Aerodynamics	PC	VII/IV		√	√	√	√			√		√	√	√	√
Heat Transfer	PC	VII/IV		√	√	√	√			√		√	√	√	√
Composite Materials and structures	PC	VII/IV		√	√	√	√			√		√	√	√	√
Rockets and Launch Vehicles	PC	VII/IV		√	√	√	√			√		√	√	√	√
Aircraft Design Project-II	EEC	VII/IV		√	√	√	√			√		√	√	√	√

Subjects/PO	Cate-gory	Sem/Year	a	b	c	d	e	f	g	h	i	j	k	l	m
Communication Skills and Soft Skills	EEC	VII/IV		√	√	√		√		√		√	√	√	√
Experiments in Flight Laboratory	EEC	VIII/IV		√	√	√	√			√		√	√	√	
Project Work	EEC	VIII/IV		√	√	√	√			√		√	√	√	√
Aero Elasticity	PE	Elective		√	√	√	√			√		√	√	√	√
Theory of Elasticity	PE	Elective		√	√	√	√			√		√	√	√	√
Theory of Vibrations	PE	Elective		√	√	√	√			√		√	√	√	√
Approximate Methods in Structural Mechanics	PE	Elective		√	√	√	√			√		√	√	√	√
Fatigue and Fracture Mechanics	PE	Elective		√	√	√	√			√		√	√	√	√
Fundamentals of Control Engineering	PE	Elective		√	√	√	√			√		√	√	√	√
Avionics	PE	Elective		√	√	√	√			√		√	√	√	√
Aircraft Engine Repairs and Maintenance	PE	Elective		√	√	√	√			√		√	√	√	√

Subjects/PO	Cate-gory	Sem/Year	a	b	c	d	e	f	g	h	i	j	k	l	m
Aircraft Rules and Regulations CAR I & II	PE	Elective		√	√	√	√			√		√	√	√	√
Airframe Repair and Maintenance	PE	Elective		√	√	√	√			√		√	√	√	√
Boundary Layer Theory	PE	Elective		√	√	√	√			√		√	√	√	√
Combustion in Aerospace Vehicles	PE	Elective		√	√	√	√			√		√	√	√	√
Design of Gas Turbine Engine Components	PE	Elective		√	√	√	√			√		√	√	√	√
Wind Tunnel Techniques	PE	Elective		√	√	√	√			√		√	√	√	√
Hypersonic Aerodynamics	PE	Elective		√	√	√	√			√		√	√	√	√
Structural dynamics	PE	Elective		√	√	√	√			√		√	√	√	√
Satellite Technology	PE	Elective		√	√	√	√			√		√	√	√	√
Space Mechanics	PE	Elective		√	√	√	√			√		√	√	√	√
UAV system design	PE	Elective		√	√	√	√			√		√	√	√	√
Theory of Plates and Shells	PE	Elective		√	√	√	√			√		√	√	√	√
Aircraft design	PE	Elective		√	√	√	√			√		√	√	√	√

Subjects/PO	Cate-gory	Sem/Year	a	b	c	d	e	f	g	h	i	j	k	l	m
Fundamentals of Nanoscience	PE	Elective		√	√	√	√			√		√	√	√	√
Aircraft systems Engineering	PE	Elective		√	√	√	√			√		√	√	√	√
Wind Engineering	PE	Elective		√	√	√	√			√		√	√	√	√
Missile Aerodynamics	PE	Elective		√	√	√	√			√		√	√	√	√
Experimental Stress Analysis	PE	Elective		√	√	√	√			√		√	√	√	√
Helicopter Aerodynamics	PE	Elective		√	√	√	√			√		√	√	√	√
Numerical Heat Transfer	PE	Elective		√	√	√	√			√		√	√	√	√
Aerospace Materials	PE	Elective		√	√	√	√			√		√	√	√	√
Disaster Management	PE	Elective		√	√	√	√			√		√	√	√	√
Human Rights	PE	Elective		√	√	√	√			√		√	√	√	√

ANNA UNIVERSITY, CHENNAI

UNIVERSITY DEPARTMENTS

B.E. AERONAUTICAL ENGINEERING

REGULATIONS – 2015

CHOICE BASED CREDIT SYSTEM

CURRICULA I - VIII SEMESTERS
AND
SYLLABI I - III SEMESTERS

SEMESTER I

S. No	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
THEORY								
1.	HS7151	Foundational English	HS	4	4	0	0	4
2.	MA7151	Mathematics-I	BS	4	4	0	0	4
3.	PH7151	Engineering Physics	BS	3	3	0	0	3
4.	CY7151	Engineering Chemistry	BS	3	3	0	0	3
5.	GE7152	Engineering Graphics	ES	5	3	2	0	4
PRACTICAL								
6.	BS7161	Basic Sciences Laboratory	BS	4	0	0	4	2
7.	GE7162	Engineering Practices Laboratory	ES	4	0	0	4	2
			TOTAL	**27**	**17**	**2**	**8**	**22**

SEMESTER II

S. No	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
THEORY								
1.	HS7251	Technical English	HS	4	4	0	0	4
2.	MA7251	Mathematics-II	BS	4	4	0	0	4
3.	PH7251	Materials Science	BS	3	3	0	0	3
4.	GE7151	Computing Techniques	ES	3	3	0	0	3
5.	PR7251	Production Processes	ES	3	3	0	0	3
6.	GE7153	Engineering Mechanics	ES	4	4	0	0	4
PRACTICAL								
7.	PR7261	Production Processess Laboratory	ES	4	0	0	4	2
8.	GE7161	Computer Practices Laboratory	ES	4	0	0	4	2
			TOTAL	**29**	**21**	**0**	**8**	**25**

SEMESTER III

S.No	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
THEORY								
1.	AE7301	Aero Engineering Thermodynamics	ES	3	3	0	0	3
2.	AE7302	Principles of Flight	PC	3	3	0	0	3
3.	AE7351	Engineering Fluid Mechanics and Machinery	ES	3	3	0	0	3
4.	AE7353	Solid Mechanics	ES	3	3	0	0	3
5.	EE7151	Basic Electrical and Electronics Engineering	ES	3	3	0	0	3
6.	MA7354	Numerical Methods	BS	4	4	0	0	4
PRACTICAL								
7.	EE7261	Electrical and Electronics Engineering Laboratory	ES	4	0	0	4	2
8.	ME7362	Mechanical Sciences Laboratory	ES	4	0	0	4	2
			TOTAL	**27**	**19**	**0**	**8**	**23**

SEMESTER IV

S.No	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
THEORY								
1.		Aerodynamics - I	PC	3	3	0	0	3
2.		Aircraft Structures - I	PC	3	3	0	0	3
3.		Aircraft Systems and Instruments	PC	3	3	0	0	3
4.		Propulsion - I	PC	3	3	0	0	3
5.		Transform Techniques and Partial Differential Equations	BS	4	4	0	0	4
6.		Kinematics and Dynamics of Machines	PC	4	4	0	0	4
PRACTICAL								
7.		Aerodynamics Laboratory	PC	4	0	0	4	2
8.		Aircraft Component Drawing Laboratory	PC	4	0	0	4	2
			TOTAL	**28**	**20**	**0**	**8**	**24**

SEMESTER V

S.No	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
THEORY								
1.		Aerodynamics - II	PC	3	3	0	0	3
2.		Aircraft Structures-II	PC	3	3	0	0	3
3.		Flight Mechanics	PC	3	3	0	0	3
4.		Propulsion - II	PC	3	3	0	0	3
5.		Professional Elective-I	PE	3	3	0	0	3
6.		Professional Elective-II	PE	3	3	0	0	3
PRACTICAL								
7.		Aircraft Structures Laboratory	PC	4	0	0	4	2
8.		Propulsion Laboratory	PC	4	0	0	4	2
			TOTAL	**26**	**18**	**0**	**8**	**22**

SEMESTER VI

S.No	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
THEORY								
1.		Aircraft Stability and Control	PC	4	4	0	0	4
2.		Computational Fluid Dynamics	PC	3	3	0	0	3
3.		Finite Element Methods	PC	3	3	0	0	3
4.		Environmental Science and Engineering	HS	3	3	0	0	3
5.		Professional Elective-III	PE	3	3	0	0	3
6.		Professional Elective-IV	PE	3	3	0	0	3
PRACTICAL								
7.		Aeromodelling	EEC	4	0	0	4	2
8.		Aircraft Design Project – I	EEC	4	0	0	4	2
			TOTAL	**27**	**19**	**0**	**8**	**23**

SEMESTER VII

S.No	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
THEORY								
1.		Composite Materials and Structures	PC	3	3	0	0	3
2.		Experimental Aerodynamics	PC	3	3	0	0	3
3.		Heat Transfer	PC	3	3	0	0	3
4.		Rockets and Launch Vehicles	PC	3	3	0	0	3
5.		Professional Elective-V	PE	3	3	0	0	3
6.		Open Elective - I*	OE	3	3	0	0	3
PRACTICAL								
7.		Aircraft Design Project-II	EEC	4	0	0	4	2
8.		Communication Skills and Soft Skills	HS	3	1	0	2	2
			TOTAL	**25**	**19**	**0**	**6**	**22**

SEMESTER VIII

S.No	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
THEORY								
1.		Professional Elective-VI	PE	3	3	0	0	3
2.		Open Elective-II*	OE	3	3	0	0	3
PRACTICAL								
3.		Experiments in flight Laboratory	EEC	4	0	0	4	2
4.		Project Work	EEC	20	0	0	20	10
			TOTAL	**30**	**6**	**0**	**24**	**18**

TOTAL NO. OF CREDITS: 179

***Course from the curriculum of other UG Programmes**

HUMANITIES AND SOCIALSCIENCES (HS)

S.No	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
1.		Foundational English	HS	4	4	0	0	4
2.		Technical English	HS	4	4	0	0	4
3.		Environmental science and Engineering	HS	3	3	0	0	3
4.		Communication Skills and Soft Skills	HS	3	1	0	2	2

BASIC SCIENCES (BS)

S.No	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
1.		Mathematics-I	BS	4	4	0	0	4
2.		Engineering Physics	BS	3	3	0	0	3
3.		Engineering Chemistry	BS	3	3	0	0	3
4.		Basic Sciences Laboratory	BS	4	0	0	4	2
5.		Mathematics-II	BS	4	4	0	0	4
6.		Material Science	BS	3	3	0	0	3
7.		Numerical Methods	BS	4	4	0	0	4
8.		Transform Techniques and Partial Differential Equation	BS	4	4	0	0	4

ENGINEERING SCIENCES (ES)

S.No	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
1.		Engineering Graphics	ES	5	3	2	0	4
2.		Engineering Practices Laboratory	ES	4	0	0	4	2
3.		Computing Techniques	ES	3	3	0	0	3
4.		Production Processes	ES	3	3	0	0	3
5.		Engineering Mechanics	ES	4	4	0	0	4
6.		Production Processes Laboratory	ES	4	0	0	4	2
7.		Computer Practices Laboratory	ES	4	0	0	4	2

8.		Engineering Fluid Mechanics and Machinery	ES	3	3	0	0	3
9.		Aero Engineering Thermodynamics	ES	3	3	0	0	3
10.		Solid Mechanics	ES	3	3	0	0	3
11.		Basic Electrical and Electronics Engineering	ES	3	3	0	0	3
12.		Electrical and Electronics Engineering Laboratory	ES	4	0	0	4	2
13.		Mechanical Sciences Laboratory	ES	4	0	0	4	2

PROFESSIONAL CORE (PC)

S.No	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
1.		Principles of Flight	PC	3	3	0	0	3
2.		Aircraft Systems and Instruments.	PC	3	3	0	0	3
3.		Aerodynamics-I	PC	3	3	0	0	3
4.		Propulsion-I	PC	3	3	0	0	3
5.		Aircraft Structures-I	PC	3	3	0	0	3
6.		Kinematics and Dynamics of Machines	PC	4	4	0	0	4
7.		Aerodynamics Laboratory	PC	4	0	0	4	2
8.		Aircraft component Drawing Laboratory	PC	4	0	0	4	2
9.		Flight Mechanics	PC	3	3	0	0	3
10.		Aerodynamics-II	PC	3	3	0	0	3
11.		Propulsion-II	PC	3	3	0	0	3
12.		Aircraft Structures-II	PC	3	3	0	0	3
13.		Propulsion Laboratory	PC	4	0	0	4	2
14.		Aircraft structures Laboratory	PC	4	0	0	4	2
15.		Aircraft Stability and Control	PC	4	4	0	0	4

16.		Computational Fluid Dynamics	PC	3	3	0	0	3
17.		Finite Element Methods	PC	3	3	0	0	3
18.		Experimental Aerodynamics	PC	3	3	0	0	3
19.		Heat Transfer	PC	3	3	0	0	3
20.		Composite Materials and structures	PC	3	3	0	0	3
21.		Rockets and Launch Vehicles	PC	3	3	0	0	3

PROFESSIONAL ELECTIVES (PE)

S.No	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
1.		Aero Elasticity	PE	3	3	0	0	3
2.		Aerospace Materials	PE	3	3	0	0	3
3.		Aircraft Design	PE	3	3	0	0	3
4.		Aircraft Engine Repairs and Maintenance	PE	3	3	0	0	3
5.		Aircraft Rules and Regulations CAR I & II	PE	3	3	0	0	3
6.		Aircraft Systems Engineering	PE	3	3	0	0	3
7.		Airframe Repair and Maintenance	PE	3	3	0	0	3
8.		Approximate Methods in Structural Mechanics	PE	3	3	0	0	3
9.		Avionics	PE	3	3	0	0	3
10.		Boundary Layer Theory	PE	3	3	0	0	3
11.		Combustion in Aerospace Vehicles	PE	3	3	0	0	3
12.		Design of Gas Turbine Engine Components	PE	3	3	0	0	3
13.		Fatigue and Fracture Mechanics	PE	3	3	0	0	3
14.		Fundamentals of Control Engineering	PE	3	3	0	0	3
15.		Helicopter Aerodynamics	PE	3	3	0	0	3

16.		Hypersonic Aerodynamics	PE	3	3	0	0	3
17.		Missile Aerodynamics	PE	3	3	0	0	3
18.		Numerical Heat Transfer	PE	3	3	0	0	3
19.		Satellite Technology	PE	3	3	0	0	3
20.		Space Mechanics	PE	3	3	0	0	3
21.		Structural Dynamics	PE	3	3	0	0	3
22.		Theory of Elasticity	PE	3	3	0	0	3
23.		Theory of Plates and Shells	PE	3	3	0	0	3
24.		Theory of Vibrations	PE	3	3	0	0	3
25.		UAV System Design	PE	3	3	0	0	3
26.		Wind Engineering	PE	3	3	0	0	3
27.		Wind Tunnel Techniques	PE	3	3	0	0	3
28.		Experimental Stress Analysis	PE	3	3	0	0	3
29.		Disaster Management	PE	3	3	0	0	3
30.		Fundamentals of Nanoscience	PE	3	3	0	0	3
31.		Human Rights	PE	3	3	0	0	3

EMPLOYABILITY ENHANCEMENT COURSES (EEC)

S.No	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
1.		Aircraft Design Project-I	EEC	4	0	0	4	2
2.		Aeromodelling	EEC	4	0	0	4	2
3.		Aircraft Design Project-II	EEC	4	0	0	4	2
4.		Experiments in flight laboratory	EEC	4	0	0	4	2
5.		Project work	EEC	20	0	0	20	10

SUMMARY

S.NO.	SUBJECT AREA	CREDITS AS PER SEMESTER								CREDITS TOTAL
		I	II	III	IV	V	VI	VII	VIII	
1.	HS	04	04	00	00	00	03	02	00	**11**
2.	BS	12	07	04	04	00	00	00	00	**27**
3.	ES	06	14	16	00	00	00	00	00	**36**
4.	PC	00	00	03	20	16	10	12	00	**61**
5.	PE	00	00	00	00	06	06	03	03	**18**
6.	OE	00	00	00	00	00	00	03	03	**6**
7.	EEC	00	00	00	00	00	04	02	12	**20**
	Total	**22**	**25**	**23**	**24**	**22**	**23**	**22**	**18**	**179**
8.	**Non Credit / Mandatory**									

HS7151 FOUNDATIONAL ENGLISH L T P C
4 0 0 4

COURSE DESCRIPTION:
This course aims at developing the language skills necessary for the first year students of Engineering and Technology.

OBJECTIVES:
- To develop the four language skills – Listening, Speaking, Reading and Writing.
- To improve the students' communicative competence in English.
- To teach students the various aspects of English language usage.

CONTENTS

UNIT I GREETING AND INTRODUCING ONESELF 12
Listening- Types of listening – Listening to short talks, conversations; **Speaking** – Speaking about one's place, important festivals etc. – Introducing oneself, one's family/ friend;**Reading** – Skimming a passage– Scanning for specific information;**Writing**- Guided writing - Free writing on any given topic (My favourite place/ Hobbies/ School life, writing about one's leisure time activities, hometown, etc.); **Grammar** – Tenses (present and present continuous) -Question types - Regular and irregular verbs; **Vocabulary** – Synonyms and Antonyms.

UNIT II GIVING INSTRUCTIONS AND DIRECTIONS 12
Listening – Listening and responding to instructions; **Speaking** – Telephone etiquette - Giving oral instructions/ Describing a process – Asking and answering questions; **Reading** – Reading and finding key information in a given text - Critical reading - **Writing –**Process description(non-technical)- **Grammar** – Tense (simple past& past continuous) - Use of imperatives – Subject – verb agreement – Active and passive voice; - **Vocabulary** – Compound words – Word formation – Word expansion (root words).

UNIT III READING AND UNDERSTANDING VISUAL MATERIAL 12
Listening- Listening to lectures/ talks and completing a task; **Speaking** –Role play/ Simulation – Group interaction; **Reading** – Reading and interpreting visual material;**Writing**- Jumbled sentences – Discourse markers and Cohesive devices – Essay writing (cause & effect/ narrative);**Grammar** – Tenses (perfect), Conditional clauses –Modal verbs; **Vocabulary** –Cause and effect words; Phrasal verbs in context.

UNIT IV CRITICAL READING AND WRITING 12
Listening- Watching videos/ documentaries and responding to questions based on them; **Speaking** Informal and formal conversation; **Reading** –Critical reading (prediction & inference);**Writing**–Essay writing (compare & contrast/ analytical) – Interpretation of visual materials;**Grammar** – Tenses (future time reference);**Vocabulary** – One word substitutes (with meanings) – Use of abbreviations & acronyms – Idioms in sentences.

UNIT V LETTER WRITING AND SENDING E-MAILS 12
Listening- Listening to programmes/broadcast/ telecast/ podcast;**Speaking** – Giving impromptu talks, Making presentations on given topics- Discussion on the presentation;**Reading** –Extensive reading;**Writing**- Poster making – Letter writing (Formal and E-mail) ;**Grammar** – Direct and Indirect speech – Combining sentences using connectives; **Vocabulary** –Collocation;

TEACHING METHODS:
Interactive sessions for the speaking module.
Use of audio – visual aids for the various listening activities.
Contextual Grammar Teaching.

EVALUATION PATTERN:
Internals – 50%
End Semester – 50%

TOTAL:60 PERIODS

OUTCOMES:
- Students will improve their reading and writing skills
- Students will become fluent and proficient in communicative English
- Students will be able to improve their interpersonal communication

TEXTBOOK:
1. Richards, Jack.C with Jonathan Hull and Susan Proctor **New Interchange : English for International Communication. (level2, Student's Book)** Cambridge University Press,New Delhi: 2010.

REFERENCES:
1. Bailey, Stephen. **Academic Writing: A practical guide for students**. New York: Rutledge,2011.
2. Morgan, David and Nicholas Regan. **Take-Off: Technical English for Engineering**. London: Garnet Publishing Limited, 2008.
3. Redston, Chris & Gillies Cunningham **Face2Face** (Pre-intermediate Student's Book& Workbook) Cambridge University Press, New Delhi: 2005
4. Comfort, Jeremy, et al. **Speaking Effectively : Developing Speaking Skillsfor Business English.** Cambridge University Press, Cambridge: Reprint 2011.

		L	T	P	C
MA7151	**MATHEMATICS – I**				
	(Common to all branches of B.E. / B.Tech. Programmes in I Semester)	**4**	**0**	**0**	**4**

OBJECTIVES:
- The goal of this course is for students to gain proficiency in calculus computations. In calculus, we use three main tools for analyzing and describing the behavior of functions: limits, derivatives, and integrals. Students will use these tools to solve application problems in a variety of settings ranging from physics and biology to business and economics.
- To make the student acquire sound knowledge of techniques in solving ordinary differential equations that model engineering problems.
- To familiarize the student with functions of several variables. This is needed in many branches of engineering.
- To acquaint the student with mathematical tools needed in evaluating multiple integrals and their usage.

UNIT I DIFFERENTIAL CALCULUS 12

Representation of functions - New functions from old functions - Limit of a function - Limits at infinity - Continuity - Derivatives - Differentiation rules - Polar coordinate system - Differentiation in polar coordinates - Maxima and Minima of functions of one variable.

UNIT II FUNCTIONS OF SEVERAL VARIABLES 12

Partial derivatives – Homogeneous functions and Euler's theorem – Total derivative – Differentiation of implicit functions – Change of variables – Jacobians – Partial differentiation of implicit functions – Taylor's series for functions of two variables – Errors and approximations – Maxima and minima of functions of two variables – Lagrange's method of undetermined multipliers.

UNIT III INTEGRAL CALCULUS 12

Definite and Indefinite integrals - Substitution rule - Techniques of Integration - Integration by parts, Trigonometric integrals, Trigonometric substitutions, Integration of rational functions by partial fraction, Integration of irrational functions - Improper integrals.

UNIT IV MULTIPLE INTEGRALS 12

Double integrals – Change of order of integration – Double integrals in polar coordinates – Area enclosed by plane curves – Triple integrals – Volume of solids – Change of variables in double and triple integrals.

UNIT V DIFFERENTIAL EQUATIONS 12

Method of variation of parameters – Method of undetermined coefficients – Homogenous equation of Euler's and Legendre's type – System of simultaneous linear differential equations with constant coefficients.

TOTAL: 60 PERIODS

OUTCOMES:

- Understanding of the ideas of limits and continuity and an ability to calculate with them and apply them.
- Improved facility in algebraic manipulation.
- Fluency in differentiation.
- Fluency in integration using standard methods, including the ability to find an appropriate method for a given integral.
- Understanding the ideas of differential equations and facility in solving simple standard examples.

TEXTBOOKS:

1. James Stewart, "Calculus with Early Transcendental Functions", Cengage Learning, New Delhi, 2008.
2. Narayanan S. and Manicavachagom Pillai T. K., "Calculus" Volume I and II, S. Viswanathan Publishers Pvt. Ltd., Chennai, 2007.
3. Erwin Kreyszig, "Advanced Engineering Mathematics", John Wiley and Sons, 9th Edition, New Delhi, 2014.
4. Grewal B.S., "Higher Engineering Mathematics", Khanna Publishers, New Delhi, 43rd Edition, 2014.

REFERENCES:

1. Ramana B.V., "Higher Engineering Mathematics", Tata McGraw Hill Co. Ltd., New Delhi, 11th Reprint, 2010.

2. Jain R.K. and Iyengar S.R.K., “Advanced Engineering Mathematics”, Narosa Publications, New Delhi, 3rd Edition, 2007.
3. Bali N., Goyal M. and Watkins C., “Advanced Engineering Mathematics”, Firewall Media (An imprint of Lakshmi Publications Pvt., Ltd.,), New Delhi, 7th Edition, 2009.
4. Greenberg M.D., “Advanced Engineering Mathematics”, Pearson Education, New Delhi, 2nd Edition, 5th Reprint, 2009.
5. Peter V.O’Neil, “Advanced Engineering Mathematics”, Cengage Learning India Pvt., Ltd, New Delhi, 2007.

PH7151 ENGINEERING PHYSICS L T P C
(Common to all branches of B.E / B.Tech programmes) 3 0 0 3

OBJECTIVE:

To introduce the basic physics concepts relevant to different branches of Engineering and Technology

UNIT I PROPERTIES OF MATTER 9

Elasticity – Poisson’s ratio and relationship between moduli (qualitative) - stress-strain diagram for ductile and brittle materials, uses - factors affecting elastic modulus and tensile strength - bending of beams - cantilever - bending moment - Young’s modulus determination - theory and experiment - uniform and non-uniform bending - I shaped girders - twisting couple - hollow cylinder - shaft - torsion pendulum - determination of rigidity modulus-moment of inertia of a body (regular and irregular).

UNIT II ACOUSTICS AND ULTRASONICS 9

Classification of sound - loudness and intensity - Weber-Fechner Law - standard intensity and intensity level - decibel - reverberation - reverberation time - calculation of reverberation time for different types of buildings – sound absorbing materials - factors affecting acoustics of buildings : focussing, interference, echo, echelon effect, resonance - noise and their remedies. Ultrasonics: production - magnetostriction and piezoelectric methods - detection of ultrasound - acoustic grating – ultrasonic interferometer - industrial applications – Non-destructive testing - ultrasonic method: scan modes and practice.

UNIT III THERMAL AND MODERN PHYSICS 9

Thermal expansion - thermal stress - expansion joints - bimetallic strips - thermal conductivity- heat conductions in solids – flow of heat through compound media - Forbe’s and Lee’s disc method: theory and experiment- Black body radiation – Planck’s theory (derivation) – Compton effect – wave model of radiation and matter – Schrödinger’s wave equation – time dependent and independent equations – Physical significance of wave function – particle in a one dimensional box.

UNIT IV APPLIED OPTICS 9

Interference - Michelson interferometer: construction, working, determination of wave length and thickness - anti-reflection coating - air wedge and its applications - Lasers – principle and applications – Einstein’s coefficients – CO2 and Nd:YAG laser - semiconductor lasers: homo junction and hetro junction - construction and working – applications. Optical fibres - classification (index & mode based) - principle and propagation of light in optical fibres -

acceptance angle and numerical aperture - fibre optic communication system - active and passive sensors.

UNIT V CRYSTAL PHYSICS 9

Single crystalline, polycrystalline and amorphous materials – Single crystals: unit cell, crystal systems, Bravais lattices, directions and planes in a crystal, Miller indices - interplanar distance for a cubic crystal - coordination number and packing factor for SC, BCC, FCC, HCP and diamond structures - structure and significance of NaCl, CsCl, ZnS and graphite - crystal imperfections: point defects, line defects – Burger vectors, dislocations and stacking faults – Growth of single crystals: Bridgman and Czochralski methods.

TOTAL: 45 PERIODS

OUTCOME:

The students will acquire knowledge on the basics of physics related to properties of matter, optics, acoustics etc., and they will apply these fundamental principles to solve practical problems related to materials used for engineering applications.

TEXTBOOKS:

1. Palanisamy P.K., “Engineering Physics”, Scitech Publications (P) Ltd. (2006).
2. Arumugam M., “Engineering Physics”, Anuradha Publications (2000)
3. Gaur R.K. and Gupta S.L., “Engineering Physics”, Dhanpat Rai Publications (2013)

REFERENCES:

1. Serway R.A. and Jewett, J.W. “Physics for Scientists and Engineers with Modern Physics”. Brooks/cole Publishing Co. (2010).
2. Tipler P.A. and Mosca, G.P., “Physics for Scientists and Engineers with Modern Physics”. W.H.Freeman, (2007).
3. Markert J.T.,Ohanian, H. and Ohanian, M. “Physics for Engineers and Scientists”. W.W.Norton & Co. (2007).

CY7151 ENGINEERING CHEMISTRY L T P C

3 0 0 3

OBJECTIVES:

- To develop an understanding about fundamentals of polymer chemistry.
- Brief elucidation on surface chemistry and catalysis.
- To develop sound knowledge photochemistry and spectroscopy.
- To impart basic knowledge on chemical thermodynamics.
- To understand the basic concepts of nano chemistry.

UNIT I POLYMER CHEMISTRY 9

Introduction: Functionality-degree of polymerization. Classification of polymers- natural and synthetic, thermoplastic and thermosetting. Types and mechanism of polymerization: addition (free radical, cationic, anionic and living); condensation and copolymerization. Properties of polymers: Tg, tacticity, molecular weight-weight average, number average and polydispersity index. Techniques of polymerization: Bulk, emulsion, solution and suspension.

UNIT II SURFACE CHEMISTRYAND CATALYSIS 9

Adsorption-Types of adsorption-adsorption of gases on solids- adsorption from solutions-Types of isotherms–Frendlich adsorption isotherm, Langmuir adsorption isotherm. Industrial applications of adsorption. Catalysis: Characteristics and types of catalysts-homogeneous and heterogeneous, auto catalysis. Enzyme catalysis -factors affecting enzyme catalysis, Michaelis- Menton equation. Industrial applications of catalysts.

UNIT III PHOTOCHEMISTRY AND SPECTROSCOPY 9

Photochemistry: Laws of photochemistry-Grotthuss-Draper law, Stark-Einstein law and Lambert-Beer Law. Photo processes-internal conversion, inter-system crossing, fluorescence, phosphorescence, chemiluminescence and photo-sensitization. Spectroscopy: Electromagnetic spectrum-absorption of radiation-electronic, vibrational and rotational transitions. Width and intensities of spectral lines.Spectrophotometric estimation of iron.UV-Vis and IR spectroscopy- principles, instrumentation (Block diagram) and applications.

UNIT IV CHEMICAL THERMODYNAMICS 9

Second law: Entropy-entropy change for an ideal gas, reversible and irreversible processes; entropy of phase transitions; Free energy and work function: Helmholtzand Gibbs free energy functions; Criteria of spontaneity; Gibbs-Helmholtz equation; Clausius Clapeyron equation; Maxwell relations-Van't Hoff isotherm and isochore. Chemical potential; Gibbs-Duhem equation- variation of chemical potential with temperature and pressure.

UNIT V NANOCHEMISTRY 9

Basics-distinction between molecules, nanoparticles and bulk materials; size-dependent properties. Preparation of nanoparticles – sol-gel and solvothermal. Preparation of carbon nanotube by chemical vapour deposition and laser ablation. Preparation of nanowires by VLS growth, electrochemical deposition and electro spinning. Properties and uses of nanoparticles, nanoclusters, nanorods, nanotubes and nanowires.

TOTAL: 45 PERIODS

OUTCOMES:

- Will be familiar with polymer chemistry, surface chemistry and catalysis.
- Will know the photochemistry, spectroscopy and chemical thermodynamics.
- Will know the fundamentals of nano chemistry.

TEXTBOOKS

1. Jain P. C. & Monica Jain., "Engineering Chemistry", DhanpatRai Publishing Company (P) Ltd, New Delhi, 2014.
2. Kannan P., Ravikrishnan A., "Engineering Chemistry", Sri Krishna Hitech Publishing Company Pvt. Ltd. Chennai, 2014

REFERENCES

1. Pahari A., Chauhan B., "Engineering Chemistry", Firewall Media, New Delhi, 2012.
2. Sivasankar B., "Engineering Chemistry", Tata McGraw-Hill Publishing Company Ltd, New Delhi, 2012.
3. AshimaSrivastava. Janhavi N N, Concepts of Engineering Chemistry", ACME Learning Private Limited., New Delhi., 2010.
4. Vairam S., Kalyani P., Suba Ramesh., "Engineering Chemistry", Wiley India Pvt Ltd., New Delhi., 2011.

GE7152 ENGINEERING GRAPHICS

L	T	P	C
3	2	0	4

OBJECTIVES

• To develop in students, graphic skills for communication of concepts, ideas and design of engineering products and expose them to existing national standards related to technical drawings.

CONCEPTS AND CONVENTIONS (NOT FOR EXAMINATION) 1

Importance of graphics in engineering applications – Use of drafting instruments – BIS conventions and specifications – Size, layout and folding of drawing sheets – Lettering and dimensioning.

UNIT I PLANE CURVES AND FREE HANDSKETCHING 14

Basic Geometrical constructions, Curves used in engineering practices-Conics – Construction of ellipse, parabola and hyperbola by eccentricity method – Construction of cycloid – construction of involutes of square and circle – Drawing of tangents and normal to the above curves. Visualization concepts and Free Hand sketching: Visualization principles – Representation of Three Dimensional objects – Layout of views- Free hand sketching of multiple views from pictorial views of objects

UNIT II PROJECTION OF POINTS, LINES AND PLANE SURFACES 14

Orthographic projection- principles-Principal planes-First angle projection-Projection of points. Projection of straight lines (only First angle projections) inclined to both the principal planes-Determination of true lengths and true inclinations by rotating line method and trapezoidal method and traces Projection of planes (polygonal and circular surfaces) inclined to both the principal planes by rotating object method.

UNIT III PROJECTION OF SOLIDS 14

Projection of simple solids like prisms, pyramids, cylinder, cone and truncated solids when the axis is inclined to both the principal planes by rotating object method and auxiliary plane method.

UNIT IV PROJECTION OF SECTIONED SOLIDS AND DEVELOPMENT OF SURFACES 14

Sectioning of solids in simple vertical position when the cutting plane is inclined to the one of the principal planes and perpendicular to the other – obtaining true shape of section.

Development of lateral surfaces of simple and sectioned solids – Prisms, pyramids cylinders and cones. Development of lateral surfaces of solids with cut-outs and holes.

UNIT V ISOMETRIC AND PERSPECTIVE PROJECTIONS 15

Principles of isometric projection – isometric scale –Isometric projections of simple solids and truncated solids - Prisms, pyramids, cylinders, cones- combination of two solid objects in simple vertical positions and miscellaneous problems.

Perspective projection of simple solids-Prisms pyramids and cylinders by visual ray method and vanishing point method.

COMPUTER AIDED DRAFTING (DEMONSTRATION ONLY) 3

Introduction to drafting packages and demonstration of their use.

L=45+T=30, TOTAL: 75 PERIODS

OUTCOMES:

On Completion of the course the student will be able to

- Perform free hand sketching of basic geometrical shapes and multiple views of objects.
- Draw orthographic projections of lines, planes and solids
- Obtain development of surfaces.
- Prepare isometric and perspective views of simple solids.

TEXT BOOK:

1. N.D.Bhatt and V.M.Panchal, "Engineering Drawing", Charotar Publishing House, 50th Edition, 2010.

REFERENCES:

1. K.R.Gopalakrishna., "Engineering Drawing" (Vol I&II combined) Subhas Stores, Bangalore, 2007
2. Luzzader, Warren.J., and Duff,John M.,'' Fundamentals of Engineering Drawing with an introduction to Interactive Computer Graphics for Design and Production", Eastern Economy Edition, Prentice Hall of India Pvt Ltd, New Delhi, 2005
3. M.B.Shah and B.C.Rana, "Engineering Drawing", Pearson, 2nd Edition, 2009
4. K.Venugopal and V.Prabhu Raja, "Engineering Graphics", New Age International (P)Limited ,2008.
5. K. V.Natarajan, "A text book of Engineering Graphics", 28th Edition, Dhanalakshmi Publishers, Chennai, 2015.
6. BasantAgarwal and Agarwal C.M., "Engineering Drawing", Tata McGraw Hill Publishing Company Limited, New Delhi, 2008.
7. N.S Parthasarathy and Vela Murali, " Engineering Drawing", Oxford University Press, 2015

Publication of Bureau of Indian Standards:

1. IS 10711 – 2001: Technical products Documentation – Size and lay out of drawing sheets
2. IS 9609 (Parts 0 & 1) – 2001: Technical products Documentation – Lettering.
3. IS 10714 (Part 20) – 2001 & SP 46 – 2003: Lines for technical drawings.
4. IS 11669 – 1986 & SP 46 – 2003: Dimensioning of Technical Drawings.
5. IS 15021 (Parts 1 to 4) – 2001: Technical drawings – Projection Methods.

Special points applicable to University Examinations on Engineering Graphics:

1. There will be five questions, each of either or type covering all units of the syllabus.
2. All questions will carry equal marks of 20 each making a total of 100.
3. The answer paper shall consist of drawing sheets of A3 size only. The students will be permitted to use appropriate scale to fit solution within A3 size.
4. The examination will be conducted in appropriate sessions on the same day.

BS7161	BASIC SCIENCES LABORATORY	L T P C
	(Common to all branches of B.E. / B.Tech Programmes)	0 0 4 2

PHYSICS LABORATORY: (Any Seven Experiments)

OBJECTIVE:

To introduce different experiments to test basic understanding of physics concepts applied in optics, thermal physics, properties of matter and liquids.

1. Torsional pendulum - Determination of rigidity modulus of wire and moment of inertia of disc
2. Non-uniform bending - Determination of young's modulus
3. Uniform bending – Determination of young's modulus
4. Lee's disc Determination of thermal conductivity of a bad conductor
5. Potentiometer-Determination of thermo e.m.f of a thermocouple
6. Laser- Determination of the wave length of the laser using grating
7. Air wedge - Determination of thickness of a thin sheet/wire
8. a) Optical fibre -Determination of Numerical Aperture and acceptance angle
   b) Compact disc- Determination of width of the groove using laser.
9. Acoustic grating- Determination of velocity of ultrasonic waves in liquids.
10. Ultrasonic interferometer – determination of the velocity of sound and compressibility of liquids
11. Post office box -Determination of Band gap of a semiconductor.
12. Spectrometer- Determination of wavelength using gating.
13. Viscosity of liquids - Determination of co-efficient of viscosity of a liquid by Poiseuille"s flow

OUTCOME:

The hands on exercises undergone by the students will help them to apply physics principles of optics and thermal physics to evaluate engineering properties of materials.

CHEMISTRY LABORATORY:

(Minimum of 8 experiments to be conducted)

1. Estimation of HCl using Na_2CO_3 as primary standard and Determination of alkalinity in water sample.
2. Determination of total, temporary & permanent hardness of water by EDTA method.
3. Determination of DO content of water sample by Winkler's method.
4. Determination of chloride content of water sample by argentometric method.
5. Estimation of copper content of the given solution by Iodometry.
6. Determination of strength of given hydrochloric acid using pH meter.
7. Determination of strength of acids in a mixture of acids using conductivity meter.
8. Estimation of iron content of the given solution using potentiometer.
9. Estimation of iron content of the water sample using spectrophotometer (1, 10-Phenanthroline/thiocyanate method).
10. Estimation of sodium and potassium present in water using flame photometer.
11. Determination of molecular weight of poly vinyl alcohol using Ostwald viscometer.
12. Pseudo first order kinetics-ester hydrolysis.
13. Corrosion experiment-weight loss method.
14. Determination of CMC.
15. Phase change in a solid.

TOTAL: 60 PERIODS

TEXTBOOKS

1. Vogel's Textbook of Quantitative Chemical Analysis (8^{TH} edition, 2014)
2. Laboratory Manual- Department of Chemistry, CEGC, Anna University (2014).

GE7162	ENGINEERING PRACTICES LABORATORY (Common to all Branches of B.E. / B.Tech. Programmes)	L	T	P	C
		0	0	4	2

OBJECTIVES

To provide exposure to the students with hands-on experience on various Basic Engineering Practices in Civil, Mechanical, Electrical and Electronics Engineering.

GROUP – A (CIVIL & ELECTRICAL)

1. CIVIL ENGINEERING PRACTICES **15**

PLUMBING

Basic pipe connections involving the fittings like valves, taps, coupling, unions, reducers, elbows and other components used in household fittings. Preparation of plumbing line sketches.

- Laying pipe connection to the suction side of a pump.
- Laying pipe connection to the delivery side of a pump.
- Practice in connecting pipes of different materials: Metal, plastic and flexible pipes used in household appliances.

WOOD WORK

Sawing, planing and making joints like T-Joint, Mortise and Tenon joint and Dovetail joint.

STUDY

- Study of joints in door panels and wooden furniture
- Study of common industrial trusses using models.

2. ELECTRICAL ENGINEERING PRACTICES **15**

- Basic household wiring using Switches, Fuse, Indicator and Lamp etc.,
- Stair case light wiring
- Tube – light wiring
- Preparation of wiring diagrams for a given situation.
- Study of Iron-Box, Fan Regulator and Emergency Lamp

GROUP – B (MECHANICAL AND ELECTRONICS) **15**

3. MECHANICAL ENGINEERING PRACTICES

WELDING

- Arc welding of Butt Joints, Lap Joints, and Tee Joints
- Gas welding Practice.
- Basic Machining - Simple turning, drilling and tapping operations..
- Study and assembling of the following:
    a. Centrifugal pump
    b. Mixie
    c. Air Conditioner.

DEMONSTRATION ON FOUNDRY OPERATIONS.

4. ELECTRONIC ENGINEERING PRACTICES **15**

- Soldering simple electronic circuits and checking continuity.
- Assembling electronic components on a small PCB and Testing.
- Study of Telephone, FM radio and Low Voltage Power supplies.

TOTAL: 60 PERIODS

OUTCOMES

- Ability to fabricate carpentry components and to lay pipe connections including plumbing works.
- Ability to use welding equipments to join the structures
- Ability to do wiring for electrical connections and to fabricate electronics circuits.

HS7251 **TECHNICAL ENGLISH** **L T P C**
4 0 0 4

OBJECTIVES

- To enable students acquire proficiency in technical communication.
- To enhance their reading and writing skills in a technical context.
- To teach various language learning strategies needed in a professional environment.

CONTENTS

UNIT I ANALYTICAL READING **12**

Listening- Listening to informal and formal conversations; **Speaking** – Conversation Skills(opening, turn taking, closing)-explaining how something works-describing technical functions and applications; **Reading** –Analytical reading, Deductive and inductive reasoning; **Writing**- vision statement–structuring paragraphs.

UNIT II SUMMARISING **12**

Listening- Listening to lectures/ talks on Science & Technology; **Speaking** –Summarizing/ Oral Reporting, **Reading** – Reading Scientific and Technical articles; **Writing**- Extended definition –Lab Reports – Summary writing.

UNIT III DESCRIBING VISUAL MATERIAL **12**

Listening- Listening to a panel discussion; **Speaking** – Speaking at formal situations; **Reading** – Reading journal articles - Speed reading; **Writing**-data commentary-describing visual material-writing problem-process- solution-the structure of problem-solution texts- writing critiques

UNIT IV WRITING/ E-MAILING THE JOB APPLICATION **12**

Listening- Listening to/ Viewing model interviews; **Speaking** –Speaking at different types of interviews – Role play practice (mock interview); **Reading** – Reading job advertisements and profile of the company concerned; **Writing**- job application – cover letter –Résumé preparation.

UNIT V REPORT WRITING **12**

Listening- Viewing a model group discussion; **Speaking** –Participating in a discussion - Presentation; **Reading** – Case study - analyse -evaluate – arrive at a solution; **Writing**–

Recommendations- Types of reports (feasibility report)- designing and reporting surveys- – Report format.- writing discursive essays.

TEACHING METHODS:

Practice writing
Conduct model and mock interview and group discussion.
Use of audio – visual aids to facilitate understanding of various forms of technical communication.
Interactive sessions.

EVALUATION PATTERN:

Internals – 50%
End Semester – 50%

TOTAL:60 PERIODS

OUTCOMES

- Students will learn the structure and organization of various forms of technical communication.
- Students will be able to listen and respond to technical content.
- Students will be able to use different forms of communication in their respective fields.

TEXTBOOK:

1. Craig,Thaine**. Cambridge Academic English: An integrated skills course for EAP(Student's Book)Level: Intermediate** Cambridge University Press, New Delhi: 2012

REFERENCES:

1. Laws, Anne. **Presentations.** Hyderabad: Orient Blackswan, 2011.
2. Ibbotson, Mark. **Cambridge English for Engineering**. Cambridge University Press, Cambridge,New Delhi: 2008
3. Naterop, Jean B. and Rod Revell. **Telephoning in English**. Cambridge: Cambridge University Press, 2004.
4. Rutherford, Andrea J. **Basic Communication Skills for Technology**. New Delhi: Pearson Education, 2001.
5. Bailey, Stephen. **Academic Writing A practical Guide for Students**. Routledge, London: 2004
6. Hewings, Martin**. Cambridge Academic English: An integrated skills course for EAP(Student's Book)Level: Intermediate** Cambridge University Press, New Delhi: 2012.

MA7251	MATHEMATICS - II (Common to all branches of B.E. / B.Tech. Programmes in II Semester)	L	T	P	C
		4	0	0	4

OBJECTIVES:

- To develop the use of matrix algebra techniques that is needed by engineers for practical applications.
- To acquaint the student with the concepts of vector calculus, needed for problems in all engineering disciplines.
- To develop an understanding of the standard techniques of complex variable theory so as to enable the student to apply them with confidence, in application areas such as heat conduction, elasticity, fluid dynamics and flow of the electric current.
- To make the student appreciate the purpose of using transforms to create a new domain in which it is easier to handle the problem that is being investigated.

UNIT I MATRICES 12

Eigenvalues and Eigenvectors of a real matrix – Characteristic equation – Properties of eigenvalues and eigenvectors – Cayley-Hamilton theorem – Diagonalization of matrices – Reduction of a quadratic form to canonical form by orthogonal transformation – Nature of quadratic forms.

UNIT II VECTOR CALCULUS 12

Gradient and directional derivative – Divergence and Curl – Irrotational and Solenoidal vector fields – Line integral over a plane curve – Surface integral - Area of a curved surface - Volume integral - Green's, Gauss divergence and Stoke's theorems – Verification and application in evaluating line, surface and volume integrals.

UNIT III ANALYTIC FUNCTION 12

Analytic functions – Necessary and sufficient conditions for analyticity - Properties – Harmonic conjugates – Construction of analytic function - Conformal mapping – Mapping by functions $w = z + c$, az, $\frac{1}{z}$, z^2 - Bilinear transformation.

UNIT IV COMPLEX INTEGRATION 12

Line integral - Cauchy's integral theorem – Cauchy's integral formula – Taylor's and Laurent's series – Singularities – Residues – Residue theorem – Application of residue theorem for evaluation of real integrals – Use of circular contour and semicircular contour with no pole on real axis.

UNIT V LAPLACE TRANSFORMS 12

Existence conditions – Transforms of elementary functions – Transform of unit step function and unit impulse function – Basic properties – Shifting theorems -Transforms of derivatives and integrals – Initial and final value theorems – Inverse transforms – Convolution theorem – – Transform of periodic functions – Application to solution of linear ordinary differential equations with constant coefficients.

TOTAL: 60 PERIODS

OUTCOMES:

- Upon successful completion of the course, students should be able to:
- Evaluate real and complex integrals using the Cauchy integral formula and the residue theorem
- Appreciate how complex methods can be used to prove some important theoretical

results.

- Evaluate line, surface and volume integrals in simple coordinate systems
- Calculate grad, div and curl in Cartesian and other simple coordinate systems, and establish identities connecting these quantities
- Use Gauss, Stokes and Greens theorems to simplify calculations of integrals and prove simple results.

TEXTBOOKS:

1. Erwin Kreyszig, "Advanced Engineering Mathematics", John Wiley and Sons, 9th Edition, New Delhi, 2014.
2. Grewal B.S., “Higher Engineering Mathematics”, Khanna Publishers, New Delhi, 43rd Edition, 2014.

REFERENCES:

1. Ramana, B.V. “Higher Engineering Mathematics”, Tata McGraw Hill, New Delhi, 2010.
2. Glyn James, “Advanced Modern Engineering Mathematics”, Pearson Education, New Delhi, 2007.
3. Jain R.K. and Iyengar S.R.K., “Advanced Engineering Mathematics”, Narosa Publications, New Delhi, 3rd Edition, 2007.
4. Bali N., Goyal M. and Watkins C., “Advanced Engineering Mathematics”, Firewall Media (An imprint of Lakshmi Publications Pvt., Ltd.,), New Delhi, 7th Edition, 2009.
5. Peter V. O’Neil , “Advanced Engineering Mathematics”, Cengage Learning India Pvt., Ltd, New Delhi, 2007.

PH7251	MATERIALS SCIENCE	L	T	P	C
	(Common to Manufacturing, Industrial, Mining, Aeronautical, Automobile and Production Engineering)	3	0	0	3

OBJECTIVE:

- To introduce the essential principles of materials science for mechanical and related Engineering applications.

UNIT I PHASE DIAGRAMS 9

Solid solutions - Hume Rothery’s rules - The phase rule - single component system - one-component system of iron - binary phase diagrams - isomorphous systems - the tie-line rule - the lever rule - application to isomorphous system - eutectic phase diagram - peritectic phase diagram - other invariant reactions – free energy composition curves for binary systems - microstructural change during cooling.

UNIT II FERROUS ALLOYS AND HEAT TREATMENT 9

The iron-carbon equilibrium diagram - phases, invariant reactions - microstructue of slowly cooled steels - eutectoid steel, hypo and hypereutectoid steels - effect of alloying elements on the Fe-C system - diffusion in solids - Fick’s law - phase transformations - T-T-T-diagram for eutectoid steel – pearlitic, baintic and martensitic transformations - tempering of martensite - heat treatment of steels - annealing - normalizing - quenching and tempering - case hardening - induction, flame and laser hardening - carburizing, cyaniding, carbonitriding and nitriding.

UNIT III MECHANICAL PROPERTIES 9

Tensile test - plastic deformation mechanisms - slip and twinning - role of dislocations in slip - strengthening methods - strain hardening - refinement of the grain size - solid solution strengthening - precipitation hardening - creep resistance - creep curves - mechanisms of creep - creep-resistant materials - fracture - the Griffith criterion - critical stress intensity factor and its determination - fatigue failure - fatigue tests - methods of increasing fatigue life - hardness - Rockwell and Brinell hardness - Knoop and Vickers microhardness.

UNIT IV MAGNETIC, DIELECTRIC AND SUPERCONDUCTING MATERIALS 9

Ferromagnetism – Domain theory – types of energy – hysteresis – hard and soft magnetic materials – ferrites - dielectric materials – types of polarization – Langevin-Debye equation – frequency effects on polarization - dielectric breakdown – insulating materials – Ferroelectric materials - superconducting materials, properties, types and applications.

UNIT V NEW MATERIALS 9

Ceramics – types and applications – Composites: classification, role of matrix and reinforcement – processing of fiber reinforced plastics – Metallic glasses – types , glass forming ability of alloys – Inoue criteria – melt spinning process – applications - Shape memory alloys – phases, shape memory effect, pseudoelastic effect – NiTi alloy – applications- Nanomaterials – preparation: ball milling and chemical vapour deposition - properties and applications – carbon nanotubes - Biomaterials.

TOTAL: 45 PERIODS

OUTCOME:

- Upon completion of this course, the students can able to apply the different materials, their processing, and heat treatments in suitable application in mechanical engineering fields.

TEXTBOOKS:

1. Raghavan, V. “Physical Metallurgy: Principles and Practice”, Phi Learning (2009).
2. Balasubramaniam, R. “Callister’s Materials Science and Engineering”, Wiley India Pvt. Ltd. (2014).
3. Palanisamy P.K., “Materials Science”, Scitech (2013).

REFERENCES:

1. Raghavan, V. “Materials Science and Engineering”, Printice Hall of India (2007).
2. Shackelford, J.F. “Introduction to Materials Science for Engineers”. Pearson India (2006).
3. Donald Askeland. “Materials Science and Engineering”, Brooks/Cole (2010).
4. Smith, W.F., Hashemi, J. and R.Prakash. “Materials Science and Engineering”,Tata Mcgraw Hill Education Private Limited (2014).

GE7151	COMPUTING TECHNIQUES	L	T	P	C
	(Common to all branches of Engineering and Technology)	**3**	**0**	**0**	**3**

OBJECTIVES:

- To learn programming using a structured programming language.
- To provide C programming exposure.
- To introduce foundational concepts of computer programming to students of different branches of Engineering and Technology.

UNIT I INTRODUCTION 9

Introduction to Computers – Computer Software – Computer Networks and Internet - Need for logical thinking – Problem formulation and development of simple programs - Pseudo code - Flow Chart and Algorithms.

UNIT II C PROGRAMMING BASICS 9

Introduction to C programming – Fundamentals – Structure of a C program – Compilation and linking processes - Constants, Variables – Data Types – Expressions - Operators –Decision Making and Branching – Looping statements – Solving Simple Scientific and Statistical Problems.

UNIT III ARRAYS AND STRINGS 9

Arrays – Initialization – Declaration – One dimensional and two dimensional arrays - Strings- String operations – String Arrays - simple programs- sorting- searching – matrix operations.

UNIT IV POINTERS 9

Macros - Storage classes –Basic concepts of Pointers– Pointer arithmetic - Example Problems - Basic file operations

UNIT V FUNCTIONS AND USER DEFINED DATA TYPES 9

Function – definition of function – Declaration of function – Pass by value – Pass by reference – Recursion –Enumerators – Structures - Unions

TOTAL : 45 PERIODS

OUTCOMES:

At the end of the course, the student should be able to:

- Write C program for simple applications
- Formulate algorithm for simple problems
- Analyze different data types and arrays
- Perform simple search and sort**.**
- Use programming language to solve problems.

TEXTBOOKS:

1. Pradip Dey, Manas Ghosh, “Computer Fundamentals and Programming in C”, Second Edition, Oxford University Press, 2013.
2. Ashok N. Kamthane, “Computer programming”, Pearson Education, 2007.
3. Yashavant P. Kanetkar. “Let Us C”, BPB Publications, 2011.

REFERENCES:

1. Kernighan,B.W and Ritchie,D.M, “The C Programming language”, Second Edition, Pearson Education, 2006 .
2. Byron S Gottfried, “Programming with C”, Schaums Outlines, Second Edition, Tata McGraw-Hill, 2006.
3. R.G. Dromey, “How to Solve it by Computer”, Pearson Education, Fourth Reprint, 2007.

PR7251 PRODUCTION PROCESSES L T P C
(Common to Aero/Auto/Rubber and Plastics) 3 0 0 3

OBJECTIVES:

- To impart the knowledge about the various production processes available
- To expose the student on the principle and applications of the processes
- To make a decision on a relevant process based on the merits and demerits.

UNIT I CASTING PROCESSES 10

Methods of production processes – comparison – sand casting – mould, pattern, die – pattern allowances – materials – types – 2 and 3 box moulding process – steps involved – core function and core making – runner, riser, gate-purpose – construction, principle, merits, demerits and applications of die casting, shell moulding, investment casting, centrifugal casting, continuous casting squeeze casting.

UNIT II METAL FORMING PROCESSES 8

Definition and companion of hot and cold forming – Principle, construction, types, merits, demerits and application of forging, rolling, extrusion, spinning processes – sheet metal operations – Types of dies used – Principle of powder metallurgy – steps involved – merits, demerits and applications.

UNIT III MACHINING PROCESSES 9

Machine and machine tool – construction, types operations in the following machines with block diagrams – Lathe, Milling, Drilling and Grinding – Concept of NC/CNC machines – Comparison of CNC with conventional machines – sample manual part programming for CNC Lathe and milling.

UNIT IV WELDING PROCESSES 9

Types of joining – soldering, brazing, welding, Chemical and mechanical – Fusion welding process – Gas welding – flame types – applications = Arc welding – types of joint – electrode – power supply – edge preparation – weld symbol – filler material – flux/ shielding gases – arc theory – Construction and applications of types of arc welding – Manual, GTAW, GMAW, SAW, ESW – Thermit welding, Pressure welding – resistance welding – spot, seam, projection and flash butt welding – stud welding – friction stir welding – diffusion bonding.

UNIT V UNCONVENTIONAL MACHINING PROCESSES 9

Need for unconventional – Construction, working principle merits, demerits and applications with block diagram only for AJM, AWJM, USM, CHM, ECM, EDM, EBM, LBM, PAM and IBM.

TOTAL: 45 PERIODS

OUTCOMES:

- Has enough knowledge on the various processes available to make a part.
- Confident to select the process to based on cost of time and quantities.
- Can determine processes for new materials.

TEXT BOOKS

1. Serope Kalpakjian, Steven R. Schmid, Manufacturing Engineering and Technology - Anna University, 4/e, Pearson Education, 2014
2. P.C. Sharma, “A Text Book of Production Technology”, S.Chand and Co. Ltd., New Delhi, 2010.

REFERENCE BOOKS:

1. B.H.Amstead, Phillip F.Ostwald, L.Begemon, “Manufacturing Processes”, John Wiley

and Sons, 8th Edition, 1998.
2. De Garmo, "Materials and Processes in Manufacturing", Prentice Hall of India, 8th Edition, 2008.
3. P.N.Rao, "Manufacturing Technology – I and II", Tata McGraw Hill Publishing Co., New Delhi – 2013.
4. Amitabha Ghosh, Asok Kumar Mallik, Manufacturing Science, EWP Pvt. Ltd, 2007

GE7153 ENGINEERING MECHANICS

L	T	P	C
4	0	0	4

OBJECTIVE :

- The objective of this course is to inculcate in the student the ability to analyze any problem in a simple and logical manner and to predict the physical phenomena and thus lay the foundation for engineering applications.

UNIT I STATICS OF PARTICLES 12

Fundamental Concepts and Principles, Systems of Units, Method of Problem Solutions, Statics of Particles -Forces in a Plane, Resultant of Forces, Resolution of a Force into Components, Rectangular Components of a Force, Unit Vectors.

Equilibrium of a Particle- Newton's First Law of Motion, Space and Free-Body Diagrams, Forces in Space, Equilibrium of a Particle in Space.

UNIT II EQUILIBRIUM OF RIGID BODIES 12

Principle of Transmissibility, Equivalent Forces, Vector Product of Two Vectors, Moment of a Force about a Point ,Varignon's Theorem, Rectangular Components of the Moment of a Force, Scalar Product of Two Vectors, Mixed Triple Product of Three Vectors, Moment of a Force about an Axis, Couple - Moment of a Couple, Equivalent Couples, Addition of Couples, Resolution of a Given Force into a Force -Couple system, Further Reduction of a System of Forces, Equilibrium in Two and Three Dimensions - Reactions at Supports and Connections.

UNIT III DISTRIBUTED FORCES 16

Centroids of lines and areas – symmetrical and unsymmetrical shapes, Determination of Centroids by Integration , Theorems of Pappus-Guldinus, Distributed Loads on Beams, Center of Gravity of a Three-Dimensional Body, Centroid of a Volume, Composite Bodies , Determination of Centroids of Volumes by Integration.

Moments of Inertia of Areas and Mass - Determination of the Moment of Inertia of an Area by Integration , Polar Moment of Inertia , Radius of Gyration of an Area , Parallel-Axis Theorem , Moments of Inertia of Composite Areas, Moments of Inertia of a Mass - Moments of Inertia of Thin Plates , Determination of the Moment of Inertia of a Three-Dimensional Body by Integration.

UNIT IV FRICTION 8

The Laws of Dry Friction. Coefficients of Friction, Angles of Friction, Wedges, Wheel Friction. Rolling Resistance , Ladder friction.

UNIT V DYNAMICS OF PARTICLES 12

Kinematics - Rectilinear Motion and Curvilinear Motion of Particles.

Kinetics- Newton's Second Law of Motion -Equations of Motions , Dynamic Equilibrium, Energy and Momentum Methods - Work of a Force , Kinetic Energy of a Particle, Principle of Work and Energy, Principle of Impulse and Momentum, Impact, Method of Virtual Work - Work of a Force, Potential Energy, Potential Energy and Equilibrium.

L – 45 + T – 15 TOTAL: 60 PERIODS

OUTCOME:

- Upon completion of this course, students will be able to construct meaningful mathematical models of physical problems and solve them.

TEXT BOOK

1. Beer,F.P and Johnson Jr. E.R, "Vector Mechanics for Engineers", McGraw-Hill Education (India) Pvt. Ltd. 10th Edition, 2013.

REFERENCES

1. Hibbeller, R.C., Engineering Mechanics: Statics, and Engineering Mechanics: Dynamics, 13th edition, Prentice Hall, 2013.
2. J.L. Meriam & L.G. Karige, Engineering Mechanics: Statics (Volume I) and Engineering Mechanics: Dynamics, 7th edition, Wiley student edition, 2013.
3. P. Boresi & J. Schmidt, Engineering Mechanics: Statics and Dynamics, 1/e, Cengage learning, 2008.
4. Irving H. Shames, G. Krishna Mohana Rao, Engineering Mechanics - Statics and Dynamics, Fourth Edition – PHI / Pearson Education Asia Pvt. Ltd., 2006.
5. Vela Murali, "Engineering Mechanics", Oxford University Press (2010)

PR7261	PRODUCTION PROCESSESS LABORATORY (Common to Aero/Auto/Rubber and Plastics)	L 0	T 0	P 4	C 2

OBJECTIVES:

- To get hands on experience in the machines for production
- To prepare the process planning sheets for all the operations and then follow the sequence during the machining processes.

LIST OF EXPERIMENTS:

1. Study of all the machining tools- identification of parts/mechanisms and position of tool and work piece.
2. Facing, plain turning/step turning operations in Lathe.
3. Tape Turning/Threading and knurling operations in Lathe.
4. Multi-start Threading/Burnishing operations in Lathe.
5. Machining to make a cube using shaper
6. Machining to make a V-block using shaper.
7. Counter sinking, counter Boring and Tapping operations in a drilling machine.

8. Surfacing/pocket milling in a vertical milling machine.
9. Polygonal shape milling in a horizontal milling machine
10. Flat surface grinding and cylindrical grinding operations
11. Machining an internal spline in slotting machine.
12. To machine the given part drawing using Lathe and milling machines.

TOTAL: 60PERIODS

OUTCOMES:

- Enough experience to operate machines and processes commonly used in production of components.
- Enable interpretation of process plan sheets to be followed for the machining of products.

GE7161 COMPUTER PRACTICES LABORATORY

L	T	P	C
0	0	4	2

OBJECTIVES:

- To understand the basic programming constructs and articulate how they are used to develop a program with a desired runtime execution flow.
- To articulate where computer programs fit in the provision of computer-based solutions to real world problems.
- To learn to use user defined data structures.

LIST OF EXPERIMENTS

1. Search, generate, manipulate data using MS office/ Open Office
2. Presentation and Visualization – graphs, charts, 2D, 3D
3. Problem formulation, Problem Solving and Flowcharts
4. C Programming using Simple statements and expressions
5. Scientific problem solving using decision making and looping.
6. Simple programming for one dimensional and two dimensional arrays.
7. Solving problems using String functions
8. Programs with user defined functions
9. Program using Recursive Function
10. Program using structures and unions.

TOTAL: 60 PERIODS

OUTCOMES:

At the end of the course, the student should be able to:

- Write and compile programs using C programs.
- Write program with the concept of Structured Programming
- Identify suitable data structure for solving a problem
- Demonstrate the use of conditional statement.

LABORATORY REQUIREMENTS FOR BATCH OF 30 STUDENTS

30 Systems with C compiler

AE7301 AERO ENGINEERING THERMODYNAMICS L T P C
3 0 0 3

OBJECTIVE:

- To introduce fundamental concepts in thermodynamics, heat transfer, and refrigeration and air conditioning. Apply Mathematical foundations, principles in solving thermodynamics problems.

UNIT I FIRST LAW OF THERMODYNAMICS 9

Concept of continuum-Macroscopic approach-thermodynamic systems-properties-state, path and process, quasi-static process- work and heat-zeroth law and first law of thermodynamics-internal energy-enthalpy- applications of first law of thermodynamics to closed and open system.

UNIT II SECOND LAW OF THERMODYNAMICS 10

Second law of thermodynamics-Kelvin's and Clausius statements of second law-reversibility and irreversibility-carnot theorem-carnot cycle- reversed carnot cycle- clausius inequality-concept of entropy-principle of energy-availability and unavailability-Exergy for closed and an open systems.

UNIT III PROPERTIES OF PURE SUBSTANCES AND POWER CYCLE 8

Properties of pure substances-Thermodynamic properties of pure substances in solid, liquid and vapour phases, phase rule, P-V, P-T, T-V, H-S diagrams, PVT surfaces thermodynamics properties of steam, calculations of work done and heat transfer in non-flow and flow processes. Standard Rankine cycle, Reheat and Regeneration cycle.

UNIT IV AIR STANDARD CYLCES AND IC ENGINES 9

Cycle-air standard efficiency-Otto cycle-diesel cycle- dual cycle- Brayton cycle-components of IC engines-Two stroke and four stroke cycle engine-performance of IC engine-supercharging.

UNIT V REFRIGERATION, AIR CONDITIONING AND PSYCHROMETRY 9

Concepts of psychrometry, Psychrometric relation and charts-processes-Refrigeration systems-Air-conditioning systems and its types- simple vapour compression system-vapour absorption system-Refrigerants.

TOTAL: 45 PERIODS

OUTCOME:

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

TEXT BOOKS:

1. Nag.P.K., "Engineering Thermodynamics", McGraw Hill Education (India) Private Limited; Fifth edition ,April 2013.
2. Rathakrishnan E, "Fundamentals of Engineering Thermodynamics", Prentice Hall India, 2 revised edition 2005.
3. Yunus A. Cengel and Michael A. Boles, "Thermodynamics: An Engineering Approach" McGraw-Hill Science/Engineering/Math; 7thedition 2010.

REFERENCES:

1. Ramalingam K.K. "Thermodynamics", Sci-Tech Publications, 2006
2. Holman.J.P., "Thermodynamics", 3rd Ed. McGraw-Hill, 2007.
3. Venwylen and Sontag, "Classical Thermodynamics", Wiley Eastern, 1987
4. Arora C.P, "Thermodynamics", Tata McGraw-Hill, New Delhi, 2003.
5. Merala C, Pother, Craig W, Somerton, "Thermodynamics for Engineers", Schaum Outline Series, Tata McGraw-Hill, New Delhi, 2004.

AE7302 **PRINCIPLES OF FLIGHT** **L T P C**
3 0 0 3

OBJECTIVE:

- To introduce the concepts of flying, International standard atmosphere, structural aspects of airplanes, brief description of systems of instruments used in airplanes and power plants used**.**

UNITI HISTORY OF FLIGHT 8

Balloon flight-ornithopers-Early Airplanes by Wright Brothers, biplanes and monoplanes, Developments in aerodynamics, materials, structures and propulsion over the years.

UNITII AIRCRAFT CONFIGURATIONS AND ITS CONTROLS 10

Different types of flight vehicles, classifications-Components of an airplane and their functions-Conventional control, powered control- Basic instruments for flying-Typical systems for control actuation.

UNIT III BASICS OF AERODYNAMICS 9

Physical Properties and structures of the Atmosphere, Temperature, pressure and altitude relationships, Newton's Law of Motions applied to Aeronautics-Evolution of lift, drag and moment. Aerofoils, Mach number, Maneuvers.

UNIT IV BASICS OF PROPULSION 9

Basic ideas about piston, turboprop and jet engines – use of propeller and jets for thrust production- Comparative merits, Principle of operation of rocket, types of rocket and typical applications, Exploration into space.

UNITV BASICS OF AIRCRAFT STRUCTURES 9

General types of construction, Monocoque, semi-monocoque and geodesic constructions, typical wing and fuselage structure. Metallic and non-metallic materials. Use of Aluminium alloy, titanium, stainless steel and composite materials. Stresses and strains-Hooke's law- stress-strain diagrams-elastic constants-Factor of Safety.

TOTAL : 45 PERIODS

OUTCOME:

- On completion of the course, the students will understand the basic concepts of Aerospace, their power plants and the Mechanics of its flight.

TEXT BOOKS

1. Anderson, J.D., Introduction to Flight, McGraw-Hill; 8th edition , 2015
2. Stephen.A. Brandt, Introduction to aeronautics: A design perspective, 2nd edition, AIAA Education Series, 2004.

REFERENCES

1. Kermode, A.C. Flight without Formulae, Pearson Education; Eleven edition, 2011

AE7351 ENGINEERING FLUID MECHANICS AND MACHINERY L T P C
3 0 0 3

OBJECTIVE:

- The student is introduced to the mechanics of fluids through a thorough understanding of the properties of the fluids. The dynamics of fluids is introduced through the control volume approach which gives an integrated understanding of the transport of mass, momentum and energy. The applications of the conservation laws to flow though pipes and hydraulics machines are studied.

UNIT I INTRODUCTION 8

Units and dimensions- Properties of fluids- mass density, specific weight, specific volume, specific gravity, viscosity, compressibility, vapor pressure, surface tension and capillarity. Flow characteristics – concept of control volume - application of continuity equation, energy equation and momentum equation.

UNIT II FLOW THROUGH CIRCULAR CONDUITS 9

Hydraulic and energy gradient - Laminar flow through circular conduits and circular annuli- Boundary layer concepts – types of boundary layer thickness – Darcy Weisbach equation –friction factor- Moody diagram- commercial pipes- minor loses – Flow through pipes in series and parallel.

UNIT III DIMENSIONAL ANALYSIS 8

Need for dimensional analysis – methods of dimensional analysis – Similitude –types of similitude - Dimensionless parameters- application of dimensionless parameters – Model analysis.

UNIT IV TURBINES 10

Impact of jets - Euler's equation - Theory of roto-dynamic machines-Classification of turbines – heads and efficiencies – velocity triangles. Axial, radial and mixed flow turbines. Pelton wheel, Francis turbine and Kaplan turbines- working principles - work done by water on the runner –. Specific speed - unit quantities – performance curves for turbines .

UNIT V PUMPS 10

Various efficiencies– velocity components at entry and exit of the rotor- velocity triangles - Centrifugal pumps– working principle - work done by the impeller - performance curves - Reciprocating pump- working principle – Rotary pumps –classification.

TOTAL: 45 PERIODS

OUTCOME:

- On completion of the course, students will be familiar with all the basic concepts of fluids and fluid flow phenomenon, conservation equations and their applications to simple problems.

TEXT BOOKS:

1. Bansal, R.K., Fluid Mechanics and Hydraulics Machines, Laxmi Publications (P) Ltd., New Delhi, Ninth edition,2015.
2. Rathakrishnan. E, Fluid Mechanics, Prentice Hall of India (II Ed.), 2007.

REFERENCES:

1. Ramamurtham. S, Hydraulics, Fluid Mechanics and Fluid Machines, Dhanpat Rai Publishing Co Pvt., Ltd, 9th edition, 2012.
2. Kumar. K.L. Engineering Fluid Mechanics (VII Ed.) S Chand publishers Reprint Edition 2006 edition (1 December 2010)
3. Streeter. V. L., and Wylie, E.B., Fluid Mechanics, McGraw Hill, 1983.

AE7353 **SOLID MECHANICS** **L T P C**
3 0 0 3

OBJECTIVE:

- To introduce various behavior of structural components under various loading conditions. Also to introduce about the deflection of beams, stresses and strains in torsional members.

UNIT I STRESS-STRAIN – AXIAL LOADING 9

Definition of stress and strain- Stress-Strain relation- Relation between material constants.-Bar under axial loading- Statically determinate and indeterminate cases – Thermal stress-Impact Loading

UNIT II STRESSES IN BEAMS 9

Types of beams and loadings – Relation between shear force and bending moment - Shear force and bending moment diagrams – Euler beam theory - Bending stress in beams – Shear stress in beam – Composite beam.

UNIT III DEFLECTION OF BEAM 9

Various methods for statically determinate beams - Double integration method – Macaulay's method – Moment area method – Conjucate Beam method – Method of superposition

UNIT IV TORSION – SPRINGS 9

Shear stress and twist relation for circular section – Comparison of hollow shaft and solid shaft – Compound shaft – Power transmission by circular shafts – Springs – Deflection expression for close coiled helical spring – Stress in springs.

UNIT V BIAXIAL STRESS 9

Thin walled cylinder under internal pressure – Principal stresses for general biaxial stress field – Mohr's circle - Stresses in combined loading

TOTAL: 45 PERIODS

OUTCOMES:

At the end of the course

- Students will be familiarizing with the fundamentals of deformation, stresses, and strains in structural elements and pressure vessels.
- Students will be familiarizing the beam of different cross sections for shear force, bending moment, slope and deflection.

TEXT BOOKS:

1. Timoshenko and young, 'Elements of strength of Materials', Vol I & II, Van Nostrand Reinhold Company; 5th Revised edition,1968.
2. William Nash, Strength of Materials, McGraw-Hill Education; 6th edition , 2013.
3. 'Mechanics of Materials' by James M. Gere & Barry J Goodno, cengage Learning Custom Publishing, 8th edition, 2012.

REFERENCES:

1. Clive L. Dym , Irving H. Shames, "Solid Mechanics : A Variational Approach, Augmented Edition", Springer publishers, 2013.
2. Stephen Timoshenko, 'Strength of Materials',Vol I & II, CBS Publishers and Distributors, 3rd edition, 2004.
3. R.K.Rajput, 'Strength of Materials', S Chand; 4th Rev. Edition 2007.

EE7151 BASIC ELECTRICAL AND ELECTRONICS ENGINEERING L T P C
3 0 0 3

OBJECTIVES:

- To impart the knowledge on basic concepts of electrical circuits and electrical machines.
- To impart the knowledge on basic concepts of electronic components, devices and circuits

UNIT I BASIC CONCEPTS AND DC CIRCUITS 9

Ohm's law - Electrical resistance - Series /Parallel resistive circuits - Star/Delta transformations - Kirchoff's law - Node and Mesh analysis - Thevenin's and Norton's theorem.

UNIT II A.C.CIRCUITS 9

RMS and average value of periodic waves - Form factor - Phase and Phase difference - Simple RC.RL and RLC circuits - series and parallel resonance - power and power factor - introduction to three phase systems – power measurement in 3 phase system.

UNIT III D.C. MACHINES 10

Construction details of DC machines - principle of operation of DC generator - EMF equation - principle of DC motor - Back EMF - Voltage and torque equation - Principle of transformer - construction and type - EMF equation - Tests on transformer - Equivalent circuit - Induction motor - Construction and basic principle of operation - Starting and Running torques.

UNIT IV ELECTRONIC COMPONENTS AND DEVICES 9

Operating principle and characteristics of Simple PN Junction Diodes, Zener diode, Bipolar Junction transistor - Field Effect Transistors – UJT – SCR.

UNIT V ANALOG CIRCUITS 8

Rectifier and Power Supply Circuits, clipper, clamper using diodes, Operational Amplifiers (Ideal) - properties and typical circuits like differentiator, integrator, summer, comparator.

TOTAL: 45 PERIODS

OUTCOME:

- Ability to use the various electrical machines like AC/ DC, electronic components and applications of analog circuits

REFERENCES:

1. Theraja, B.L., "A Text Books of Electrical Technology ", S.S. Chand and Co., New Delhi, 1998.
2. Edminister J.A., "Theory and Problems on Electric circuits ", McGraw Hill International Edition, 1994.
3. Kosow, I.L., "Electrical Machinery and Transformers ", 4th Edition, Prentice Hall of India, 1991.
4. Nagrath I.J. and Kothari D.P., "Theory and Problems of Basic Electrical Engineering", Prentice Hall of India, 1998.
5. Millman.J. and Grabel.S, Integrated Electronics, Tata McGraw Hill, 1995.
6. Horowits.P. and Hill.W, The Art of Electronics, McGraw Hill, 1995.

MA7354 NUMERICAL METHODS L T P C
4 0 0 4

OBJECTIVES:

- To provide the mathematical foundations of numerical techniques for solving linear system, Eigen value problems, interpolation, numerical differentiation and integration and the errors associated with them;
- To demonstrate the utility of numerical techniques of ordinary and partial differential equations in solving engineering problems where analytical solutions are not readily available.

UNIT I SOLUTION OF EQUATIONS AND EIGENVALUE PROBLEMS 12

Solution of algebraic and transcendental equations - Fixed point iteration method – Newton-Raphson method- Solution of linear system of equations - Gauss elimination method – Pivoting - Gauss-Jordan methods – Iterative methods of Gauss-Jacobi and Gauss-Seidel - Matrix Inversion by Gauss-Jordan method – Eigen values of a matrix by Power method and by Jacobi's method.

UNIT II INTERPOLATION AND APPROXIMATION 12

Interpolation with unequal intervals - Lagrange interpolation – Newton's divided difference interpolation – Cubic Splines - Interpolation with equal intervals - Newton's forward and backward difference formulae – Least square method - Linear curve fitting.

UNIT III NUMERICAL DIFFERENTATION AND INTEGRATION 12

Approximation of derivatives using interpolation polynomials - Numerical integration using Trapezoidal, Simpson's 1/3 and Simpson's 3/8 rules – Romberg's method - Two point and three point Gaussian quadrature formulae – Evaluation of double integrals by Trapezoidal and Simpson's rules.

UNIT IV INITIAL VALUE PROBLEMS FOR ORDINARY DIFFERENTIAL EQUATIONS 12

Single step-methods - Taylor's series method - Euler's method - Modified Euler's method - Fourth order Runge-Kutta method for solving first and second order equations - Multi-step methods - Milne's and Adams-Bashforth predictor-corrector methods for solving first order equations.

UNIT V BOUNDARY VALUE PROBLEMS IN ORDINARY AND PARTIAL DIFFERENTIAL EQUATIONS 12

Finite difference methods for solving two-point linear boundary value problems - Finite difference techniques for the solution of two dimensional Laplace's and Poisson's equations on rectangular domain – One dimensional heat-flow equation by explicit and implicit (Crank-Nicholson) methods - One dimensional wave equation by explicit method.

TOTAL: 60 PERIODS

OUTCOMES:

Upon completion of this course, the students will be able to:

- Demonstrate understanding of common numerical methods and how they are used to obtain approximate solutions.
- Apply numerical methods to obtain approximate solutions to mathematical problems.
- Derive numerical methods for various mathematical operations and tasks, such as interpolation, differentiation, integration, the solution of linear and nonlinear equations, and the solution of differential equations.
- Analyse and evaluate the accuracy of common numerical methods.

TEXT BOOKS:

1. Grewal, B.S. and Grewal,J.S., “Numerical methods in Engineering and Science”, Khanna Publishers, New Delhi, 9th Edition, 2007.
2. Sankara Rao . K, “Numerical Methods for Scientists and Engineers” PHI Learning Pvt Ltd. New Delhi, 2007.

REFERENCES:

1. Brian Bradie, “A Friendly Introduction to Numerical Analysis”, Pearson Education Asia, New Delhi, 1st Edition, 2007.
2. Gerald, C.F. and Wheatley, P.O., “Applied Numerical Analysis”, Pearson Education Asia, New Delhi, 6th Edition, 2006.
3. Laurene V. Fausett, “Applied Numerical Analysis using MATLAB”, Pearson Education, New Delhi, 1st print, 2nd Edition, 2009.
4. S. R. K. Iyengar, R. K. Jain, Mahinder Kumar Jain, "Numerical Methods for Scientific and Engineering Computation", 6th Edition, New Age International Publishers, New Delhi, 2012.

EE7261	ELECTRICAL AND ELECTRONICS ENGINEERING LABORATORY	L	T	P	C
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OBJECTIVE:

- To train the students in performing various tests on electrical drives, sensors and circuits.

LIST OF EXPERIMENTS:

1. Load test on separately excited DC shunt generator
2. Load test on DC shunt moor
3. Load test on S Transformer
4. Load test on Induction motor
5. Regulation of 3 Alternator
6. Study of CRO
7. Logic gates
8. Operational amplifiers
9. Time constant of RC circuit
10. Characteristics of LVDT
11. Calibration of Rotometer
12. RTD and Thermistor
13. Flapper Nozzle system

TOTAL: 60 PERIODS

OUTCOMES:

- Ability to perform speed characteristic of different electrical machine
- Ability to use of diodes, transistors for rectifiers
- Ability to use of operational amplifiers

ME7362 **MECHANICAL SCIENECS LABORATORY** **L T P C**
0 0 4 2

OBJECTIVE:

- To train the students in testing and quantifying the mechanical properties of Engineering Materials, Engines.

LIST OF EXPERIMENTS:

Material Testing Lab

- Tension Test
- Torsion Test
- Testing of springs
- Impact test i) Izod, ii) Charpy
- Hardness test i) Vickers, ii) Brinell, iii) Rockwell, iv) Shore
- Deflection of Beams
- Dye Penetrant Test
- Tensile testing of polymers.
- Flex Fatigue test for Elastomers.
- Injection moulding machine operation.

IC Engines Lab

- Performance test on a 4 stroke engine
- Viscosity determination of the given fluid
- Moment of inertia of connecting rod
- Determination of Effectiveness of a parallel and counter flow heat exchangers.
- Valve timing of a 4 stroke engine and port timing of a 2 stroke engine.
- Determination of Flash point and Fire point of the given oil.

TOTAL: 60 PERIODS

OUTCOME:

- Upon completion of this course, the students can able to apply determine the strength materials and thermal properties.