

SCHEME OF STUDIES & EXAMINATION

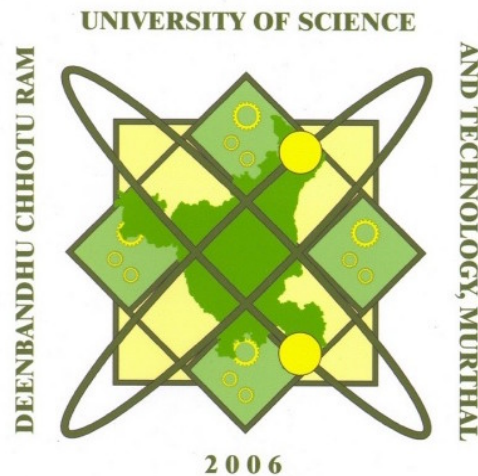
SYLLABUS

BACHELOR OF TECHNOLOGY

(4 Year Degree Programme)

AERONAUTICAL ENGINEERING

(w.e.f. session 2012-13)



DEENBANDHU CHHOTU RAM UNIVERSITY OF SCIENCE AND TECHNOLOGY

MURTHAL (SONIPAT-131039)

JUNE-2012/MARCH-2013

Deenbandhu Chhotu Ram University of Science & Technology, Murthal (Sonapat)
SCHEME OF STUDIES & EXAMINATIONS
B.Tech. 1ST YEAR (SEMESTER – I) (Common for all branches)
Credit Based Scheme w.e.f. 2012-13

S. No.	Course No.	Course Title	Teaching Schedule			Marks of Class work	Examination Marks		Total	Credit	Duration of Exam	
			L	T	P		Theory	Practical				
1	HUM 101B	COMMUNICATIVE ENGLISH	3	1		25	75	-	100	4	3	
2	MATH 101B	MATHEMATICS-I	3	1		25	75	-	100	4	3	
3	PHY 101B	ENGINEERING PHYSICS-I	3	1		25	75	-	100	4	3	
4	ME101B	MANUFACTURING PROCESSES (Gr-A)	3	1		25	75	-	100	4	3	
	CH101 B	OR ENGINEERING CHEMISTRY (Gr-B)	3	1		25	75	-				
5	EE101B	PRINCIPLES OF ELECTRICAL ENGINEERING (Gr-A)	3	1		25	75	-	100	4	3	
	CSE101B	OR INTRODUCTION TO COMPUTERS & PROGRAMMING (Gr-B)	3	1		25	75	-				
6	ME103B	ENGINEERING GRAPHICS & DRAWING (Gr-A)	1	-	4	40	-	60	100	3	3	
	ME105B	OR ELEMENTS OF MECHANICAL ENGINEERING (Gr-B)	3	1	-	25	75	-				
7	PHY103B	PHYSICS LAB-I	-	-	2	20		30	50	1	3	
8	ME 107B	WORKSHOP PRACTICE (Gr-A)	-	-	4	40		60	100	2	3	
	CH103B	OR CHEMISTRY LAB (Gr-B)	-	-	2	20		30				
9	EE103B	PRINCIPLES OF ELECTRICAL ENGINEERING LAB (Gr-A)	-	-	2	20		30	50	1	3	
	CSE103B	OR COMPUTER PROGRAMMING LAB (Gr-B)	-	-	2	20		30				
10	ME109B	ELEMENTS OF MECHANICAL ENGINEERING LAB (Gr-B)	-	-	2	20		30	50	1	3	
Total			Gr-A	16	5	12	245	375	180	800	27	
			Gr-B	18	6	8	230	450	120	800	28	

Note:

- 1 Every student has to participate in the sports activities. Minimum one hour is fixed for sports activities either in the morning or evening. Weightage of sports is given in General Proficiency & Ethics Syllabus.
- 2 The students will be allowed to use non-programmable scientific calculator. However, sharing/exchange of calculator is prohibited in the examination.
- 3 Electronics gadgets including Cellular phones are not allowed in the examination.
- 4 All the branches are to be divided into group 'A' and 'B' as per the suitability of the institute/ college, so that there is an equitable distribution of teaching load in odd and even semesters.

Deenbandhu Chhotu Ram University of Science & Technology, Murthal (Sonapat)
SCHEME OF STUDIES & EXAMINATIONS
B.Tech. 1ST YEAR (SEMESTER – II) (Common for all branches)
Credit Based Scheme w.e.f. 2012-13

S. No.	Course No.	Course Title	Teaching Schedule			Marks of Class work	Examination Marks		Total	Credit	Duration of Exam
			L	T	P		Theory	Practical			
1.	MATH102B	MATHEMATICS-II	3	1		25	75	-	100	4	3
2	PHY102B	ENGINEERING PHYSICS-II	3	1		25	75	-	100	4	3
3	ME101 B	MANUFACTURING PROCESSES (Gr-B)	3	1		25	75	-	100	4	3
	CH101 B	ENGINEERING CHEMISTRY (Gr-A)	3	1		25	75	-			
4	EE101B	PRINCIPLES OF ELECTRICAL ENGINEERING (Gr-B)	3	1		25	75	-	100	4	3
	CSE101B	INTRODUCTION TO COMPUTERS & PROGRAMMING (Gr-A)	3	1		25	75	-			
5	ECE102B	BASICS OF ELECTRONICS ENGINEERING	3	1		25	75	-	100	4	3
	BT102B	BASICS OF BIO TECHNOLOGY									
	HUM102 B	ORAL COMMUNICATION SKILLS									
	CE102 B	BASICS OF CIVIL ENGINEERING									
6	ME103B	ENGINEERING GRAPHICS & DRAWING (Gr-B)	1	-	4	40	-	60	100	3	3
	ME105B	ELEMENTS OF MECHANICAL ENGINEERING (Gr-A)	3	1	-	25	75	-	100	4	
7	PHY104B	PHYSICS LAB-II	-	-	2	20		30	50	1	3
8	ME 107B	WORKSHOP PRACTICE (Gr-B)	-	-	4	40		60	100	2	3
	CH103B	CHEMISTRY LAB (Gr-A)	-	-	2	20		30	50	1	
9	EE103B	PRINCIPLES OF ELECTRICAL ENGINEERING LAB (Gr-B)	-	-	2	20		30	50	1	3
	CSE103B	COMPUTER PROGRAMMING LAB (Gr-A)	-	-	2	20		30	50		
10	ME109B	ELEMENTS OF MECHANICAL ENGINEERING LAB (Gr-A)	-	-	2	20		30	50	1	3
11	GP 102B	GENERAL PROFICIENCY & ETHICS	1			-		50	50	2	
Total			Gr-B	17	5	12	245	375	230	850	29
			Gr-A	19	6	8	230	450	170	850	30

Note:

- Every student has to participate in the sports activities. Minimum one hour is fixed for sports activities either in the morning or evening. Weightage of Sports is given in General Proficiency & Ethics Syllabus
- Each student has to undergo a workshop atleast 4 weeks (80-100 hours) at the end of II semester during summer vacations. The evaluation of this training shall be carried out in the III semester.
- The students will be allowed to use non-programmable scientific calculator. However, sharing/exchange of calculator is prohibited in the examination.
- Electronics gadgets including Cellular phones are not allowed in the examination.
- All the branches are to be divided into group 'A' and 'B' as per the suitability of the institute/ college, so that there is an equitable distribution of teaching load in odd and even semesters.

HUM 101B COMMUNICATIVE ENGLISH						
B. Tech. Semester - I (Common for all Branches)						
L	T	P	Credits		Class Work	: 25 Marks
3	1	--	4		Examination	: 75 Marks
					Total	: 100 Marks
					Duration of Examination	: 3 Hours

Objective

The course aims at developing the desired language (English) skills of students of engineering and technology so that they become proficient in communication to excel in their professional lives. The course has been designed so as to enhance their linguistic and communicative competence.

Deenbandhu Chhotu Ram University of Science & Technology, Murthal (Sonapat)
SCHEME OF STUDIES & EXAMINATIONS
B.Tech. 1ST YEAR (SEMESTER – I) (Common for all branches)
Credit Based Scheme w.e.f. 2012-13

S. No.	Course No.	Course Title	Teaching Schedule			Marks of Class work	Examination Marks		Total	Credit	Duration of Exam	
			L	T	P		Theory	Practical				
1	HUM 101B	COMMUNICATIVE ENGLISH	3	1		25	75	-	100	4	3	
2	MATH 101B	MATHEMATICS-I	3	1		25	75	-	100	4	3	
3	PHY 101B	ENGINEERING PHYSICS-I	3	1		25	75	-	100	4	3	
4	ME101B	MANUFACTURING PROCESSES (Gr-A)	3	1		25	75	-	100	4	3	
	CH101 B	OR ENGINEERING CHEMISTRY (Gr-B)	3	1		25	75	-				
5	EE101B	PRINCIPLES OF ELECTRICAL ENGINEERING (Gr-A)	3	1		25	75	-	100	4	3	
	CSE101B	OR INTRODUCTION TO COMPUTERS & PROGRAMMING (Gr-B)	3	1		25	75	-				
6	ME103B	ENGINEERING GRAPHICS & DRAWING (Gr-A)	1	-	4	40	-	60	100	3	3	
	ME105B	OR ELEMENTS OF MECHANICAL ENGINEERING (Gr-B)	3	1	-	25	75	-				
7	PHY103B	PHYSICS LAB-I	-	-	2	20		30	50	1	3	
8	ME 107B	WORKSHOP PRACTICE (Gr-A)	-	-	4	40		60	100	2	3	
	CH103B	OR CHEMISTRY LAB (Gr-B)	-	-	2	20		30				
9	EE103B	PRINCIPLES OF ELECTRICAL ENGINEERING LAB (Gr-A)	-	-	2	20		30	50	1	3	
	CSE103B	OR COMPUTER PROGRAMMING LAB (Gr-B)	-	-	2	20		30				
10	ME109B	ELEMENTS OF MECHANICAL ENGINEERING LAB (Gr-B)	-	-	2	20		30	50	1	3	
Total			Gr-A	16	5	12	245	375	180	800	27	
			Gr-B	18	6	8	230	450	120	800	28	

Note:

- 5 Every student has to participate in the sports activities. Minimum one hour is fixed for sports activities either in the morning or evening. Weightage of sports is given in General Proficiency & Ethics Syllabus.
- 6 The students will be allowed to use non-programmable scientific calculator. However, sharing/exchange of calculator is prohibited in the examination.
- 7 Electronics gadgets including Cellular phones are not allowed in the examination.
- 8 All the branches are to be divided into group 'A' and 'B' as per the suitability of the institute/ college, so that there is an equitable distribution of teaching load in odd and even semesters.

Deenbandhu Chhotu Ram University of Science & Technology, Murthal (Sonapat)
SCHEME OF STUDIES & EXAMINATIONS
B.Tech. 1ST YEAR (SEMESTER – II) (Common for all branches)
Credit Based Scheme w.e.f. 2012-13

S. No.	Course No.	Course Title	Teaching Schedule			Marks of Class work	Examination Marks		Total	Credit	Duration of Exam
			L	T	P		Theory	Practical			
1.	MATH102B	MATHEMATICS-II	3	1		25	75	-	100	4	3
2	PHY102B	ENGINEERING PHYSICS-II	3	1		25	75	-	100	4	3
3	ME101 B	MANUFACTURING PROCESSES (Gr-B)	3	1		25	75	-	100	4	3
	CH101 B	ENGINEERING CHEMISTRY (Gr-A)	3	1		25	75	-			
4	EE101B	PRINCIPLES OF ELECTRICAL ENGINEERING (Gr-B)	3	1		25	75	-	100	4	3
	CSE101B	INTRODUCTION TO COMPUTERS & PROGRAMMING (Gr-A)	3	1		25	75	-			
5	ECE102B	BASICS OF ELECTRONICS ENGINEERING	3	1		25	75	-	100	4	3
	BT102B	BASICS OF BIO TECHNOLOGY									
	HUM102 B	ORAL COMMUNICATION SKILLS									
	CE102 B	BASICS OF CIVIL ENGINEERING									
6	ME103B	ENGINEERING GRAPHICS & DRAWING (Gr-B)	1	-	4	40	-	60	100	3	3
	ME105B	ELEMENTS OF MECHANICAL ENGINEERING (Gr-A)	3	1	-	25	75	-	100	4	
7	PHY104B	PHYSICS LAB-II	-	-	2	20		30	50	1	3
8	ME 107B	WORKSHOP PRACTICE (Gr-B)	-	-	4	40		60	100	2	3
	CH103B	CHEMISTRY LAB (Gr-A)	-	-	2	20		30	50	1	
9	EE103B	PRINCIPLES OF ELECTRICAL ENGINEERING LAB (Gr-B)	-	-	2	20		30	50	1	3
	CSE103B	COMPUTER PROGRAMMING LAB (Gr-A)	-	-	2	20		30	50		
10	ME109B	ELEMENTS OF MECHANICAL ENGINEERING LAB (Gr-A)	-	-	2	20		30	50	1	3
11	GP 102B	GENERAL PROFICIENCY & ETHICS	1			-		50	50	2	
Total			Gr-B	17	5	12	245	375	230	850	29
			Gr-A	19	6	8	230	450	170	850	30

Note:

6. Every student has to participate in the sports activities. Minimum one hour is fixed for sports activities either in the morning or evening. Weightage of Sports is given in General Proficiency & Ethics Syllabus
7. Each student has to undergo a workshop atleast 4 weeks (80-100 hours) at the end of II semester during summer vacations. The evaluation of this training shall be carried out in the III semester.
8. The students will be allowed to use non-programmable scientific calculator. However, sharing/exchange of calculator is prohibited in the examination.
9. Electronics gadgets including Cellular phones are not allowed in the examination.
10. All the branches are to be divided into group 'A' and 'B' as per the suitability of the institute/ college, so that there is an equitable distribution of teaching load in odd and even semesters.

Deenbandhu Chhotu Ram University of Science & Technology, Murthal (Sonapat)
SCHEME OF STUDIES & EXAMINATIONS
B.Tech. 2nd YEAR (SEMESTER –III) AERONAUTICAL ENGINEERING
Credit Based Scheme w.e.f. 2013-14

S. No.	Course No.	Course Title	Teaching Schedule			Marks of Class work	Examination Marks		Total	Credit	Duration of Exam	
			L	T	P		Theory	Practical				
1	MGT 201 B	ENGINEERING ECONOMICS (Common for all branches Except BT & BME) (Gr-A)	4	-		25	75	-	100	4	3	
	GES 201 B	OR ENVIRONMENTAL STUDIES (Common for all branches) (Gr- B)	3	-		-	75*		75*	--	3	
2	ME 201B	THERMODYNAMICS (AER, ME)	3	1		25	75	-	100	4	3	
3	ME 203B	STRENGTH OF MATERIALS-I (AER ,ME)	3	1		25	75	-	100	4	3	
4	ME205B	ENGINEERING MECHANICS (AER ,ME & AE)	3	1		25	75	-	100	4	3	
5	ME207B	FLUID MECHANICS (AER ME))	3	1		25	75	-	100	4	3	
6	AER-201B	INTRODUCTION TO AERONAUTICS	3	1	-	25	75	-	100	4	3	
7	AER-203B	INTRODUCTION TO AERONAUTICS LAB	-	-	2	20		30	50	1	3	
7	ME211B	STRENGTH OF MATERIALS- ILAB (AER ,ME)	-	-	2	20		30	50	1	3	
8	ME 215B	FLUID MECHANICS LAB (AER, ME)	-	-	2	20		30	50	1	3	
9	GES 203B	ENVIRONMENTAL STUDIES FIELD WORK (Common for all branches) Gr- B)	-	-	-	-		25*	25*	-		
10	ME 217B	WORKSHOP (Common for all branches Except BT, AE)	--	--	2	50	--	--	50	2	3	
Total												
			Gr-A	19	5	8	260	450	90	800	29	
			Gr-B	18	5	8	235	375	90	700	25	

Note:

- 1 Every student has to participate in the sports activities. Minimum one hour is fixed for sports activities either in the morning or evening. Weightage of Sports is given in General Proficiency & Ethics Syllabus.
- 2 * The Environmental studies (GES-201 B & Environment Studies Field work (GES-203B) are compulsory & qualifying courses only.
- 3 The students will be allowed to use non-programmable scientific calculator. However, sharing/exchange of calculator is prohibited in the examination.
- 4 Electronics gadgets including Cellular phones are not allowed in the examination
- 5 All the branches are to be divided into group 'A' and 'B' as per the suitability of the institute/ college, so that there is an equitable distribution of teaching load in odd and even semesters.

Deenbandhu Chhotu Ram University of Science & Technology, Murthal (Sonapat)
SCHEME OF STUDIES & EXAMINATIONS
B.Tech. 2nd YEAR (SEMESTER –IV) AERONAUTICAL ENGINEERING
Credit Based Scheme w.e.f. 2013-14

S. No.	Course No.	Course Title	Teaching Schedule			Marks of Class work	Examination Marks		Total	Credit	Duration of Exam	
			L	T	P		Theory	Practical				
1	MGT- 201 B	ENGINEERING ECONOMICS (Common for all branches Except BT & BME) (Gr- B)	4	-		25	75	-	100	4	3	
	GES 201 B	OR ENVIRONMENTAL STUDIES (Common for all branches) (Gr-A)	3	-		-	75*		75*	-		
2	AER-202B	AIRCRAFT PRODUCTION	4	-		25	75		100	4	3	
3	AER-204B	AIRCRAFT MATERIAL	4	-		25	75	-	100	4	3	
4	AER-206 B	AEROPLANE PERFORMANCE, STABILITY AND CONTROL	3	1		25	75	-	100	4	3	
5	AER-208B	MAINTENANCE OF RADIO & COMMUNICATION SYSTEMS	4	-		25	75	-	100	4	3	
6	AER-210B	AIRCRAFT INSTRUMENTATION	4	-		25	75	-	100	4	3	
7	AER-212B	AIRCRAFT INSTRUMENTATION LAB	-	-	2	20		30	50	1	3	
8	ME 218B	MANUFACTURING PRACTICE (AER, ME)	-	-	3	20	-	30	50	1.5	3	
9	GES 203 B	ENVIRONMENTAL STUDIES FIELD WORK (Common for all branches) (Gr-A)	-	-	-	-	-	25*	25*	-		
10	GPAER 202B	GENERAL PROFICIENCY & ETHICS	1	-	-	-	-	75	75	2	3	
Total												
			Gr-B	24	1	5	190	450	135	775	28.5	
			Gr-A	23	1	5	165	375	135	675	24.5	

Note:

- 6 Every student has to participate in the sports activities. Minimum one hour is fixed for sports activities either in the morning or evening. Weightage of Sports is given in General
- 7 Proficiency & Ethics Syllabus.
- 1 * The Environmental studies (GES-201 B & Environment Studies Field work (GES-203B) are compulsory & qualifying courses only.
- 2 The students will be allowed to use non-programmable scientific calculator. However, sharing/exchange of calculator is prohibited in the examination.
- 3 Electronics gadgets including Cellular phones are not allowed in the examination
- 4 Each students has to undergo Professional Training of at least 4 weeks from the industry, institute, research lab, training center etc during summer vacation and its evaluation shall be carries out in the V semester
- 5 All the branches are to be divided into group 'A' and 'B' as per the suitability of the institute/ college, so that there is an equitable distribution of teaching load in odd and even semesters.

Deenbandhu Chhotu Ram University of Science & Technology, Murthal (Sonapat)
SCHEME OF STUDIES & EXAMINATIONS
B.Tech. 3rd YEAR (SEMESTER –V) AERONAUTICAL ENGINEERING
Credit Based Scheme w.e.f. 2014-15

S. No.	Course No.	Course Title	Teaching Schedule			Marks of Class work	Examination Marks		Total	Credit	Duration of Exam
			L	T	P		Theory	Practical			
1	AER-301B	AIRCRAFT PROPULSION-I	3	1	-	25	75	-	100	4	3
2	AER-303B	HELICOPTER DYNAMICS	3	1	-	25	75	-	100	4	3
3	AER-305B	AIRCRAFT STRUCTURE-I	3	1	-	25	75	-	100	4	3
4	AER-307B	ADVANCE AERODYNAMICS	3	1	-	25	75	-	100	4	3
5	ME307B	INTERNAL COMBUSTION ENGINES & GAS TURBINES (AER ,ME)	3	1	-	25	75	-	100	4	3
6	AER-309B	AIRCRAFT DESIGN	3	2	-	25	75	-	100	5	3
7	AER-311B	AERODYNAMICS LAB	-	-	3	20	-	30	50	1.5	3
8	AER-313B	AIRCRAFT STRUCTURE LAB	-	-	3	20	-	30	50	1.5	3
9	ME315B	INTERNAL COMBUSTION ENGINES LAB (AER , ME)	-	-	2	20	-	30	50	1	3
10	AER-315B	PROFESSIONAL TRAINING-I	-	-	2	50	-	-	50	2	3
Total			18	7	10	260	450	90	800	31	

Note:

- 1 Every student has to participate in the sports activities. Minimum one hour is fixed for sports activities either in the morning or evening. Weightage of Sports is given in General Proficiency & Ethics Syllabus.
- 2 The students will be allowed to use non-programmable scientific calculator. However, sharing/exchange of calculator is prohibited in the examination.
- 3 Electronics gadgets including Cellular phones are not allowed in the examination

Deenbandhu Chhotu Ram University of Science & Technology, Murthal (Sonapat)
SCHEME OF STUDIES & EXAMINATIONS
B.Tech. 3rd YEAR (SEMESTER–VI) AERONAUTICAL ENGINEERING
Credit Based Scheme w.e.f. 2014-15

S. No.	Course No.	Course Title	Teaching Schedule			Marks of Class work	Examination Marks		Total	Credit	Duration of Exam
			L	T	P		Theory	Practical			
1	AER-302B	AIRCRAFT PROPULSION-II	4	1		25	75	-	100	5	3
2	AER 304B	WIND TUNNEL TECHNIQUES	3	1		25	75	-	100	4	3
3	ME 312 B	INDUSTRIAL ENGINEERING (AER, ME)	4	-		25	75	-	100	4	3
4	AER-306B	AIRCRAFT STRUCTURE -II	4	1		25	75	-	100	5	3
5	AER-308B	NON DESTRUCTIVE EVALUATION	4	-		25	75	-	100	4	3
6	ME306B	HEAT TRANSFER (AER , ME)	4	1		25	75	-	100	5	3
7	AER-310B	AIRCRAFT PROPULSION LAB	-	-	3	20	-	30	50	1.5	3
8	ME316B	HEAT TRANSFER LAB (AER , ME)	-	-	2	20	-	30	50	1	3
9	HUM- 302 B	REPORT WRITING SKILLS (Common for all branches)	1	-	-	25	50		75	1	2
10	HUM- 304 B	ORAL PRESENTATION SKILLS (Common for all branches)	-	-	2	20	-	30	50	1	2
11	GPAER302B	GENERAL PROFICIENCY & ETHICS	1	-	-	-	-	75	75	2	-
Total			25	4	7	235	500	165	900	33.5	

Note:

- 1 Every student has to participate in the sports activities. Minimum one hour is fixed for sports activities either in the morning or evening. Weightage of Sports is given in General Proficiency & Ethics Syllabus.
- 2 The students will be allowed to use non-programmable scientific calculator. However, sharing/exchange of calculator is prohibited in the examination.
- 3 Electronics gadgets including Cellular phones are not allowed in the examination
- 4 Each students has to undergo Professional Training of at least 4 weeks from the industry, institute, research lab, training center etc during summer vacation and its evaluation shall be carries out in the VII semester

Deenbandhu Chhotu Ram University of Science & Technology, Murthal (Sonapat)
SCHEME OF STUDIES & EXAMINATIONS
B.Tech. Final YEAR (SEMESTER–VII) AERONAUTICAL ENGINEERING
Credit Based Scheme w.e.f. 2015-16

S. No.	Course No.	Course Title	Teaching Schedule			Marks of Class work	Examination Marks		Total	Credit	Duration of Exam
			L	T	P		Theory	Practical			
1	AER-401B	COMPUTATION FLUID DYNAMICS	3	1		25	75	-	100	4	3
2	AER-403B	SPACE DYNAMICS	3	1		25	75	-	100	4	3
3	ME-403 B	REF & AIR CONDITIONING (AER, ME)	3	1		25	75	-	100	4	3
4	ME 405B	OPERATION RESEARCH (AER, ME)	3	1		25	75	-	100	4	3
5		OPEN ELECTIVE*	4	0		25	75	-	100	4	3
6	AER-405B	COMPUTATIONAL LAB	-	-	3	20		30	50	1.5	3
7	ME-411 B	R.A.C.LAB (AER, ME)	-	-	2	20		30	50	1	3
8	AER-407B	PROJECT	-	-	4	100	-	--	100	4	-
9	AER-409B	PROFESSIONAL TRAINING-II	-	-	2	50	-	-	50	2	-
Total			16	4	11	315	375	60	750	28.5	

*** List of Open Electives**

1	MEI 623B	ENTREPRENEURSHIP	6	BT401B	BIOINFORMATICS
2	BME451B	MEDICAL INSTRUMENTATION	7	AE417B	MODERN VEHICLE TECHNOLOGY
3	ECE305B	CONSUMER ELECTRONICS	8	CE451B	POLLUTION & CONTROL
4	EE451B	ENERGY AUDIT	9	CSE-411B	MANAGEMENT INFORMATION SYSTEM
5	EEE457B	ENERGY RESOURCES & TECHNOLOGY	10	IT-413B	CYBER SECURITY

Note:

- Every student has to participate in the sports activities. Minimum one hour is fixed for sports activities either in the morning or evening. Weightage of Sports is given in General Proficiency & Ethics Syllabus.
- Students will be permitted to opt for any one elective run by the other department. However, the department shall offer those elective for which they have expertise. The choice of the students for any elective shall not be binding for the department to offer, if the department does not have expertise. The minimum strength of students should be 20 to run an elective course.
- Assessment of Professional Training-II, undergone at the end of VI semester, will be based on seminar, viva-voce, report and certificate of Professional Training obtained by the student from the industry, institute, research lab, training center etc
- The students will be allowed to use non-programmable scientific calculator. However, sharing/exchange of calculator is prohibited in the examination.
- Electronics gadgets including Cellular phones are not allowed in the examination
- Project coordinator will be assigned the project load of maximum of 2 hrs. per week including his own guiding load of one hr. However, the guiding teacher will be assigned maximum of one period of teaching load irrespective of number of students/groups under him/her.

Deenbandhu Chhotu Ram University of Science & Technology, Murthal (Sonapat)
SCHEME OF STUDIES & EXAMINATIONS
B.Tech. Final YEAR (SEMESTER – VIII) AERONAUTICAL ENGINEERING
Credit Based Scheme w.e.f. 2015-16

S. No.	Course No.	Course Title	Teaching Schedule			Marks of Class work	Examination Marks		Total	Credit	Duration of Exam
			L	T	P		Theory	Practical			
1	AER-402B	ROCKETS AND MISSILES	3	1		25	75	-	100	4	3
2	AER-404B	GAS DYNAMICS	3	1		25	75	-	100	4	3
3		ELECTIVE I	4	-		25	75	-	100	4	3
4		ELECTIVE II	4	-		25	75	-	100	4	3
5	AER-406B	SEMINAR	-	-	2	50	-	-	50	2	3
6	AER-407B	PROJECT	-	-	8	75	-	125	200	8	3
7	GFAER408B	GENERAL FITNESS FOR THE PROFESSION	1	-	-		-	100	100	4	3
Total			15	2	10	225	300	225	750	30	

Elective - I		Elective -II	
AER- 432B	THEORY OF ELASTICITY	AER-442B	ROBOTICS ENGINEERING
AER-434B	KINEMATICS AND DYNAMICS OF MACHINE	AER-444B	AIR TRANSPORTATION AND AIR CRAFT MAINTENANCE
AER-436B	AVIONICS	AER-446B	MODERN MANUFACTURING PROCESSES
AER-438B	FLEXIBLE MANUFACTURING SYSTEM	AER-448B	WIND ENERGY CONVERSION

Note:

- 1 Every student has to participate in the sports activities. Minimum one hour is fixed for sports activities either in the morning or evening. Weightage of Sports is given in General Proficiency Syllabus.
- 2 The students will be allowed to use non-programmable scientific calculator. However, sharing/exchange of calculator is prohibited in the examination.
- 3 Electronics gadgets including Cellular phones are not allowed in the examination.
- 4 The minimum strength of students should be 20 to run an elective course.
5. The choice of students for any elective subject shall not be binding for the department offer, if the department does not have expertise.

Course Content

UNIT I

Communicative Grammar:

- A) Spotting the errors pertaining to tenses, conditional sentences, Concord – grammatical concord, notional concord and the principle of proximity b/w subject and verb
- B) Voice, Reported Speech.

UNIT II

Language through Literature:

Linguistic Reading of the following texts

- A) 'Kabuliwallah' by Rabindranath Tagore*
- B) 'Am I Blue?' by Alice Walker*
- C) 'If You are Wrong, Admit It' by Dale Carnegie*
- D) 'Engine Trouble' by R.K. Narayan*

The prescribed texts will be used as case studies for various components of the syllabus. * the Source is given in the list of Texts Books given below.

UNIT III

Group Communication:

- A) Communication: concept, Process and Barriers
- B) Communicating using Standard Pronunciation with the help of IPA
- C) Formal Speaking with peers (e.g. discussion, talks on current issues in a class)
- B) Writing official letters on issues concerning students and social life
- C) Writing small reports on scientific issues, IT issues, University fests/programmes
- C) E-mail writing and writing for web

UNIT IV

Communicative Creativity:

- A) Comprehension: Extracting, interpreting, summarizing, reviewing and analyzing the prescribed texts.
- B) Composition: Developing themes and situations through role play activities or dialogue writing.

Contd.

TEXT BOOKS

1. Quirk, Randolph, Sidney Greenbaum, Geoffrey Leech & Jan Svartvik. *A Comprehensive Grammar of the English Language*. London: Longman, 1989
2. Communicative English for Engineers and Professionals by Nitin Bhatnagar & Mamta Bhatnagar New Delhi: Pearson / Longman
3. Crystal, David. *Rediscover Grammar*. London: Longman/Pearson, 1988.
4. *Tagore, Rabinder. "Kabuliwallah", *Famous Indian Stories*. Ed. M.G.Narsimha Murthy .Mumbai: Orient Blackswan, 2009. (Web source: www.angelfire.com)
5. * Walker, Alice. "Am I Blue", *An Anthology of Short Stories* . Ed. Usha Bande .New Delhi: OUP , 2004. (Web source- www.old.li.sru.edu)
6. *Narayanan .K.R. "Engine Trouble", *Contemporary English Prose* .Ed. K.P.K.Menon. New York: OUP,1976. (Web Source- www.scribd.com)
7. *Carnegie, Dale. "If you are wrong admit it", *An Anthology of Modern Prose*. Ed Manmohan K.Bhatnagar.Delhi :Macmillan India Ltd,2006.

SUGGESTED READING

1. Pink, M.A. and S.E. Thomas. *English Grammar, Composition and Correspondence*. Delhi: S. Chand and Sons
2. McRae, John and Roy Boardman. *Reading Between the Lines*. Delh: Foundation Books (Cambridge University Press)
3. Sharma, Sangeeta and Binod Mishra. *Communication Skills for Engineers and scientists*. Delhi: PHI, 2009
4. Fitikides, T.J. *Common Mistakes in English*. Essex: Pearson Education, 1936, 6th edition 2000.

SCHEME OF END SEMESTER EXAMINATION (MAJOR TEST)

Theory

1. The duration of the exam will be 3 hours.
2. The Question Paper for this theory course shall have seven questions in all covering all the units of the syllabus..
3. The student is required to attempt all the seven questions.
4. Questions No. 1 based on Unit I is of **15** marks. It may be in the form of 'Do as directed: trace the error, choose the correct alternative, supply the correct alternative/ s, change the voice, convert the speech from direct to indirect or vice-versa'.
5. Question no 2 and 3 based on prescribed texts in Unit II. Question no 2 of **10** marks is to evaluate the comprehension of the text through short answer questions or a long answer question to assess the students' reading comprehension, interpretative and analytical abilities. Question no 3 of **15** marks will judge the linguistic aspect of the text such as using a particular word in its various syntactic forms like noun, adjective, verb etc.; matching the lists of words and their explanation; providing opposite/ similar meanings and other grammar components prescribed in Unit I of the syllabus.
6. Question no 4 based on Unit III is of **10** marks. It may be in the form of transcription of words given, describe an event, classmate, discuss an issue etc.
7. Question no 5 based on Unit III is of **10** marks. It requires the student to frame either a small report on a topic given or write the given official letter, or e-mail a message.
8. Question no 6 based on unit IV is of **10** marks. It evaluates the Comprehension and Interpretation of the texts prescribed in Unit II. The vocabulary, general

understanding and interpretation of the content may be evaluated in the form of question answer exercise, culling out important points, suggesting a suitable topic/title, summarising and interpreting.

9. Question No. 7 based on unit IV is of **5** marks. It requires the student to develop a hypothetical situation in a dialogue form, or to develop an outline, key expression, for role play activity.

MATH 101B MATHEMATICS – I						
B. Tech. Semester - I (Common for all Branches)						
L	T	P	Credits		Class Work	: 25 Marks
3	1	--	4		Examination	: 75 Marks
					Total	: 100 Marks
					Duration of Examination	: 3 Hours

UNIT-I

INFINITE SERIES : Convergence and divergence, Comparison, D' Alembert's ratio, Integral, Raabe's, Logarithmic and Cauchy root tests, Alternating series, Absolute and conditional convergence. Applications of Differentiation : Taylor's and Maclaurin's series, Asymptotes, Curvature Asymptotes.

UNIT-II

PARTIAL DIFFERENTIATION & ITS APPLICATIONS : Functions of two or more variables;

partial derivatives, Total differential and differentiability, Derivatives of composite and implicit functions, Jacobians, Higher order partial derivatives.

Homogeneous functions, Euler's theorem, Taylor's series for functions of two variables (without proof), maxima-minima of function of two variables, Lagrange's method of undetermined multipliers, Differentiation under integral sign.

UNIT-III

APPLICATIONS OF SINGLE & MULTIPLE INTEGRATION : Applications of single integration to find volume of solids and surface area of solids of revolution. Double integral, change of order of integration, Double integral in polar coordinates, Applications of double integral to find area enclosed by plane curves and volume of solids of revolution.

Triple integral, volume of solids, change of variables, Beta and gamma functions and relationship between them.

UNIT-IV

VECTOR CALCULUS : Differentiation of vectors, scalar and vector point functions Gradient of a scalar field and directional derivative, divergence and curl of a vector field and their physical interpretations.

Integration of vectors, line integral, surface integral, volume integral, Green, Stoke's and Gauss theorems (without proof) and their simple applications.

TEXT BOOKS :

1. Advanced Engineering Mathematics : F. Kreyszig.
2. Higher Engineering Mathematics : B.S. Grewal.

REFERENCE BOOKS :

1. Engineering Mathematics Part-I : S.S. Sastry.
2. Differential and Integral Calculus : Piskunov.
3. Advanced Engineering Mathematics : R.K. Jain and S.R.K.Iyengar
4. Advanced Engg. Mathematics : Michael D. Greenberg

Note:

1. In the semester examination, the examiner will set two questions from each unit (total 08 questions in all), covering the entire syllabus. The students will be required to attempt only 5 questions selecting at least one question from each unit.
2. The use of scientific calculator will be allowed in the examination. However, programmable calculator and cellular phone will not be allowed

PHY 101B ENGINEERING PHYSICS – I						
B. Tech. Semester - I (Common for all Branches)						
L	T	P	Credits		Class Work	: 25 Marks
3	1	--	4		Examination	: 75 Marks
					Total	: 100 Marks
					Duration of Examination	: 3 Hours

UNIT-I

PHYSICAL OPTICS:

Interference: Division of wave front-Fresnel's Biprism, Division of amplitude – Newton's rings, Michelson interferometer, applications.

Diffraction : Difference between Fraunhofer and Fresnel diffraction, Fraunhofer diffraction through a slit, Plane transmission diffraction grating and its spectra, dispersive and resolving

powers.

Polarization : Polarised and unpolarized light, double refraction, Nicol prism, quarter and half wave plates, Plane, Elliptically & circularly polarised light, Polarimetry: Biquartz and Laurent's half-shade polarimeters.

UNIT-II

LASER & FIBRE OPTICS: Introduction, Spontaneous and stimulated emissions, Laser action, characteristics of laser beam, Ruby laser, He-Ne, Nd-Yag and semiconductor lasers, applications of laser.

Introduction, Propagation of light in fibres, Types of fiber (pulse & continuous), numerical aperture, Modes of propagation in optical fibre, application of optical fibre.

ACOUSTIC OF BUILDINGS: Introduction, Reverberation, Sabine's formula for reverberation time, Absorption coefficient and its measurements, factors affecting the architectural acoustics and their remedy, Sound absorbing materials.

UNIT-III

TRANSMISSION OF HEAT AND THERMAL RADIATION

Modes of transmission of heat, Thermal conductivity, Rectilinear flow of heat through a rod, Radial flow of heat through a spherical shell, determination of Thermal conductivity of good and bad conductors.

Black body, Emissive and Absorptive Powers, Wein's Displacement Law, Kirchhoff's Law, Stefan's Law, Determination of Stefan's Constant.

UNIT-IV

NUCLEAR & ELEMENTARY IDEA OF PARTICLE PHYSICS

Outline of interaction of charged particles and of Gamma-rays with matter. Counters: Gas filled counters (Ionization Chamber, Proportional Counter and G M Counter). Detector: Scintillation detector, Semiconductor detectors (p-n junction detector), Biological effects of nuclear radiation.

Introduction to elementary particles, Interaction in particle physics: strong, electromagnetic, weak and gravitational. .

TEXT BOOKS :

1. A text book of Optics – Brij Lal and Subramanyam
2. Perspectives of Modern Physics - Arthur Beiser (TMH)
3. Modern Engineering Physics – A.S. Vasudeva (S. Chand)
4. Engineering Physics by R.K. Gaur and S.L. Gupta
5. Engineering Physics by H.K Malik and A.K. Singh (Tata McGraw Hill).
7. Engineering Physics by S.P. Taneja (Chand Pub.)

REFERENCE BOOKS:

- 1.. Physics Vol-I & II – Resnick & Halliday (Wiley Eastern)
2. Heat and Thermodynamics – M.N. Saha & B.N. Srivastava
3. Nuclear Physics Principles and Applications by John Lilley(Wiley-India).

Note:

1. In the semester examination, the examiner will set two questions from each unit (total 08 questions in all), covering the entire syllabus. The students will be required to attempt only 5 questions selecting at least one question from each unit.
2. The use of scientific calculator will be allowed in the examination. However, programmable calculator and cellular phone will not be allowed

ME 101B MANUFACTURING PROCESSES

B. Tech. Semester – I/II (Common for all Branches)

L	T	P	Credits	Class Work	: 25 Marks
3	1	--	4	Examination	: 75Marks
				Total	: 100 Marks
				Duration of Examination	: 3 Hours

UNIT-I

INTRODUCTION: Introduction to Manufacturing Processes and their Classification , automation in manufacturing, Industrial Safety; Introduction, Types of Accidents, Causes and Common Sources of Accidents, Methods of Safety, Electric Safety Measures, First Aid.

Plant Layout, Principles of Plant Layout, Objectives of Layout, Types of Plant and shop layouts and their Advantages.

UNIT-II

ENGINEERING MATERIALS: General Properties and Applications of Engineering Materials, Mild Steel, Medium Carbon Steel, High Carbon Steel, High Speed Steel and Cast Iron, Non-Ferrous Materials, Shop's Tools Materials, Super Alloys or High Temperature Materials

FOUNDRY: Introduction to Casting Processes, Basic Steps in Casting Process, Pattern, Types of Patterns, Pattern allowances, Risers, Runners, Gates, Molding Sand and its composition, Sand Preparation, Molding Methods, Core Sands and Core Making, Core Assembly, Mold Assembly, Melting (Cupola) and Pouring, Fettling, Casting Defects and Remedies. Testing of Castings

UNIT-III

COLD WORKING (SHEET METAL WORK): Sheet Metal Operations, Measuring, Layout Marking, Shearing, Punching, Blanking, Piercing, Forming, Bending and Joining - Advantages and Limitations. Hot Working Processes: Introduction to Hot Working, Principles of Hot Working Processes, Forging, Rolling, Extrusion, Wire Drawing.

INTRODUCTION TO MACHINE TOOLS: Specifications and Uses of commonly used Machine Tools in a Workshop such as Lathe, Shaper, Planer, Milling, Drilling, Slotter, Introduction to Metal Cutting. Nomenclature of a Single Points Cutting Tool and Tool Wear, Mechanics of Chips Formation, Type of Chips, Use of Coolants in machining.

UNIT-IV

WELDING: Introduction to Welding, Classification of Welding Processes, Gas Welding: Oxy-Acetylene Welding, Resistance Welding; Spot and Seam Welding, Arc Welding: Metal Arc, TIG & MIG Welding, Welding Defects and Remedies, Soldering & Brazing, Comparisons among Welding, Brazing and Soldering

Surface Finishing Processes, Introduction to Heat Treatment Processes, Estimating of Manufacturing Cost

Text Books:

1. Workshop Technology Vol. I & II - Hazra & Chaudhary, Asian Book Comp., New Delhi.
2. Process and Materials of Manufacture -- Lindberg, R.A. Prentice Hall of India, New Delhi.
3. Principles of Manufacturing Materials and Processes - Campbell, J.S.- McGraw- Hill.

Reference Books:

1. Manufacturing Science - Amitabha Ghosh & Ashok Kumar Malik, - East-West Press.
2. Manufacturing Process and Systems - Ostwald, Munoz, John Wiley.
3. Workshop Technology, Vol. 1, 2 & 3 – Chapman, WAJ, Edward Arnold.

Note:

1. In the semester examination, the examiner will set two questions from each unit (total 08 questions in all), covering the entire syllabus. The students will be required to attempt only 5 questions selecting at least one question from each unit.
2. The use of scientific calculator will be allowed in the examination. However, programmable calculator and cellular phone will not be allowed

CH 101B ENGINEERING CHEMISTRY						
B. Tech. Semester – I/II (Common for all Branches)						
L	T	P	Credits		Class Work	: 25 Marks
3	1	--	4		Examination	: 75 Marks
					Total	: 100 Marks
					Duration of Examination	: 3 Hours

UNIT-I

THERMODYNAMICS –Second law, concept of entropy ,entropy change for ideal gas, free energy and work functions, free energy change ,chemical potential, Gibb’s Helmholtz equation, Clausius – Clapeyron equation. Related numerical problems with above topics.

PHASE-RULE- Terminology, Derivation of Gibb’s Phase Rule equation ,One component system(water system), Two components systems, system with Eutectic point (Pb-Ag), system with congruent melting point (Zn-Mg), system with incongruent melting point (Na-K), Applications of above systems. Elementary idea of Zone refining and Zone levelling

UNIT-II

WATER AND ITS TREATMENT- Hardness of water and its determination, units of hardness, alkalinity of water and its determination, related numerical problems ,water softening, Ion-exchange process, mixed bed demineralisation, desalination of water by using different methods.

CORROSION AND ITS PREVENTION: Galvanic & concentration cell, dry and wet corrosion, Electrochemical theory of corrosion, Galvanic corrosion, Pitting corrosion , differential aeration corrosion, water line corrosion, stress corrosion, factor effecting corrosion, Preventing measures, electroless Plating of Ni and Cu.

UNIT-III

POLYMERS AND POLYMERIZATION: Organic polymers, polymerisation, various types of polymerisation, effect of structure on properties of polymers, preparation properties and technical applications of thermoplastics (PE, PVC, PVA, Teflon), thermosets (PF, UF & MF) and elastomers (Synthetic Rubber including SBR, Buna-S, Buna-N, Thiokol & Polyurethanes) , Inorganic polymers (general properties) , Glass transition temperature, silicones

COMPOSITE MATERIALS & THEIR APPLICATION: optical fibres, Fullerenes ,organic electronic material ,composite materials & their classification, constituents of composites, role of interface in composite performance and durability, fiber –Reinforced composite, advantage and applications of composites.

UNIT-IV

LUBRICANTS AND FUELS: Friction, mechanism of lubrication, classification and properties of lubricants and selection of Lubricants, Definition and classification of fuel, Calorific value and methods of its determination.

Analytical methods: Thermal methods; Principle, method and application of TGA,DTA & DSC, interaction of E.M radiation with a molecule and origin of spectrum, Vibrational & electronic spectra (Experimental details are excluded), spectrophotometry, , conductometric titrations, elementary discussion on Flame-photometry.

TEXT/ REFERENCE BOOKS:

1. Physical Chemistry, P.W. Atkins (ELBS, Oxford Press).
2. Physical Chemistry, W.J. Moore (Orient-Longman).
3. Instrumental methods of Chemical Analysis, MERITT & WILLARD (East-West Press).

4. Chemistry in Engineering & Tech., Vol.I& II, Rajaram, Kuriacose (TMH)

5.Engineering Chemistry ,ShashiChawla (DhanpatRai and co.)

6. Engineering Chemistry, P.C. Jain, Monica Jain (DhanpatRai& Co.).

7.Engeneering chemistry ,S.S Dara (S.chand&co.)

Note:

In the semester examination, the Examiners will set 08 questions in all selecting two from each unit. The candidates will be required to attempt five questions in all selecting at least one from each unit.

EE 101B PRINCIPLES OF ELECTRICAL ENGINEERING						
B. Tech. Semester – I/II (Common for all Branches)						
L	T	P	Credits		Class Work	: 25 Marks
3	1	--	4		Examination	: 75 Marks
					Total	: 100 Marks
					Duration of Examination	: 3 Hours

UNIT-1

D.C. CIRCUIT ANALYSIS: Basic concepts of electric circuits, Ohm's Law, Independent energy sources, Dependent energy sources, passive elements, circuit properties, Kirchoff's laws, applications of Kirchoff's laws, Nodal and Loop methods of Analysis, , Superposition Theorem, Thevenin's Theorem, Norton's Theorem, Reciprocity Theorem, Maximum Power Transfer Theorem, Millman's Theorem, Star-Delta or delta-star transformation, Applications of network theorems P-spice for DC circuit analysis.

UNIT-2

A.C. CIRCUITS: Sinusoidal signal, Phasors, polar & rectangular, exponential & trigonometric representations, Resistance, Inductance & Capacitance components, behavior of these components in A.C. circuits, Phasor relationship for circuit elements, Impedance & Admittance, instantaneous & peak values, average and RMS values, active power, reactive power, apparent power, power factor, complex power, behavior of AC series , parallel circuits, RL, RC & RLC A.C. circuits (series and parallel), Resonance-series and parallel R-L-C Circuits, Q-factor, cut-off frequencies & bandwidth.

UNIT-3

THREE PHASE CIRCUITS: Phase and line voltages and currents, balanced star and delta circuits, power equation, measurement of power by two wattmeter method.

Measuring Instruments: Principle, Construction & working of moving coil type voltmeter & ammeter, moving iron type voltmeter & ammeter, Electrodynamic type wattmeter, single-phase induction type energy meter.

UNIT-4

TRANSFORMERS: Ampere's law, Mutual Inductance, Construction, Working principle and phasor diagrams of Single-phase Transformer, Emf equation, Equivalent circuit, testing, efficiency and regulation of single-phase transformer, Auto transformer.

ROTATING MACHINES: Construction and working principle of dc motor and generator and its characteristics. Construction and working principle of 3-phase Induction machines & 3-phase synchronous machines, torque-speed characteristics.

TEXT BOOKS:

1. Basic Electrical Engg (2nd Edition) : Kothari & Nagarath, TMH
2. Electrical Technology (Vol-I): B.L Theraja & A K Theraja, S.Chand
3. Fundamental of electrical Engineering, Rajendra Prasad, PHI, Edition 2005.
4. Basic Electrical Engineering, V.N Mittle & Arvind Mittal, TMH, Second Edition
5. Basic Electrical Engineering, S.N. Singh, PHI

REFERENCE BOOKS:

1. Electrical Engineering Fundamentals: Deltoro, PHI
2. Basic Electrical Engineering (TMH WBUT Series), Abhijit Chakrabarti & Sudipta Nath, TMH
3. Basic Electrical Engineering, T.K. Nagsarkar & M.S. Sukhija, Oxford
4. Introduction to Electrical Engineering, M.S. Naidu & S, Kamakshaiah, TMH
5. Basic Electrical Engineering, J.J. Cathey & S.A Nasar, TMH, Second Edition.

Note: In the semester examination, the examiner will set 08 questions in all selecting two from each unit. The candidates will be required to attempt five questions in all selecting at least one from each unit. All questions will carry equal marks.

CSE 101B INTRODUCTION TO COMPUTERS AND PROGRAMMING						
B. Tech. Semester – I/II (Common for all Branches)						
L	T	P	Credits		Class Work	: 25 Marks
3	1	--	4		Examination	: 75 Marks
					Total	: 100 Marks
					Duration of Examination	: 3 Hours

UNIT-I

AN INTRODUCTION OF COMPUTER SYSTEM: Anatomy of a digital Computer, Different Units of Computer System, Classification of Computer Systems, Radix Number systems. Binary codes: BCD, Gray, EBCDIC, ASCII

OPERATING SYSTEM: Operating System Concepts, Operating System services, Types of Operating Systems.

INTRODUCTION TO PC OPERATING SYSTEMS: Unix/Linux, DOS, Windows.

UNIT-II

PROGRAMMING LANGUAGES AND ALGORITHMS: Machine, Assembly and High Level Language; Assembler, Linker, Loader, Compiler, Interpreter, debuggers, Programming fundamentals: problem definition, algorithms, flowcharts and their symbols

COMPUTER NETWORKS: Basic concepts of Computer Networks, Working of Internet and its Major features. Network Topologies: Bus, Star, Ring, Hybrid, Tree, Complete, Irregular; Types of Networks: LAN, MAN and WAN.

ELECTRONIC MAIL: advantages and disadvantages, e-mail addresses, message components, message composition, mailer features, E-mail inner workings, E-mail management, Newsgroups, mailing lists, chat rooms.

UNIT-III

BASICS OF 'C' LANGUAGE : C Fundamentals, Basic data types, local and external variables and scope, formatted input/ output, expressions, selection statements, loops and their applications; arrays, functions, recursive functions, pointers and arrays. Strings literals, arrays of strings; applications, Structures, Unions and Enumerations.

UNIT-IV

ADVANCED FEATURES OF 'C' LANGUAGE: preprocessor directives, macro definition, conditional compilation, storage classes, type's qualifiers, Low level programming (Bitwise operators, Bit fields in structures, other low level techniques), error handling, file operations(low level/ high level).

BOOKS

1. The C Programming Language by Dennis M Ritchie, Brian W. Kernigham, 1988, PHI.
2. Fundamentals of Computing and C Programming, R. B. Patel, Khanna Publications, 2010, New Delhi.
3. Information technology, Dennis P. Curtin, Kim Foley, Kunal Sen, Cathleen Morin, 1998, TMH
4. Theory and problem of programming with C, Byron C Gottfried, TMH
5. Using Computers and Information by Jack B. Rochester, 1996, Que Education & Training.
6. C Programming – A modern approach by K.N. King, 1996, WW Norton & Co.

Note:

1. In the semester examination, the examiner will set two questions from each unit (total 08 questions in all), covering the entire syllabus. The students will be required to attempt only 5 questions selecting at least one question from each unit.
2. The use of scientific calculator will be allowed in the examination. However, programmable calculator and cellular phone will not be allowed

ME 103 B ENGINEERING GRAPHICS AND DRAWING

B. Tech. Semester – I/II (Common for all Branches)

L	T	P	Credits
1	--	4	3

Class Work	: 40 Marks
Examination	: 60Marks
Total	: 100 Marks
Duration of Examination	: 3 Hours

UNIT I

BASICS OF ENGINEERING GRAPHICS AND DRAWING – Drawing Papers, Minidrafter, Pencils. Drawing Paper Layout, Title Block, Types of Lines, Lettering, Dimensioning, types of Projections; First and Third Angle systems of Orthographic Projections. Projection of Points in different Quadrants.

PROJECTIONS OF STRAIGHT LINES – Contained by both Reference Planes, Contained by one and inclined to other Reference Plane, Contained by one and Parallel to other Reference Plane, Parallel to both Reference Plane, Perpendicular to one of the Reference Planes, Inclined to one Plane but Parallel to the other Reference Planes, Inclined to both the Reference Planes, True Length of a Line and its Inclination with Reference Planes, Traces of a Line.

UNIT II

PROJECTIONS OF PLANES – Parallel to one Reference Plane, Inclined to one Plane but Perpendicular to the other, Inclined to both Reference Planes.

PROJECTIONS OF POLYHEDRAL SOLIDS AND SOLIDS OF REVOLUTION- in simple positions with axis perpendicular to a Reference Plane, with axis parallel to both Reference Planes, with axis parallel to one Reference Plane and inclined to the other Reference Plane, Projections of sections of Prisms, Pyramids, Cylinders and Cones. True Shape of Sections of Solids.

UNIT III

DEVELOPMENT - Development of Surfaces of various Solids objects.

FREE HAND SKETCHING - Orthographic Views from Isometric, Views of Simple Machine Components such as Brackets, Bearing Blocks, Guiding Blocks and Simple Couplings and Pipe Joints.

UNIT IV

ISOMETRIC PROJECTIONS - Introduction, Isometric Scale, Isometric Views and Drawing of various Plane and Solids objects. Perspective drawing and oblique view.

Orthographic Drawings - Screw Threads, Bolts, Nuts and Washers, Bolted, Riveted and Welded Joints

Text Books:

1. Engineering Drawing: MB Shah and BC Rana, Pearsons
2. Engineering Graphics and Drafting: P.S. Gill, S.K. Kataria and Sons.

Reference Books:

1. A Text Book of Engineering Drawing: RK Dhawan, S Chand & Company
2. Engineering Drawing Plane and Solid Geometry : N.D. Bhatt, Charotar Publishing House.

Note:

1. For class work, the students shall be assigned to prepare at least ten drawing sheets covering all units and each topic of the syllabus.
2. For practical examination, the examiner will set a question paper containing total eight questions, two questions from each unit covering each topic of the syllabus; students are required to attempt five questions at least one from each unit.

ME 105 B ELEMENTS OF MECHANICAL ENGINEERING

B. Tech. Semester – I/II (Common for all Branches)

L	T	P	Credits	Class Work	: 25 Marks
3	1	--	4	Examination	: 75Marks
				Total	: 100 Marks
				Duration of Examination	: 3 Hours

UNIT-I

THERMODYNAMICS- Elementary definitions in thermodynamics, fundamentals of first and 2nd law of thermodynamic- concept of internal energy, enthalpy and entropy, heat pump and refrigerator, elementary numerical problems.

PROPERTIES OF STEAM & BOILERS: properties of steam, use of steam tables and mollier diagram, measurement of dryness fraction of steam, Carnot and Rankin cycle, elementary numerical problems. Classification of boilers, Comparison of water and fire tube boilers mounting and accessories with their functions, Constructional and operational details of Cochran and Babcock and Wilcox boilers, elementary numerical problems.

STEAM TURBINES AND CONDENSERS: Classification of turbines and their working principles, Types of condensers and their uses.

UNIT-II

I.C. ENGINES AND GAS TURBINES: Introduction, Classification, Constructional details and working of two-stroke and four-stroke diesel and petrol engines, Efficiency of Otto & Diesel cycles , Working principle of gas turbine, elementary numerical problems.

REFRIGERATION AND AIR CONDITIONING- rating of refrigeration machine, coefficient of performance, simple vapor compression cycle, fundamentals of air conditioning, use of Psychrometric charts.

UNIT-III

WATER TURBINES AND PUMPS : Introduction, Classification, Construction details and working principle of Pelton, Francis and Kaplan turbines, Classification of water pumps and construction detail & working principle of centrifugal pump.

SIMPLE LIFTING MACHINES: Definition of machine, Velocity ratio, Mechanical advantage, Efficiency, Laws of machines, Reversibility of machine, Wheel and axle, Differential pulley block, Single, double and triple start worm and worm wheel, Single and double purchase winch crabs, Simple and compound screw jacks, elementary numerical problems.

UNIT-IV

INTRODUCTION TO POWER TRANSMISSION AND DEVICES: Belt drive, Rope drive, Chain drive, Types of gear and Gear train, Types and function of clutches, Types and function of brakes.

STRESSES AND STRAINS: Introduction, Concept & types of Stresses and strains, Poisson's ratio, stresses and strains in simple and compound bars under axial loading, Stress-strain diagrams, Hooks law, Elastic constants & their relationships. Concept of shear force and bending moments in beams, elementary numerical problems.

TEXT BOOKS:

1. Hydraulic and Fluid Mechanics – Modi and Seth, Pub. – Standard Book House, New Delhi
2. Engineering Thermodynamics – C.P. Arora, Pub. - TMH, New Delhi
3. Thermal Engineering – A.S. Sarad, Pub. - Satya Prakashan, New Delhi.
4. Engineering Mechanics – K.L. Kumar, Pub. - TMH, New Delhi.
5. Theory of Machines – S.S. Rattan, Pub. – TMH, New Delhi.

REFERENCE BOOKS:

1. Strength of Materials – Popov, Pub. - PHI, New Delhi.
2. Hydraulic Machines – Jagdish Lal, Pub.- Metropolitan, Allahbad.
3. Thermal Science and Engineering – D.S. Kumar, Pub. – Kateria & Sons, New Delhi.

Note:

1. In the semester examination, the examiner will set two questions from each unit (total 08 questions in all), covering the entire syllabus. The students will be required to attempt only 5 questions selecting at least one question from each unit.
2. The use of scientific calculator will be allowed in the examination. However, programmable calculator and cellular phone will not be allowed

PHY 103B PHYSICS LAB – I						
B. Tech. Semester - I (Common for all Branches)						
L	T	P	Credits		Class Work	: 20Marks
--	--	2	1		Examination	: 30Marks
					Total	: 50 Marks
					Duration of Examination	: 3 Hours

LIST OF EXPERIMENTS

1. To find the wavelength of sodium light by using Newton's rings experimental setup.
2. To find the wavelength of sodium light by Fresnel's biprism experimental setup
3. To find the wavelength of various colours of white light with the help of a plane transmission diffraction grating.
4. To find the refractive index and Cauchy's constants of a prism by using spectrometer.
5. To find the wavelength of sodium light by using Michelson interferometer.
6. To find the resolving power of a telescope.
7. To find the pitch of a screw using He-Ne laser.
8. To find the specific rotation of sugar solution by using a polarimeter.
9. To compare the capacitances of two capacitors by De'sauty bridge.
10. To find the flashing and quenching potentials of Argon and also to find the capacitance of unknown capacitor.
11. To study the photo conducting cell and hence to verify the inverse square law.
12. To find the temperature co-efficient of resistance by using platinum resistance thermometer and Callender and Griffith bridge.
13. To find the frequency of A.C. mains by using sonometer.
14. To find the velocity of ultrasonic waves in non-conducting medium by piezo-electric method.
15. To determine the value of Stefan's constant.
16. To find the coefficient of thermal conductivity of a good conductor by Searle's method.
17. To determine the coefficient of thermal conductivity of a bad conductor by Lee and Charlton method.

Note: Students will be required to perform 10 experiments in a semester.

RECOMMENDED BOOKS :

1. Advanced Practical Physics – B.L. Worshnop and H.T. Flint (KPH)
2. Practical Physics – S.L.Gupta & V.Kumar (Pragati Prakashan).
3. Advanced Practical Physics Vol.I & II – Chauhan & Singh (Pragati Prakashan).

ME 107B WORKSHOP PRACTICE						
B. Tech. Semester – I/II (Common for all Branches)						
L	T	P	Credits		Class Work	: 40 Marks
--	--	4	2		Examination	: 60Marks
					Total	: 100 Marks
					Duration of Examination	: 3 Hours

LIST OF EXPERIMENTS / JOBS

1. To study different types of measuring tools/instruments used in metrology and determine least counts of vernier calipers, micrometers and vernier height gauges.
2. To study different types of machine tools (lathe, shaper, planer, slotter, milling, drilling machines).
3. To prepare a job on a lathe involving facing, outside turning, taper turning, step turning, radius making and parting-off.
4. To study different types of fitting tools and marking tools used in fitting practice.
5. To prepare lay out on a metal sheet by making and prepare rectangular tray, pipe shaped components e.g. funnel.
6. To prepare joints for welding suitable for butt welding and lap welding.
7. To study various types of carpentry tools and prepare simple types of at least two wooden joints.
8. To prepare simple engineering components/ shapes by forging.
9. To prepare mold and core assembly, to put metal in the mold and fettle the casting.
10. To prepare horizontal surface/ vertical surface/ curved surface/ slots or V-grooves on a shaper/ planner.
11. To prepare a job involving side and face milling on a milling machine.
12. To study of CNC lathe, CNC Milling and EDM Machines.

Note: 1. At least ten experiments/ jobs are to be performed/ prepared by students in the semester.

2. **At least 8 experiments/ jobs should be performed / prepared from the above list, remaining two may either be performed/ prepared from the above list or designed and set as per the scope of the syllabus of Manufacturing Processes.**

CH 103B CHEMISTRY LAB.						
B. Tech. Semester – I/II (Common for all Branches)						
L	T	P	Credits		Class Work	: 20 Marks
--	--	2	1		Examination	: 30Marks
					Total	: 50 Marks
					Duration of Examination	: 3 Hours

LIST OF EXPERIMENTS

1. Determination of Ca^{++} and Mg^{++} hardness of water sample using EDTA solution.
2. Determination of alkalinity of water sample.
3. Determination of dissolved oxygen (DO) in the given water sample.
4. To find the melting and eutectic point for a two component system by using method of cooling curve.
5. Determination of viscosity of lubricant by red wood viscometer(No. 1 & No. 2).
6. To determine Flash point & Fire point of an oil by Pensky-Marten's flash point apparatus and by Abel's closed cup apparatus..
7. To prepare Phenol-formaldehyde and urea- formaldehyde resin.
8. To find out saponification No. of an oil..
9. Determination of concentration of KMnO_4 solution spectrophotometrically.
10. Determination of strength of HCl solution by titrating it against NaOH solution conductometrically.
11. To determine amount of sodium and potassium in a given water sample by flame photometer
12. Estimation of total iron in an iron alloy.

Suggested Books:

1. A Text book on Experiments and Calculation –Engineering Chemistry by S.S.Dara, S.Chand & Company Ltd.
2. Essential of Experimental Engineering chemistry, Shashi Chawla, Dhanpat Rai Publishing Co.
3. Theory & Practice Applied Chemistry – O.P.Virmani, A.K. Narula(New Age).

Note:

1. The student will be required to perform 10 experiments/exercises from the above list and any other two experiments designed by the department based on the theory course (course code101B Course Name Chemistry)
2. The students will be allowed to use non-programmable scientific calculator. However, sharing/exchange of calculator are prohibited in the examination.
3. Electronic gadgets including Cellular phones are not allowed in the examination.

EE 103B PRINCIPLES OF ELECTRICAL ENGINEERING LAB

B. Tech. Semester – I/II (Common for all Branches)

L	T	P	Credits	Class Work	: 20 Marks
--	--	2	1	Examination	: 30Marks
				Total	: 50 Marks
				Duration of Examination	: 3 Hours

LIST OF EXPERIMENTS

1. To verify KCL and KVL.
2. To verify Thevenin's & Norton's Theorems.
3. To verify maximum power transfer theorem in D.C. Circuit.
4. To verify reciprocity theorem.
5. To verify Superposition theorem.
6. To study frequency response of a series R-L-C circuit and determine resonant frequency & Q-factor for various Values of R, L, C.
7. To study frequency response of a parallel R-L-C circuit and determine resonant frequency & Q-Factor for various values of R, L, C.
8. To perform direct load test of a transformer and plot efficiency Vs load characteristic.
9. To perform direct load test of a D.C. shunt generator and plot load voltage Vs load current curve.
10. To study various type of meters.
11. .Measurement of power by three voltmeters / three ammeters method.
12. Measurement of power in a three phase system by two watt meter method.

Note:

1. At least 10 experiments are to be performed by students in the semester.
2. At least 8 experiments should be performed from the above list; remaining two experiments may either be performed from the above list or designed and set by the Dept. as per the scope of the syllabus of EE101B.

CSE 103B COMPUTER PROGRAMMING LAB						
B. Tech. Semester – I/II (Common for all Branches)						
L	T	P	Credits		Class Work	: 20 Marks
--	--	2	1		Examination	: 30Marks
					Total	: 50 Marks
					Duration of Examination	: 3 Hours

LIST OF PRACTICAL PROBLEMS

1. Write a program to find the largest of three numbers. (if-then-else)
2. Write a program to find the largest number out of ten numbers (for-statement)
3. Write a program to find the average male height & average female heights in the class (input is in form of sex code, height).
4. Write a program to find roots of quadratic equation using functions and switch statements.
5. Write a program using arrays to find the largest and second largest no. out of given 50 nos.
6. Write a program to multiply two matrices.
7. Write a program to sort numbers using the Quicksort Algorithm.
8. Represent a deck of playing cards using arrays.
9. Write a program to check that the input string is a palindrome or not.
10. Write a program to read a string and write it in reverse order.
11. Write a program to concatenate two strings.
12. Write a program which manipulates structures (write, read, and update records).
13. Write a program which creates a file and writes into it supplied input.
14. Write a program which manipulates structures into files (write, read, and update records).

Note: At least 5 to 10 more exercises to be given by the teacher concerned

ME 109 B ELEMENTS OF MECHANICAL ENGINEERING LAB.

B. Tech. Semester – I/II (Common for all Branches)

L	T	P	Credits	Class Work	: 20 Marks
--	--	2	1	Examination	: 30Marks
				Total	: 50 Marks
				Duration of Examination	: 3 Hours

LIST OF EXPERIMENTS

1. To study Cochran & Babcock & Wilcox boilers.
2. To study the working & function of mountings & accessories in boilers.
3. To study 2-Stroke & 4-Stroke diesel engines.
4. To study 2-Stroke & 4-Stroke petrol engines.
5. To calculate the V.R., M.A. & efficiency of single, double & triple start worm & worm wheel.
6. To calculate the V.R., M.A. & efficiency of single & double purchase winch crabs.
7. To draw the SF & BM diagrams of a simply supported beam with concentrated loads.
8. To study the simple & compound screw jacks and find their MA, VR & efficiency.
9. To study the constructional features & working of Pelton Turbine.
10. To prepare stress-strain diagram for mild steel & cast iron specimens under tension and compression respectively on a Universal testing machine.

- Note:**
1. Total ten experiments are to be performed in the Semester.
 2. At least eight experiments should be performed from the above list. Remaining three experiments should be performed as designed & set as per the scope of the syllabus of **ME105B: Elements of Mechanical Engineering.**

MATH 102B MATHEMATICS – II B. Tech. Semester - II (Common for all Branches)

L	T	P	Credits	Class Work	: 75 Marks
3	1	--	4	Examination	: 75 Marks
				Total	: 100 Marks
				Duration of Examination	: 3 Hours

UNIT-I

ORDINARY DIFFERENTIAL EQUATIONS & ITS APPLICATIONS : Exact differential equations. Equations reducible to exact differential equations. Applications of Differential equations of first order & first degree to simple electric circuits, Newton's law of cooling, heat flow and orthogonal trajectories.

Linear differential equations of second and higher order. Complete solution, complementary function and particular integral, method of variation of parameters to find particular Integral, Cauchy's and Legendre's linear equations, simultaneous linear equations with constant coefficients.

UNIT-II

LAPLACE TRANSFORMS AND ITS APPLICATIONS : Laplace transforms of elementary functions, properties of Laplace transforms, existence conditions, transforms of derivatives, transforms of integrals, multiplication by t^n , division by t . Evaluation of integrals by Laplace transforms. Laplace transform of Unit step function, unit impulse function and periodic function. Inverse transforms, convolution theorem, application to linear differential equations and simultaneous linear differential equations with constant coefficients.

UNIT-III

FUNCTIONS OF COMPLEX VARIABLE : Definition, Exponential function, Trigonometric and Hyperbolic functions, Logarithmic functions. Limit and Continuity of a function, Differentiability and Analyticity.

Cauchy-Riemann equations, necessary and sufficient conditions for a function to be analytic, polar form of the Cauchy-Riemann equations. Harmonic functions, application to flow problems. Integration of complex functions. Cauchy-Integral theorem and formula.

Power series, radius and circle of convergence, Taylor's Maclaurin's and Laurent's series. Zeros and singularities of complex functions, Residues

UNIT-IV

FOURIER SERIES AND FOURIER TRANSFORMS : Euler's formulae, conditions for a Fourier expansion, change of interval, Fourier expansion of odd and even functions, Fourier expansion of square wave, rectangular wave, saw-toothed wave, half and full rectified wave, half range sine and cosine series.

Fourier integrals, Fourier transforms, Shifting theorem (both on time and frequency axes), Fourier transforms of derivatives, Fourier transforms of integrals, Convolution theorem, Fourier transform of Dirac-delta function.

TEXT BOOKS :

1. Advanced Engg. Mathematics F Kreyszig
2. Higher Engg. Mathematics B.S. Grewal

REFERENCE BOOKS:

1. Differential Equations – H.T.H. Piaggio.
2. Elements of Partial Differential Equations – I.N. Sneddon.
3. Advanced Engineering Mathematics – R.K. Jain, S.R.K. Iyengar.
4. Advanced Engg. Mathematics – Michael D. Greenberg.

Note:

1. In the semester examination, the examiner will set two questions from each unit (total 08 questions in all), covering the entire syllabus. The students will be required to attempt only 5 questions selecting at least one question from each unit.
2. The use of scientific calculator will be allowed in the examination. However, programmable calculator and cellular phone will not be allowed

PHY 102B ENGINEERING PHYSICS – II						
B. Tech. Semester - II (Common for all Branches)						
L	T	P	Credits		Class Work	: 25 Marks
3	1	--	4		Examination	: 75 Marks

					Total	:	100 Marks
					Duration of Examination	:	3 Hours

UNIT-I

ELECTRODYNAMICS & QUANTUM PHYSICS

Introduction, Displacement current, Equation of continuity, Gauss's Law in dielectric, applications of Gauss's law, Maxwell's equations (both differential and integral form), plane e.m. wave equations in free space, dielectric and conducting medium; Poynting vector.

Difficulties with Classical physics, Introduction to quantum mechanics-simple concepts, Black Body radiations, Planck's Law of radiation and its limitations, Group velocity and phase velocity, Schrodinger wave equations, Application of Schrodinger Equations (Particle in a box).

UNIT-II

CRYSTAL STRUCTURE

Space Lattice, unit cell and translation vectors, Miller indices, Bravais lattice structure in 3D, simple crystal structure (NaCl, ZnS and CsCl₂), Elementary idea of reciprocal lattice, Ewald Construction, Experimental x-ray diffraction method, Laue method, powder Method.

FREE ELECTRON THEORY

Elements of classical free electron theory, Drude's Theory of Conduction and its limitations, quantum theory of free electrons, Fermi level, Density of states, Fermi-Dirac distribution function, Thermionic emission, Richardson's equation.

UNIT-III

BAND THEORY OF SOLIDS

Origin of energy bands, Kronig, Penney Model (qualitative), E-K diagrams, Brillouin Zones, Concept of effective mass and holes, Classification of solids into metals, Semiconductors and insulators, Fermi energy and its variation with temperature, Conduction in Intrinsic and Extrinsic Semiconductors. Hall Effect and its Applications.

UNIT-IV

SUPERCONDUCTIVITY & NANOSCIENCE

Introduction to superconductivity, Critical temperature, Meissner Effect, Types of Superconductor, London Equations, penetration depth and coherence length, BCS Theory(qualitative ideas), High temperature superconductors.

Concept of Nano-materials, Size dependence of band gap, Top-down and bottom-up approach for preparing nano-materials, MEMS & NEMS, Properties and applications of Fullerene, Graphene, CNT, Nanowires, Nano-composites, Quantum dots..

TEXT BOOKS :

1. Solid State Physics – S.O.Pillai (6th Edition, New Age).
2. Quantum Mechanics – Ghatak & Loknathan.
3. Fundamentals of Solid State Physics – B.S.Saxena, R.C.Gupta & P.N.Saxena (Pragati Prakashan).
4. Solid State Physics by H. Ibach & H. Luth, Springer, Berlin.

5. Engineering Physics by H.K Malik and A.K. Singh (Tata McGraw Hill).
6. Engineering Physics by S.P. Taneja (Chand Pub.)

REFERENCE BOOKS :

1. Introduction to Solid State Physics (VII Ed.) - Charles Kittel (John Wiley).
2. Quantum Mechanics – Powell and Crasemann (Oxford & IBH)
3. Classical Electrodynamics by S.P. Puri (Narosa)
4. Nano-technology- Molecularly Designed Materials: G. M. Chow & K. E. Gonsalves (American Chemical society).

Note:

1. In the semester examination, the examiner will set two questions from each unit (total 08 questions in all), covering the entire syllabus. The students will be required to attempt only 5 questions selecting at least one question from each unit.
2. The use of scientific calculator will be allowed in the examination. However, programmable calculator and cellular phone will not be allowed

ECE 102B BASICS OF ELECTRONICS ENGINEERING						
B. Tech. Semester - II (OPTIONAL- Common for all Branches)						
L	T	P	Credits		Class Work	: 25 Marks
3	1	--	4		Examination	: 75 Marks
					Total	: 100 Marks
					Duration of Examination	: 3 Hours

UNIT I

SEMICONDUCTOR PHYSICS, DIODES AND APPLICATIONS: Basic concepts, intrinsic and extrinsic semiconductors, diffusion and drift currents, Hall effect and its applications-pn junction under open circuit, reverse bias and forward bias conditions, p-n junction in the breakdown region, ideal diode, types of diodes –zener diode, varactor diode, LED and photodiode. Rectifier (half wave and full wave).

AMPLIFIERS: Introduction of different types of BJT amplifiers & their characteristics.

UNIT II

OPERATIONAL AMPLIFIERS: OP-amps, its characteristics, inverting, non-inverting, summing, averaging, scaling, difference, integrator and differentiator amplifiers.

Power Supplies: Introduction and working of switched mode power supply (SMPS), voltage regulator.

UNIT III

DIGITAL ELECTRONICS: Binary, Octal and Hexadecimal number system and conversion, Boolean algebra, truth tables of logic gates AND, OR, NOT, EX-OR, EX-NOR, NAND, NOR AND their implementation using diodes transistors, switches and lamps, Universal gates.

ELECTRONIC INSTRUMENTS: Transducers, Role, importance and applications of general purpose test instruments viz. multi meter (digital and analog), cathode ray oscilloscope (CRO), function/ signal generator.

UNIT IV

COMMUNICATION SYSTEM: Modulation, need of modulation, Block diagram of basic communication system, overview of AM, FM and PM.

MICROPROCESSOR: Basics of 8085 & its architecture. Instruction set, Interrupts, Addressing modes.

Reference Books:

1. Sedra A S and Smith K C. “Microelectronic Circuits” New York. Oxford University Press, New York
2. Tocci R J and Widner N S “Digital Systems” – Principles and Applications”, Pearson Education India, New Delhi.
3. Cooper and Helfric, “Modern Electronic Instrumentation and Measuring Techniques”. Prentice Hall of India, New Delhi.
4. Boylestad and Nashelsky, “Electronic Devices and Circuit Theory”, Pearson Education India, New Delhi
5. Millman and Halkias, “Microelectronics”, Tata McGraw Hill
6. Millman and Halkias, “Electronics Devices and Circuits”. Tata McGraw Hill
7. Kennedy and Davis, “Electronic Communication Systems”, Tata McGraw Hill

8. Ramesh S. Gaonkar, "Microprocessor Architecture, Programming, and Applications with the 8085", Penram International Publishing.

Note:

1. In the semester examination, the examiner will set two questions from each unit (total 08 questions in all), covering the entire syllabus. The students will be required to attempt only 5 questions selecting at least one question from each unit.
2. The use of scientific calculator will be allowed in the examination. However, programmable calculator and cellular phone will not be allowed

BT 102B BASICS OF BIOTECHNOLOGY						
B. Tech. Semester – II (OPTIONAL- Common for all Branches)						
L	T	P	Credits		Class Work	: 25 Marks
3	1	--	4		Examination	: 75Marks
					Total	: 100 Marks
					Duration of Examination	: 3 Hours

UNIT – I

INTRODUCTION: Nature and scope of Biotechnology.

CELL STRUCTURE AND FUNCTION: Prokaryotes and Eukaryotes- cell wall, cell membrane, nucleus, mitochondria, chloroplast, ribosome, vacuoles, bacteria and viruses: brief descriptions.

Biomolecules: A brief account of structure and functions of carbohydrates, lipids, proteins.

UNIT– II

CELL DIVISION: Mitosis and meiosis

GENES AND CHROMOSOMES: Classical- Mendel's laws and chromosomes, nature of genetic material, DNA and RNA as genetic material, concept of organization of genetic material into chromosomes.

DNA replication: DNA polymerases, replication mechanism.

UNIT-III

GENE EXPRESSION: Central dogma, genetic code, gene expression-a brief account of transcription and translation, housekeeping genes, mutations and their molecular basis.

GENETIC ENGINEERING: An introduction to genetic engineering: cloning (vectors, enzymes), DNA and genomic libraries, transgenics, DNA fingerprinting, genomics.

UNIT – IV

APPLICATIONS OF BIOTECHNOLOGY : Bioprocess and fermentation technology, cell culture, enzyme technology, biological fuel generation, single cell protein, sewage treatment, environmental biotechnology, biotechnology and medicine, biotechnology in agriculture & forestry industry, food and beverage technology, production of biological inventions, safety in biotechnology.

TEXT/ REFERENCE BOOKS:

- Biotechnology, Smith, Cambridge Press.
- Modern Concepts of Biotechnology, H. D. Kumar, Vikas Publishing House (P) Ltd.

- Elements of Biotechnology, P. K. Gupta, Rastogi Publications.

Note:

1. In the semester examination, the examiner will set two questions from each unit (total 08 questions in all), covering the entire syllabus. The students will be required to attempt only 5 questions selecting at least one question from each unit.
2. The use of scientific calculator will be allowed in the examination. However, programmable calculator and cellular phone will not be allowed

HUM 102B ORAL COMMUNICATION SKILLS						
B. Tech. Semester – II (OPTIONAL- Common for all Branches)						
L	T	P	Credits		Class Work	: 25 Marks
3	1	--	4		Examination	: 75Marks
					Total	: 100 Marks
					Duration of Examination	: 3 Hours

OBJECTIVE

To train students to have proficiency in oral communication through interpersonal communicative situations.

COURSE CONTENT

UNIT I

ESSENTIALS OF SPEAKING SKILLS:

Familiarity with phonetic sound symbols; Transcription of simple words using International Phonetic Alphabet; Use of dictionary to cultivate standard pronunciation and develop phonetic discrimination

UNIT II

SPEAKING SKILLS:

Need and Significance of Effective Oral Communication; Practice of Conversation – Interpersonal and Telephonic Conversation; Formal Group Discussion

UNIT III

NON-VERBAL ELEMENTS IN ORAL COMMUNICATION SKILLS:

Reading Face, eyes, gesture and body posture, time, space and culture in communicative situations; practicing verbal and non-verbal communication (Body Language) to acquire effective Oral communication;

UNIT IV

LISTENING SKILLS:

Essentials of Good Listening, Types of Listening, Barriers in Effective listening, Exercises in

Listening to Talk Shows, Speech Reviews; Practice in English Sounds and

Speech using RP/MRP

RECOMMENDED READING

1. Buck, Gary. *Assessing Listening*. Delhi: Foundation Books (Cambridge University Press), 200.
2. Balasubramanian, T. *A Textbook of English Phonetics for Indian Students*. Chennai: MacMillan, 1981 (rpt 2007).
3. Gangal, J.K. *A Practical Course in Spoken English*. New Delhi: PHI, 2011
4. Raman, Meenakshi and Sangeeta Sharma. *Communication Skills*. Delhi: OUP, 2011
5. Ribbens, Geoff and Richard Thompson. *Body Language*. New York: Hodder & Stoughton, 2007.

CE 102B BASICS OF CIVIL ENGINEERING						
B. Tech. Semester – II (OPTIONAL- Common for all Branches)						
L	T	P	Credits		Class Work	: 25 Marks
3	1	--	4		Examination	: 75Marks
					Total	: 100 Marks
					Duration of Examination	: 3 Hours

UNIT - I

MATERIALS FOR CONSTRUCTION: Stones, Sands, Lime, Bricks, Timber, Steel their Classification and Properties. Different Types of Cement and their Properties, manufacturing of Cement, Concrete, and properties of Concrete, Ingredient of Concrete and Their Functions
Component parts of a Building, Foundation, Masonry Works, Doors and Windows, Floors, Roofs, DPC, Building Services

UNIT - II

SURVEYING : Introduction to Surveying: Definition, importance, classification of surveys, Principle, Leveling: definitions of terms used in leveling, different types of levels, Contours, Definition, representation of reliefs, horizontal equivalent, contour interval, characteristics of contours, methods of contouring, contour gradient, uses of contour maps, Introduction to GIS, GPS and Remote sensing.

UNIT - III

TRANSPORTATION: Various modes and means of transportation, Different types of transport systems, Importance of road transport, History of Road Development, Indian Road Congress. Main features of 20 years road development plans in India, PMGSY
Sources of power, estimation of water power, water budget equation, necessity and importance of harnessing small hydro power plants, Dams, Types of Dams, Location and Impact assessment of a Dam project.

UNIT - IV

GEOTECHNICAL ENGINEERING: History and its applications, Soil Properties, Classification of Soil, Geotechnical and Geophysical investigation of Soil.

IRRIGATION ENGINEERING: Necessity, advantages, disadvantages, impact of irrigation on human environment, need and development of irrigation in India.

Text Books:

1. Basic Civil Engineering, Satheesh Gopi, Pearson.
2. Basic Civil Engineering, Dr. B.C. Punmia, Ashok Kumar Jain, Arun Kr. Jain, Firewall Medi

Reference Books:

1. Surveying by Prof. N. Singh, Tata McGraw Hill, New Delhi
2. Basic Civil Engineering, Rakesh Beohar, Firewall Media
3. Highway Engg. by S. K. Khanna & C.e.G. Justo, Nem Chand & Bros, Roorkee
4. Water Resources Engineering by Linseley and Franzini
5. Basic Civil Engineering, L.G. Kulkarni A. D. Pawar S. P. Nitsure, Technical Publications.

Note:

1. In the semester examination, the examiner will set two questions from each unit (total 08 questions in all), covering the entire syllabus. The students will be required to attempt only 5 questions selecting at least one question from each unit.
2. The use of scientific calculator will be allowed in the examination. However, programmable calculator and cellular phone will not be allowed.

PHY 104B PHYSICS LAB. – II						
B. Tech. Semester - II (Common for all Branches)						
L	T	P	Credits		Class Work	: 20 Marks
--	--	2	1		Examination	: 30Marks
					Total	: 50 Marks
					Duration of Examination	: 3 Hours

LIST OF EXPERIMENTS

1. To find the low resistance by Carey - Foster's bridge.
2. To find the resistance of a galvanometer by Thomson's constant deflection method using a post office box.
3. To find the value of high resistances by Substitution method.
4. To find the value of high resistances by Leakage method.
5. To study the characteristics of a solar cell and to find the fill factor.
6. To find the value of e/m for electrons by Helical method.
7. To find the ionisation potential of Argon/Mercury using a thyratron tube.
8. To study the variation of magnetic field with distance and to find the radius of coil by Stewart and Gee's apparatus.
9. To study the characteristics of (Cu-Fe, Cu-Constantan) thermo couple.
10. To find the value of Planck's constant by using a photoelectric cell.
11. To find the value of co-efficient of self-inductance by using a Rayleigh bridge.
12. To find the value of Hall Co-efficient of semi-conductor.
13. To study the V-I characteristics of a p-n diode.
14. To find the band gap of intrinsic semi-conductor using four probe method.
15. To calculate the hysteresis loss by tracing a B-H curve.
16. To verify the Truth Table of various Logic Gates.

Note: Students will be required to perform 10 experiments in a semester.

RECOMMENDED BOOKS:

1. Advanced Practical Physics – B.L. Worshnop and H.T. Flint (KPH)
2. Practical Physics – S.L.Gupta & V.Kumar (Pragati Prakashan).
3. Advanced Practical Physics Vol.I & II – Chauhan & Singh (Pragati Prakashan).

GP 102B GENERAL PROFICIENCY & ETHICS						
B. Tech. Semester – II (Common for all Branches)						
L	T	P	Credits		Examination	: 50Marks

--	--	--	2		Total	:	50 Marks
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The purpose of this course is to inculcate a sense of professionalism in a student along with personality development in terms of quality such as receiving, responding, temperament, attitude and outlook. The student efforts will be evaluated on the basis of his/ her performance / achievements in different walks of life.

A Faculty Counselor will be attached to a group of students which will remain associated with him / her during the entire period of the degree program in the University. Each faculty member will serve as a faculty counselor. They will act like a local guardian for the students associated with him / her and will help them in terms of career guidance, personal difficulties.

A. The student will present a written report before the committee with following in view:

The student will present before the committee his/ her achievements during the current academic session in the form of a written report highlighting followings:

- | | | | |
|------|--|-------|-------------------|
| I. | Academic Performance | ----- | |
| II. | Extra Curricular Activities / Community Service, Hostel Activities | | (8 Marks) |
| III. | Technical Activities / Industrial, Educational tour | | (8 Marks) |
| IV. | Sports/games | | (4 Marks) |
| V. | Moral values & Ethics | | (10 Marks) |

NOTE: Report submitted by the students should be typed on both sides of the paper.

B. A student will support his/ her achievement and verbal & communicative skill through presentation before the committee. (20 Marks)

C. Moral values & Ethics

Syllabus - Introduction to Value Education. Understanding ethics, value system, happiness, prosperity

A minor test / Quiz will be conducted and It will be the duty of the concerned teacher assigned to teach Moral values & Ethics to submit the awards to respective chairman of the department / Director/Principal.

The evaluation of this course will be made by the following Committee.

University Departments:

- | | | |
|---|-------------------------------|----------|
| 1 | Chairperson of the Department | Chairman |
| 2 | Senior Most Faculty Counselor | Member |
| 3 | Vice- Chancellor's Nominee | Member |

Affiliated Colleges:

- | | | |
|---|---|----------|
| 1 | Director/Principal | Chairman |
| 2 | Head of the Department/Sr. Faculty | Member |
| 3 | External Examiner to be appointed by the University | Member |

Note: Remuneration will be paid to the external examiner only (at par with the other practical examinations).

Deenbandhu Chhotu Ram University of Science & Technology, Murthal (Sonapat)
SCHEME OF STUDIES & EXAMINATIONS
B.Tech. 2nd YEAR (SEMESTER –III) AERONAUTICAL ENGINEERING
Credit Based Scheme w.e.f. 2013-14

S. No.	Course No.	Course Title	Teaching Schedule			Marks of Class work	Examination Marks		Total	Credit	Duration of Exam
			L	T	P		Theory	Practical			

1	MGT 201 B	ENGINEERING ECONOMICS (Common for all branches Except BT & BME) (Gr-A)	4	-		25	75	-	100	4	3
	GES 201 B	ENVIRONMENTAL STUDIES (Common for all branches) (Gr- B)	3	-		-	75*		75*	--	3
2	ME 201B	THERMODYNAMICS (AER, ME)	3	1		25	75	-	100	4	3
3	ME 203B	STRENGTH OF MATERIALS-I (AER ,ME)	3	1		25	75	-	100	4	3
4	ME205B	ENGINEERING MECHANICS (AER, ME & AE)	3	1		25	75	-	100	4	3
5	ME207B	FLUID MECHANICS (AER ME))	3	1		25	75	-	100	4	3
6	AER-201B	INTRODUCTION TO AERONAUTICS	3	1	-	25	75	-	100	4	3
7	AER-203B	INTRODUCTION TO AERONAUTICS LAB	-	-	2	20		30	50	1	3
7	ME211B	STRENGTH OF MATERIALS- ILAB (AER ,ME)	-	-	2	20		30	50	1	3
8	ME 215B	FLUID MECHANICS LAB (AER, ME)	-	-	2	20		30	50	1	3
9	GES 203B	ENVIRONMENTAL STUDIES FIELD WORK (Common for all branches) Gr- B)	-	-	-	-		25*	25*	-	
10	ME 217B	WORKSHOP (Common for all branches Except BT, AE)	--	--	2	50	--	--	50	2	3
Total			Gr-A	19	5	8	260	450	90	800	29
			Gr-B	18	5	8	235	375	90	700	25

Note:

- 8 Every student has to participate in the sports activities. Minimum one hour is fixed for sports activities either in the morning or evening. Weightage of Sports is given in General Proficiency & Ethics Syllabus.
- 9 * The Environmental studies (GES-201 B & Environment Studies Field work (GES-203B) are compulsory & qualifying courses only.
- 10 The students will be allowed to use non-programmable scientific calculator. However, sharing/exchange of calculator is prohibited in the examination.
- 11 Electronics gadgets including Cellular phones are not allowed in the examination
- 12 All the branches are to be divided into group 'A' and 'B' as per the suitability of the institute/ college, so that there is an equitable distribution of teaching load in odd and even semesters.

MGT 201B				ENGINEERING ECONOMICS			
B. Tech. Semester – III (Common for all Branches Except BT& BME)							
L	T	P	Credits	Class Work			: 25 Marks
4	-	--	4	Examination			: 75Marks
				Total			: 100 Marks
				Duration of Examination			: 3 Hours

COURSE OBJECTIVE: The aims of this course are to:

1. Acquaint the student with the basic economic concepts and their operational significance
2. Stimulate him to think systematically and objectively about cotemporary economic problems.

UNIT-I

Definition of economics- various definitions, nature of Economic problem, Micro and macro economics- their feature and scope, production possibility curve, Economic laws and their nature. Relation between Science, Engineering Technology and Economics, Concept and measurement of utility, Law of Diminishing Marginal Utility, Law of equi-marginal utility – its practical application and importance.

UNIT-II

Meaning of Demand, Individual and Market demand schedule, Law of demand, shape of demand curve. Elasticity of demand, measurement of elasticity of demand, factors effecting elasticity of demand, practical importance & application of the concept of elasticity of demand. Various concepts of cost-Fixed cost, variable cost, average cost, marginal cost, money cost, real cost, opportunity cost. Shape of average cost, marginal cost, total cost etc. in short run and long run.

UNIT III

Meaning of production and factors of production; Law of variable proportions, Law of Return to Scale, Internal and External economics and diseconomies of scale. Meaning of Market, Type of Market– perfect Competition, Monopoly, Oligopoly, Monopolistic competition (Main features of these markers).

UNIT-IV

Supply and Law of Supply, Role of Demand & Supply in Price Determination and effect of changes in demand and supply on prices . Nature and characteristics of Indian economy, privatization – meaning, merits and demerits. Globalisation of India economy – merits and demerits. Elementary Concept of WTO & TRIPS agreement, Monetary Policy & Fiscal Policy

TEXT BOOKS:

1. Ahuja H.L.”Micro Economic Theory” S. Chand Publication, New Delhi
2. Dewett K.K “Modern Economic Theory” S. Chand Publication, New Delhi
3. Jain T.R, Grover M.L, Ohri V.K Khanna O.P,”Economics for engineers” V.K .Publication ,New Delhi

SUGGESTED BOOKS:

1. Jhingan M.L”Micro Economic Theory” S.Chand Publication ,New Delhi
2. Chopra P.N “Principle of Economics” Kalyani Publishers, Delhi
3. Mishra S.K “Modern Micro Economics” Pragati Publication Mumbai.
4. Dwivedi D.N ”Micro Economics ” Pearson Education, New Delhi.

Note:

1. In the semester examination, the examiner will set two questions from each unit (total 08 questions in all), covering the entire syllabus. The students will be required to attempt only 5 questions selecting at least one question from each unit.
2. The use of scientific calculator will be allowed in the examination. However, programmable calculator and cellular phone will not be allowed

GES 201B ENVIRONMENTAL STUDIES

B. Tech. Semester – III/IV (Common for all Branches)

L	T	P	Credit	Examination	: 75Marks
3	--	--	0	Total	: 75 Marks
				Duration of Examination	: 3 Hours

UNIT – I The Multidisciplinary nature of environmental studies, Definition, scope and importance, Need for Public awareness

UNIT – II **NATURAL RESOURCES:**

Renewable and non-renewable resources:

Natural resources and associated problems.

- a) Forest resources: Use and over-exploitation: deforestation, case studies, Timber exploitation, mining, dams and their effects and forests tribal people.
- b) Water resources: Use and over-utilization of surface and ground water, floods, drought, conflicts over water, dams-benefits and problems.
- c) Mineral resources: Use and exploitation, environmental effects of extracting and using mineral resources, case studies.
- d) Food resources: World food problems, changes, caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity, case studies.
- e) Energy resources: Growing energy needs, renewable and non-renewable energy sources, use of alternate energy sources; case studies.
- f) Land resources: Land as a resource, land degradation, man induced landslides, soil erosion and desertification.
 - Role of an individual in conservation of natural resources.
 - Equitable use of resources for sustainable lifestyles.

UNIT- III **ECOSYSTEMS:**

- Concept of an ecosystem, Structure and function of an ecosystem, Producers, consumers and decomposers, Energy flow in the ecosystem, Ecological succession, Food chains, food webs and ecological pyramids.
- Introduction, types, characteristic features, structure and function of the following eco-system:
 - a) Forest ecosystem, Grassland ecosystem, Desert ecosystem.
 - b) Aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries).

UNIT- IV **BIODIVERSITY AND ITS CONSERVATIONS:**

- Introduction – Definition: Genetic, species and ecosystem diversity.
- Biogeographically classification of India.
- Value of biodiversity: consumptive use, productive use, social, ethical, aesthetic and option values.
- Biodiversity at global, National and local levels.
- India as a mega-diversity nation.
- Hot-spots of biodiversity.
- Threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts.
- Endangered and endemic species of India.

UNIT – V **ENVIRONMENTAL POLLUTION:**

Definition, causes, effects and control, measures of:

Air pollution, Water pollution, Soil pollution, Marine pollution, Noise pollution, Thermal Pollution, Nuclear hazards

- Solid waste management: Causes effects and control measures of urban and industrial wastes.
- Role of an individual in prevention of pollution.
- Pollution case studies.
- Disaster management: Floods, earthquake, cyclone and landslides.

UNIT – VI SOCIAL ISSUES AND THE ENVIRONMENT:

- a) From unsustainable to sustainable development
- b) Urban problems related to energy
- c) Water conservation, rain water harvesting, watershed management
- d) Resettlement and rehabilitation of people; its problems and concerns, case studies
- e) Environmental ethics: Issues and possible solutions
- f) Climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust, Case studies
- g) Wasteland reclamation, Consumerism and waste products
- h) Environment Protection Act, Air (Prevention and Control of Pollution) Act, Water (Prevention and Control of Pollution) Act, Wildlife Protection Act, Forest Conservation Act
- i) Issues involved in enforcement of environmental legislation, Public awareness

UNIT – VII Human population and the Environment., Population growth, variation among nations.

Population explosion – Family Welfare Programme, Environment and human health, Human Rights, Value Education, HIV/ AIDS, Woman and Child Welfare. Role of Information Technology in Environment and human health. Case Studies.

REFERENCES:

1. Agarwal, K.C. 2001, Environmental Biology, Nidi Pub. Ltd. Bikaner.
2. Bharucha, Franch, The Biodiversity of India, Mapin Publishing Pvt. Ltd., Ahmedabad – 380013, India .
3. Brunner R.C. 1989, Hazardous Waste Incineration, Mc. Graw Hill Inc. 480p.
4. Clark R.S., Marine Pollution, Slanderson Press Oxford (TB).
5. Cunningham, W.P. Cooper, T.H. Gorhani, E & Hepworth, M.T. 2001, Environmental Encyclopedia, Jaico Pub. House, Mumbai. 1195p.
6. De A.K., Environmental Chemistry, Wiley Eastern Ltd.
7. Down to Earth, Centre for Science and Environment @.
8. Gleick, H.P., 1993. Water in Crisis, Pacific Institute for Studies in Dev., Environment & Security, Stockholm Env. Institute, Oxford Univ., Press 473p.
9. Hawkins R.E. Encyclopedia of Indian Natural History, Bombay Natural History Society, Bombay (R).
10. Heywood, V.H. & Watson, R.T. 1995. Global Biodiversity Assessment. Cambridge Univ. Press 1140p.
11. Jadhav, H & Bhosale, V.M. 1995, Environmental Protection and Laws, Himalaya Pub. House, Helhi 284p.
12. Mckinney, M.L. & Schoch, RM 1996, Environmental Sciences Systems & Solutions, Web enhanced Edition 639p.
13. Mhaskar A.K., Mater Hazardous, Tekchno-Sciences Publications (TB).
14. Miller T.G. Jr. Environmental Science, Wadsoworth Publishing Co. (TB).
15. Odum, E.P. 1971, Fundamentals of Ecology, W.B. Saunders Co. USA, 574p.
16. Rao M.N. & Dutta, A.K. 1987, Waste Water Treatment. Oxford & IBH Publ. Co. Pvt. Ltd., 345p
17. Sharma, B.K., 2001, Environmental Chemistry, Goel Publ. House, Meerut.
18. Survey of the Environment, The Hindu (M).
19. Townsend C., Harper J, and Michael Begon, Essentials of Ecology, Blackwell Sciences (TB).
20. Trivedi, R.K., Handbook of Environmental Laws, Rules, Guidelines, Compliances and Standards, Vol. I and II Enviro Mdiea (R).
21. Trividi R.K., Handbook of Environmental Laws, Rules, Guidelines, Compliances and Standards, Vol I and II Enviro Media (R).
22. Trividi R.K. and P.K. Goel, Introduction to air pollution, Techno Sciences Pub. (TB).
23. Wagner K.D., 1998, Environmental Management, W.B. Saunders Co. Philadelophia, USA 499p.
24. A text bok environmental education G.V.S. Publishers by Dr. J.P. Yadav.

(M) Magazine (R) Reference (TB) Textbook

Note: 1. Examiner will set eight questions. Students will be required to attempt five Questions.
3. The awards of this paper shall not be counted in the award of the Degree/DMC.

ME 201B THERMODYNAMICS

B. Tech. Semester – III (Mechanical Engg & Aeronautical Engg)

L	T	P	Credits		Class Work	:	25 Marks
3	1	--	4		Examination	:	75Marks
					Total	:	100 Marks
					Duration of Examination	:	3 Hours

UNIT I

BASIC CONCEPTS: Macroscopic and microscopic approaches, definition of system and surrounding, concept of control volume, thermodynamic state, concepts of simple compressible substances, process and cycle, thermodynamic processes and thermodynamic equilibrium; Zeroth law; thermodynamic properties and use of tables of thermodynamic properties; Thermodynamic concept of energy; Modes of work and heat transfer.

FIRST LAW OF THERMODYNAMICS: The first law referred to cyclic and non-cyclic processes, Concept of internal energy of a system, Conservation of energy for simple compressible closed systems; Definitions of enthalpy and specific heats; free expansion process, Conservation of energy for an open system or control volume, Steady and transient processes. Problems

UNIT II

SECOND LAW OF THERMODYNAMICS: The directional constraints on natural processes; Kelvin-Planck and Clausius Statements and their Equivalence; Concept of reversibility; Carnot principle; Absolute thermodynamic temperature scale; Clausius Inequality, entropy, change in entropy in various thermodynamic processes, T-dS relations, entropy balance for closed and open systems, Principle of increase-in-Entropy, entropy generation, Third Law of Thermodynamics. Problems

Energy: Concept of reversible work and irreversibility; Second law efficiency; Energy change of a system: closed and open systems, energy transfer by heat, work and mass, energy destruction, energy balance in closed and open systems. Problems

UNIT III

PURE SUBSTANCE AND PHASE: Phase Transformation, Solid-Liquid-Vapour Equilibrium, Throttling and Measurement of Dryness Fraction of Steam, , Idea of a generalized chart and the law of corresponding states; Concept of ideal gases and their equations of state. Problems

INTRODUCTION TO PROPERTIES OF MIXTURES AND PHASES: Dalton's model, Equation of state, properties of ideal gas mixtures, Change in entropy on mixing; Law of corresponding states and introduction to real-gas mixtures; Gibbs phase rule; Air/Water Mixtures, Psychrometrics. Problems

UNIT IV

THERMODYNAMIC PROPERTY RELATIONS: Maxwell relations; Clausius-Clapeyron equation; Difference in heat capacities; Ratio of heat capacities; Joule-Thompson coefficient and inversion curve.

THERMODYNAMICS OF REACTIVE SYSTEMS: First law analysis; Internal energy and enthalpy of reaction; Enthalpy of formation; Second law analysis; chemical equilibrium; equilibrium constant for ideal-gas mixtures and its variation with temperature. Problems

Text Books:

1. Engineering Thermodynamics – P K Nag, Tata McGraw Hill
2. Engineering Thermodynamics – Jones and Dugan, PHI, New Delhi.
3. Sonntag, Borgnakke and Van Wylen, Fundamentals of Thermodynamics, 5th Ed., JW Sons, Singapore.

Reference Books:

1. Dhar, P.L., Engineering Thermodynamics - a generalized approach Elsevier, New Delhi.

2. Moran M.J. and Shapiro H.N., Engineering Thermodynamics, IV Edition, John Wiley & Sons, Singapore.
3. Çengel Y.A. and Boles, M.A., Thermodynamics: An Engineering Approach, 4th Ed., TMG Hill, New Delhi

Note:

1. In the semester examination, the examiner will set two questions from each unit (total 08 questions in all), covering the entire syllabus. The students will be required to attempt only 5 questions selecting at least one question from each unit.
2. The use of scientific calculator will be allowed in the examination. However, programmable calculator and cellular phone will not be allowed

ME 203B STRENGTH OF MATERIALS -I						
B. Tech. Semester – III (Mechanical Engg. & Aeronautical Engg.)						
L	T	P	Credits		Class Work	: 25 Marks
3	1	--	4		Examination	: 75Marks
					Total	: 100 Marks
					Duration of Examination	: 3 Hours

UNIT I

SIMPLE STRESSES & STRAINS: Concept & types of Stresses and strains, Poison's ratio, stresses and strain in simple and compound bars under axial loading, stress strain diagrams, Hooks law, elastic constants & their relationships, temperature stress & strain in simple & compound bars under axial loading, Numerical.

COMPOUND STRESSES & STRAINS: Concept of surface and volumetric strains, two dimensional stress system, conjugate shear stress at a point on a plane, principal stresses & strains and principal-planes, Mohr's circle of stresses, Numerical.

UNIT II

SHEAR FORCE & BENDING MOMENTS: Definitions, SF & BM diagrams for cantilevers, simply supported beams with or without over-hang and calculation of maximum BM & SF and the point of contra-flexure under (i) concentrated loads, (ii) uniformly distributed loads over whole span or a part of it, (iii) combination of concentrated loads and uniformly distributed loads, (iv) uniformly varying loads and (v) application of moments, relation between the rate of loading, the shear force and the bending moments, Problems.

FIXED BEAMS: Deflections, reactions and fixing moments with SF & BM calculations & diagrams for fixed beams under (i) concentrated loads, (ii) uniformly distributed load and (iii) a combination of concentrated loads & uniformly distributed load.

UNIT III

TORSION OF CIRCULAR MEMBERS: Torsion of thin circular tube, Solid and hollow circular shafts, tapered shaft, stepped shaft & composite circular shafts, combined bending and torsion, equivalent torque, effect of end thrust. Numericals.

COLUMNS & STRUTS: Column under axial load, concept of instability and buckling, slenderness ratio, derivation of Euler's formulae for the elastic buckling load, Eulers, Rankine, Gordon's formulae Johnson's empirical formula for axial loading columns and their applications, eccentric compression of a short strut of rectangular & circular sections, Numericals.

UNIT IV

BENDING & SHEAR STRESSES IN BEAMS: Bending stresses in beams with derivation & application to beams of circular, rectangular, I,T and channel sections, composite beams, shear stresses in beams with combined bending, torsion & axial loading of beams. Numericals.

SLOPE & DEFLECTION: Relationship between bending moment, slope & deflection, Mohr's theorem, moment area method, method of integration, Macaulay's method, calculations for slope and deflection of (i) cantilevers and (ii) simply supported beams with or without overhang under concentrated load, Uniformly distributed loads or combination of concentrated and uniformly distributed loads, Numericals.

BOOKS:

1. Strength of Materials – G. H. Ryder - Macmillan, India
2. Strength of Materials– Andrew Pytel and Fredinand L. Singer, Addison – Wesley

REFERENCE BOOKS:

1. Strength of Materials – Popov, PHI, New Delhi.

2. Strength of Materials A Rudimentary Approach – M.A. Jayaram, Sapna Book House, Bangalore

Note:

1. In the semester examination, the examiner will set two questions from each unit (total 08 questions in all), covering the entire syllabus. The students will be required to attempt only 5 questions selecting at least one question from each unit.
2. The use of scientific calculator will be allowed in the examination. However, programmable calculator and cellular phone will not be allowed.

ME 205B ENGINEERING MECHANICS						
B. Tech. Semester – III (Mechanical Engg., Aeronautical Engg. & Automobile Engg.)						
L	T	P	Credits		Class Work	: 25 Marks
3	1	--	4		Examination	: 75Marks
					Total	: 100 Marks

					Duration of Examination	:	3 Hours
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UNIT-I

Review of Basic Force Systems: Dimensions and units of mechanics, idealization of mechanics, laws of mechanics, vector algebra review, moment of a force about a point and axis, the couple and couple moment, addition and subtraction of couples, moment of a couple about a line, translation of a force to a parallel position, resultant of a force system, Problems.

Equilibrium: Introduction, free body diagram, control volumes, general equations of equilibrium, two point equivalent loading, static in-determinacy, simple truss, method of joints, method of sections, Problems.

UNIT-II

Properties of Surfaces & Moments and Products of inertia : First moment of an area and the centroid, principal axes, formal definition of inertia quantities, relation between mass-inertia terms and area-inertia terms, translation of coordinate axes, transportation properties of the inertia terms, a brief introduction to tensors, the inertia of ellipsoid and principal moments of inertia, Problems.

UNIT-III

Kinematics of Particles and Rigid Bodies: Velocity and acceleration in path and cylindrical coordinates, motion of a particle relative to a pair of translating axes, translation and rotation of rigid bodies, Chasles theorem, moving references, velocity and acceleration for different references, inertia and coriolis forces. Problems.

UNIT-IV

Particle Dynamics, Energy & Momentum Methods: Newton's law for rectangular coordinates & cylindrical coordinates, rectifier translation, central force motion, Newton's law for path variables, work energy equations, work energy equations for a systems of particles, linear and angular momentum equations for a systems of particles. Problems.

TEXT BOOK:

1. Engineering Mechanics - Statics & Dynamics by I.H. Shames, PHI, New Delhi.
2. Engineering Mechanics – Timoschenko.

REFERENCE BOOKS:

1. Statics & Dynamics by J.L. Meriam, JohnWiley & Sons (P) Ltd. New York.
2. Statics & Dynamics by Beer & Johnson, MGH, New Delhi.

Note:

1. In the semester examination, the examiner will set two questions from each part (total 08 questions in all), covering the entire syllabus. The students will be required to attempt only 5 questions selecting at least one question from each part.
2. The use of scientific calculator will be allowed in the examination. However, programmable calculator and cellular phone will not be allowed.

ME – 207B FLUID MECHANICS

B. Tech. Semester – III (Mechanical Engg. & Aeronautical Engg.)

L	T	P	Credits		Class Work	:	25 Marks
3	1	--	4		Examination	:	75Marks
					Total	:	100 Marks
					Duration of Examination	:	3 Hours

UNIT - I

FLUID PROPERTIES AND FLUID STATICS: Concept of fluid and flow, ideal and real fluids, properties of fluids, Newtonian and non-Newtonian fluids. Pascal's law, hydrostatic equation, hydrostatic forces on submerged plane and curved surfaces, stability of floating and submerged bodies, metacentric height, relative equilibrium.

MANOMETERS: Simple & differential manometers;

VORTEX MOTION: Free vortex flow, Forced vortex flow

UNIT - II

FLUID KINEMATICS: Eulerian and Lagrangian description of fluid flow; stream, streak and path lines; types of flows, flow rate and continuity equation, differential equation of continuity in cylindrical and polar coordinates, rotation, vorticity and circulation, stream and potential functions, flow net.

FLUID DYNAMICS: Concept of system and control volume, Euler's equation, Bernoulli's equation, venturimeter, orifices, orificemeter, mouthpieces, Notches and weirs, kinetic and momentum correction factors, Impulse momentum relationship and its applications.

UNIT - III

VISCOUS FLOW: Flow regimes and Reynold's number, Navier-Stokes equation of motion, Relationship between shear stress and pressure gradient, uni-directional flow between stationary parallel plates, parallel plates having relative motion, movement of piston in a dashpot, power absorbed in bearings.

FLOW THROUGH PIPES: Major and minor losses in pipes, Hagen-Poiseuille law, hydraulic gradient and total energy lines, series and parallel connection of pipes, branched pipes; equivalent pipe, power transmission through pipes.

UNIT IV

BOUNDARY LAYER FLOW: Boundary layer concept, displacement, momentum and energy thickness, von-Karman momentum integral equation, laminar and turbulent boundary layer flows: Boundary layer thickness, skin friction coefficient, drags on a flat plate, boundary layer separation

FLOW AROUND IMMersed BODIES: Drag force, Lift & drag coefficient, streamlined and bluff bodies, lift and drag on a cylinder and an airfoil.

TEXT BOOKS:

1. Fluid Mechanics and Machinery– CSP Ojha, R Berndthsson and P N Chandramouli, Oxford University Press
2. Mechanics of Fluids – I H Shames, Mc Graw Hill

REFERENCES BOOKS:

1. Introduction to Fluid Mechanics and Fluid Machines – S.K. Som and G. Biswas, TMH
2. Fluid Mechanics and Fluid Power Engineering – D.S. Kumar, S.K. Kataria and Sons
3. Fluid Mechanics– John F Douglas, Janusz M. Gasiorek, John A, Swaffield, Peason Education

Note:

1. In the semester examination, the examiner will set two questions from each unit (total 08 questions in all), covering the entire syllabus. The students will be required to attempt only 5 questions selecting at least one question from each unit.
2. The use of scientific calculator will be allowed in the examination. However, programmable calculator and cellular phone will not be allowed.

AER-201B INTRODUCTION TO AERONAUTICS						
B. TECH. SEMESTER – III AERONAUTICAL ENGINEERING						
L	T	P	Credits		Class Work	: 25 Marks
3	1	--	4		Examination	: 75Marks
					Total	: 100 Marks
					Duration of Examination	: 3 Hours

UNIT I

INTRODUCTION: Pre Wright Brothers era, Wright Flyer, Conventional airplane, progress in airplane design and applications, Current status, Other kinds of heavier than air vehicles, helicopter, VSTOL machines.

SPACE VEHICLES: Missile and its types, space vehicles and its types, reusable space vehicles, space shuttle, satellites, types of satellites and their functions

UNIT II

AERODYNAMICS: Airfoil nomenclature, symmetric & cambered airfoils and their aerodynamic characteristics, angle of attack, 2-D and 3-D wing, wing as a lifting surface, types of wing plan forms and their aerodynamic characteristics, centre of pressure and pressure coefficient, types of drag, lift to drag ratio as efficiency of a lifting surface, different types of flows; laminar and turbulent, effect of viscosity, concept of boundary layer, boundary layer control, high coefficient of lift devices, subsonic, transonic, supersonic and hypersonic mach no., critical mach no., drag divergence mach no.

UNIT III

AIRPLANE PROPULSION: Requirement of power to fly, balance of forces, various means of producing power for forward flight. Piston engines, jet propulsion-thrust equation, turbojet, turbofan, ramjet engines, Locations of such engines, Propeller and its use, Rocket engines.

UNIT IV

AIRPLANE STRUCTURES AND MATERIALS: Structural arrangement of the Wright Flyer,. Structural details of landing gear, wing, fuselage and tail planes, functions of ribs, skin, spars, stringers, longerons, Monocoque and semi-monocoque structures, materials for main components

CONTROL SYSTEMS AND LEVEL FLIGHT: Various types of flaps, function of rudder, elevator, ailerons, flaprons, elevons, types of tail planes, condition for straight & level flight, flight path angle

TEXT BOOKS:

- 1 Fundamentals of Flight Richard S. Shevel , Prentice Hall
2. Introduction to flight- John D. Anderson
3. Mechanics of flight by A.C. Kermode

REFERENCES BOOKS:

1. Aircraft Basic Science :Ralph D. Bent & James L. Mackinley
- 2 Jet Aircraft Power Sysytem : Jack V.Casamassa & Ralph D.Bent

AER-203B INTRODUCTION TO AERONAUTICS LAB						
B. Tech. Semester – III (AERONAUTICAL ENGINEERING)						
L	T	P	Credits		Class Work	: 20 Marks
--	--	2	1		Examination	: 30 Marks
					Total	: 50 Marks
					Duration of Examination	: 3 Hours

LIST OF EXPERIMENTS:

1. To study various types of engines used for trainer aircraft.
2. To study Turbojet ,Turboprop,Turbofanused in Aeronautical Engineering
3. To study any trainer aircraft and its working.
4. To study high coefficient of lift devices.
5. To study monocoque and semi-monocoque structures
6. To study rudder, elevator, ailerons of the aircraft'scontrol surfaces
7. To study Categorisation of various types of missiles.
8. To study, 2-D and 3-D wing.
9. To study of various types of military aircrafts.
10. To study the concept of boundary layer theory.

Note:

1. **At least ten experiments are to be performed in the semester.**
2. **At least eight experiments should be performed from the above list. Remaining two experiments may either be performed from the above list or designed & set by the department as per the scope of the syllabus.**

ME 211B STRENGTH OF MATERIALS –I LAB							
B. Tech. Semester – III (Mechanical Engg. & Aeronautical Engg.)							
L	T	P	Credit		Class Work	:	20 Marks
--	--	2	1		Examination	:	30Marks
					Total	:	50 Marks
					Duration of Examination	:	3 Hours

LIST OF EXPERIMENTS:

1. To study the Brinell hardness testing machine & perform the Brinell hardness test.
2. To study the Rockwell hardness testing machine & perform the Rockwell hardness test.
3. To study the Vickers hardness testing machine & perform the Vickers hardness test.
4. To study the Erichsen sheet metal testing machine & perform the Erichsen sheet metal test.
5. To study the Impact testing machine and perform the Impact tests (Izod & Charpy).
6. To study the Universal testing machine and perform the tensile test.
7. To perform compression & bending tests on UTM.
8. To perform the shear test on UTM.
9. To study the torsion testing machine and perform the torsion test.
10. To draw shear Force, Bending Moment Diagrams for a simply Supported Beam under Point and Distributed Loads.

Note:

3. At least ten experiments are to be performed in the semester.
4. At least eight experiments should be performed from the above list. Remaining two experiments may either be performed from the above list or designed & set by the department as per the scope of the syllabus.

ME 215B FLUID MECHANICS LAB						
B. Tech. Semester – III (Mechanical Engg. & Aeronautical Engg.)						
L	T	P	Credit		Class Work	: 20 Marks
--	--	2	1		Examination	: 30Marks
					Total	: 50 Marks
					Duration of Examination	: 3 Hours

LIST OF EXPERIMENTS:

1. To determine coefficient of discharge of an orifice meter.
2. To determine the coefficient of discharge of Notch (V / Rectangular types).
3. To determine the friction factor for the pipes.
4. To determine the coefficient of discharge of venturimeter.
5. To determine the coefficient of discharge, contraction & velocity of an orifice.
6. To verify the Bernoullis Theorem.
7. To find critical Reynolds number for a pipe flow.
8. To determine the meta-centric height of a floating body.
9. To determine the minor losses due to sudden enlargement, sudden contraction.
10. To determine loss coefficient for valves and bends.
11. To show the velocity and pressure variation with radius in a forced vertex flow.
12. To determine the coefficient of discharge of mouthpiece.
13. Flow visualization demonstration.

Note:

1. At least ten experiments are to be performed in the semester.
2. At least eight experiments should be performed from the above list. Remaining two experiments may either be performed from the above list or designed & set by the department as per the scope of the syllabus (ME207B).

GES 203B ENVIRONMENTAL STUDIES FIELD WORK						
B. Tech. Semester –III/IV (Common for all Branches)						
L	T	P	Credit		Field Work	: 25Marks
--	--	--	0		Total	: 25 Marks

FIELD WORK:

- Visit to a local area to document environmental assets – river/ forest/ grassland/ hill/ mountain.
- Visit to a local polluted site-Urban/ Rural/ Industrial/ Agricultural.
- Study of common plants, insects, birds.
- Study of simple ecosystems – pond, river, hill slopes, etc. (Field work equal to 5 lectures hours).

Note: The awards of this paper shall not be counted in the award of the Degree/DMC.

ME 217 B WORKSHOP

B. Tech. Semester – III (Common for all branches except BT & AE)

L	T	P	Credits	Class Work	: 50 Marks
-	-	2	2	Duration of Examination	: 3 Hours

Each student has to undergo a workshop atleast 4 weeks (80-100 hours) at the end of II semester during summer vacations. Out of the four weeks, two weeks would be dedicated to general skills and two weeks training for specialized discipline/ department. The evaluation of this training shall be carried out in the III semester

LIST OF JOBS TO BE CARRIED OUT DURING THIS PERIOD

1. To study and prepare different types of jobs on machine tools (lathe, shaper, planer, slotter, milling, drilling machines).
2. To prepare lay out on a metal sheet by making and prepare rectangular tray, pipe shaped components e.g. funnel.
3. To prepare joints for welding suitable for butt welding and lap welding.
4. To study various types of carpentry tools and prepare simple types of wooden joints.
5. To prepare simple engineering components/ shapes by forging.
6. To prepare mold and core assembly, to put metal in the mold and fettle the casting.
7. To study of CNC lathe, CNC Milling and EDM Machines.
8. Any work assigned in electrical workshop, computer hardware/ language lab, electronics workshop, biomedical hardware, automobile workshop etc.

This student will prepare job(s)/project as an individual or in a group using workshop in house infrastructure.

The student shall submit a typed report.

Training will be evaluated on the spot out of 20 marks.

The report will be evaluated in the III Semester by a Committee consisting of two teachers.

The student will interact with the committee through presentation to demonstrate his/ her learning. The basis of evaluation will primarily be the knowledge and exposure of students on different kinds of Machines/instruments/tools/ skills etc. The committee will evaluate out of 30 marks.

The committee shall submit the awards out of 50 marks.

Deenbandhu Chhotu Ram University of Science & Technology, Murthal (Sonapat)
SCHEME OF STUDIES & EXAMINATIONS
B.Tech. 2nd YEAR (SEMESTER –IV) AERONAUTICAL ENGINEERING
Credit Based Scheme w.e.f. 2013-14

S. No.	Course No.	Course Title	Teaching Schedule			Marks of Class work	Examination Marks		Total	Credit	Duration of Exam
			L	T	P		Theory	Practical			
1	MGT- 201 B	ENGINEERING ECONOMICS (Common for all branches Except BT & BME) (Gr- B)	4	-		25	75	-	100	4	3
	GES 201 B	OR ENVIRONMENTAL STUDIES (Common for all branches) (Gr-A)	3	-		-	75*		75*	-	
2	AER-202B	AIRCRAFT PRODUCTION	4	-		25	75	-	100	4	3
3	AER-204B	AIRCRAFT MATERIAL	4	-		25	75	-	100	4	3
4	AER-206 B	AEROPLANE PERFORMANCE, STABILITY AND CONTROL	3	1		25	75	-	100	4	3
5	AER-208B	MAINTENANCE OF RADIO & COMMUNICATION SYSTEMS	4	-		25	75	-	100	4	3
6	AER-210B	AIRCRAFT INSTRUMENTATION	4	-		25	75	-	100	4	3
7	AER-212B	AIRCRAFT INSTRUMENTATION LAB	-	-	2	20		30	50	1	3
8	ME 218B	MANUFACTURING PRACTICE (AER, ME)	-	-	3	20	-	30	50	1.5	3
9	GES 203 B	ENVIRONMENTAL STUDIES FIELD WORK (Common for all branches) (Gr-A)	-	-	-	-	-	25*	25*	-	
10	GPAER 202B	GENERAL PROFICIENCY & ETHICS	1	-	-	-	-	75	75	2	3
Total											
			Gr-B	24	1	5	190	450	135	775	28.5
			Gr-A	23	1	5	165	375	135	675	24.5

Note:

- 1 Every student has to participate in the sports activities. Minimum one hour is fixed for sports activities either in the morning or evening. Weightage of Sports is given in General Proficiency & Ethics Syllabus.
- 2 * The Environmental studies (GES-201 B & Environment Studies Field work (GES-203B) are compulsory & qualifying courses only.
- 3 The students will be allowed to use non-programmable scientific calculator. However, sharing/exchange of calculator is prohibited in the examination.
- 4 Electronics gadgets including Cellular phones are not allowed in the examination
- 5 Each students has to undergo Professional Training of at least 4 weeks from the industry, institute, research lab, training center etc during summer vacation and its evaluation shall be carries out in the V semester
- 6 All the branches are to be divided into group 'A' and 'B' as per the suitability of the institute/college, so that there is an equitable distribution of teaching load in odd and even semesters.

B. Tech. Semester – III (Common for all Branches Except BT& BME)						
L	T	P	Credits		Class Work	: 25 Marks
4	-	--	4		Examination	: 75Marks
					Total	: 100 Marks
					Duration of Examination	: 3 Hours

COURSE OBJECTIVE: The aims of this course are to:

1. Acquaint the student with the basic economic concepts and their operational significance
2. Stimulate him to think systematically and objectively about cotemporary economic problems.

UNIT-I

Definition of economics- various definitions, nature of Economic problem, Micro and macro economics- their feature and scope, production possibility curve, Economic laws and their nature. Relation between Science, Engineering Technology and Economics. Concept and measurement of utility, Law of Diminishing Marginal Utility, Law of equi-marginal utility – its practical application and importance.

UNIT-II

Meaning of Demand, Individual and Market demand schedule, Law of demand, shape of demand curve. Elasticity of demand, measurement of elasticity of demand, factors effecting elasticity of demand, practical importance & application of the concept of elasticity of demand. Various concepts of cost-Fixed cost, variable cost, average cost, marginal cost, money cost, real cost, opportunity cost. Shape of average cost, marginal cost, total cost etc. in short run and long run.

UNIT III

Meaning of production and factors of production; Law of variable proportions, Law of Return to Scale, Internal and External economics and diseconomies of scale. Meaning of Market, Type of Market– perfect Competition, Monopoly, Oligopoly, Monopolistic competition (Main features of these markers).

UNIT-IV

Supply and Law of Supply, Role of Demand & Supply in Price Determination and effect of changes in demand and supply on prices . Nature and characteristics of Indian economy, privatization – meaning, merits and demerits. Globalisation of India economy – merits and demerits. Elementary Concept of WTO & TRIPS agreement, Monetary Policy & Fiscal Policy

TEXT BOOKS:

1. Ahuja H.L.”Micro Economic Theory” S. Chand Publication, New Delhi
2. Dewett K.K “Modern Economic Theory” S. Chand Publication, New Delhi
3. Jain T.R, Grover M.L, Ohri V.K Khanna O.P, ”Economics for engineers” V.K .Publication ,New Delhi

SUGGESTED BOOKS:

1. Jhingan M.L”Micro Economic Theory” S.Chand Publication ,New Delhi
2. Chopra P.N “Principle of Economics” Kalyani Publishers, Delhi
3. Mishra S.K “Modern Micro Economics” Pragati Publication Mumbai.

4. Dwivedi D.N "Micro Economics " Pearson Education, New Delhi.

Note:

1. In the semester examination, the examiner will set two questions from each unit (total 08 questions in all), covering the entire syllabus. The students will be required to attempt only 5 questions selecting at least one question from each unit.
2. The use of scientific calculator will be allowed in the examination. However, programmable calculator and cellular phone will not be allowed

GES 201B ENVIRONMENTAL STUDIES

B. Tech. Semester – III/IV (Common for all Branches)

L	T	P	Credit	Examination	: 75Marks
3	--	--	0	Total	: 75 Marks
				Duration of Examination	: 3 Hours

UNIT – I The Multidisciplinary nature of environmental studies, Definition, scope and importance.

Need for Public awareness

UNIT – II NATURAL RESOURCES:

Renewable and non-renewable resources:

Natural resources and associated problems.

- g) Forest resources: Use and over-exploitation: deforestation, case studies, Timber exploitation, mining, dams and their effects and forests tribal people.
- h) Water resources: Use and over-utilization of surface and ground water, floods, drought, conflicts over water, dams-benefits and problems.
- i) Mineral resources: Use and exploitation, environmental effects of extracting and using mineral resources, case studies.
- j) Food resources: World food problems, changes, caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity, case studies.
- k) Energy resources: Growing energy needs, renewable and non-renewable energy sources, use of alternate energy sources; case studies.
- l) Land resources: Land as a resource, land degradation, man induced landslides, soil erosion and desertification.
 - Role of an individual in conservation of natural resources.
 - Equitable use of resources for sustainable lifestyles.

UNIT- III ECOSYSTEMS:

- Concept of an ecosystem, Structure and function of an ecosystem, Producers, consumers and decomposers, Energy flow in the ecosystem, Ecological succession, Food chains, food webs and ecological pyramids.
- Introduction, types, characteristic features, structure and function of the following eco-system:
 - a) Forest ecosystem, Grassland ecosystem, Desert ecosystem.
 - b) Aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries).

UNIT- IV BIODIVERSITY AND ITS CONSERVATIONS:

- Introduction – Definition: Genetic, species and ecosystem diversity.
- Biogeographically classification of India.
- Value of biodiversity: consumptive use, productive use, social, ethical, aesthetic and option values.
- Biodiversity at global, National and local levels.
- India as a mega-diversity nation.
- Hot-spots of biodiversity.
- Threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts.
- Endangered and endemic species of India.

UNIT – V ENVIRONMENTAL POLLUTION:

Definition, causes, effects and control, measures of:

Air pollution, Water pollution, Soil pollution, Marine pollution, Noise pollution, Thermal Pollution, Nuclear hazards

- Solid waste management: Causes effects and control measures of urban and industrial wastes.
- Role of an individual in prevention of pollution.
- Pollution case studies.
- Disaster management: Floods, earthquake, cyclone and landslides.

UNIT – VI SOCIAL ISSUES AND THE ENVIRONMENT:

- j) From unsustainable to sustainable development
- k) Urban problems related to energy
- l) Water conservation, rain water harvesting, watershed management
- m) Resettlement and rehabilitation of people; its problems and concerns, case studies
- n) Environmental ethics: Issues and possible solutions
- o) Climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust, Case studies
- p) Wasteland reclamation, Consumerism and waste products
- q) Environment Protection Act, Air (Prevention and Control of Pollution) Act, Water (Prevention and Control of Pollution) Act, Wildlife Protection Act, Forest Conservation Act
- r) Issues involved in enforcement of environmental legislation, Public awareness

UNIT – VII Human population and the Environment., Population growth, variation among nations.

Population explosion – Family Welfare Programme, Environment and human health, Human Rights, Value Education, HIV/ AIDS, Woman and Child Welfare. Role of Information Technology in Environment and human health. Case Studies.

REFERENCES:

1. Agarwal, K.C. 2001, Environmental Biology, Nidi Pub. Ltd. Bikaner.
2. Bharucha, Franch, The Biodiversity of India, Mapin Publishing Pvt. Ltd., Ahmedabad – 380013, India .
3. Brunner R.C. 1989, Hazardous Waste Incineration, Mc. Graw Hill Inc. 480p.
4. Clark R.S., Marine Pollution, Slanderson Press Oxford (TB).
5. Cunningham, W.P. Cooper, T.H. Gorhani, E & Hepworth, M.T. 2001, Environmental Encyclopedia, Jaico Pub. House, Mumbai. 1195p.
6. De A.K., Environmental Chemistry, Wiley Eastern Ltd.
7. Down to Earth, Centre for Science and Environment ®.
8. Gleick, H.P., 1993. Water in Crisis, Pacific Institute for Studies in Dev., Environment & Security, Stockholm Env. Institute, Oxford Univ., Press 473p.
9. Hawkins R.E. Encyclopedia of Indian Natural History, Bombay Natural History Society, Bombay (R).
10. Heywood, V.H. & Watson, R.T. 1995. Global Biodiversity Assessment. Cambridge Univ. Press 1140p.
11. Jadhav, H & Bhosale, V.M. 1995, Environmental Protection and Laws, Himalaya Pub. House, Helhi 284p.
12. Mckinney, M.L. & Schoch, RM 1996, Environmental Sciences Systems & Solutions, Web enhanced Edition 639p.
13. Mhaskar A.K., Mater Hazardous, Tekchno-Sciences Publications (TB).
14. Miller T.G. Jr. Environmental Science, Wadsworth Publishing Co. (TB).
15. Odum, E.P. 1971, Fundamentals of Ecology, W.B. Saunders Co. USA, 574p.
16. Rao M.N. & Dutta, A.K. 1987, Waste Water Treatment. Oxford & IBH Publ. Co. Pvt. Ltd., 345p
17. Sharma, B.K., 2001, Environmental Chemistry, Goel Publ. House, Meerut.
18. Survey of the Environment, The Hindu (M).
19. Townsend C., Harper J, and Michael Begon, Essentials of Ecology, Blackwell Sciences (TB).
20. Trivedi, R.K., Handbook of Environmental Laws, Rules, Guidelines, Compliances and Standards, Vol. I and II Enviro Media (R).
21. Trivedi R.K., Handbook of Environmental Laws, Rules, Guidelines, Compliances and Standards, Vol I and II Enviro Media (R).

22. Trividi R.K. and P.K. Goel, Introduction to air pollution, Techno Sciences Pub. (TB).
23. Wagner K.D., 1998, Environmental Management, W.B. Saunders Co. Philadelphia, USA 499p.
24. A text bok environmental education G.V.S. Publishers by Dr. J.P. Yadav.

(M) Magazine (R) Reference (TB) Textbook

Note: 1. Examiner will set eight questions. Students will be required to attempt five Questions.
2. The awards of this paper shall not be counted in the award of the Degree/DMC.

AER-202B AIRCRAFT PRODUCTION						
B. TECH. SEMESTER – IV AERONAUTICAL ENGG.						
L	T	P	Credits		Class Work	: 25 Marks
4	-	--	4		Examination	: 75Marks
					Total	: 100 Marks
					Duration of Examination	: 3 Hours

UNIT-I

Introduction: Function of process planning (Methods). Organizing for process planning - place in production planning and control, Relationship with other departments, Tool engineering.

Heat Treatment: Final and intermediary heat treatment operations carried out on aircraft materials (both ferrous and non-ferrous) and the equipment used, the importance of test pieces, Finishing by anodizing.

UNIT-II

General activities: carried out in manufacturing and assembly shops, machine shop, sheet metal shop, welding shop, plastic shop and assembly shop.

Jigs and Fixtures: Importance of special production tools used in manufacturing activity of various types of jigs and fixtures used in aircraft industry, Difference between jigs and fixtures. Design consideration. Choice of materials, Types of assembly fixtures such as table box, picture-frame, next and so on. Typical jigs for wings, fuselage and control surfaces, jigs and fixtures for turning, milling and drilling, Universal tooling.

UNIT-III

Cutting Tools: Theory of metal cutting, typical types of cutting tools used in the manufacturing shops, the advantages of tipped tools. Ceramic tools, tool life, optimum cutting speeds and feeds, factors limiting speeds, feeds and cuts. New development in cutting tools, use of DBN Diamond, ceramics and coating on cutting tools

Inspection Gauges and Equipment: Various inspection gauges in the manufacturing shops and their application. Fits, limits and tolerances, engineering reference systems, station and datum lines, chord and fuselage reference lines, lofting aerofoil, use of templates, test equipment used in aircraft production, necessity for and importance of interchangeability media, application of inter -change-ability media viz., acceptance gauges, reference gauges, aperture gauges. Use of digital read out on measuring tools.

UNIT-IV

Process Planning : Definition of mass and batch production, various types of charting techniques viz., operation process chart, flow process chart etc., definition of planning breakdown and its importance, factors to be considered for process planning, comparison of methods, simple exercise on process planning - simple machine shop and sheet metal components. Different approaches in process planning during pre-production and production phases.

Process Shop: Theory of planting, finishing processes carried on aircraft materials - planting and finishing equipment

Text Books

1. M L Begman. Manufacturing process, Media Promoters

2. ASTME, Tooling for Aircraft and Missile Manufacture

Reference Books:

3. Sachs, Sheet Metal Fabrication

4. S C Keshu and K K Ganapathy, Aircraft Production Technology and Management,
Interline 1993

Note:

1. In the semester examination, the examiner will set two questions from each unit (total 08 questions in all), covering the entire syllabus. The students will be required to attempt only 5 questions selecting at least one question from each unit.
2. The use of scientific calculator will be allowed in the examination. However, programmable calculator and cellular phone will not be allowed.

AER-204B AIRCRAFT MATERIALS						
B. TECH. SEMESTER – IV AERONAUTICAL ENGG.						
L	T	P	Credits		Class Work	: 25 Marks
4	-	--	4		Examination	: 75Marks
					Total	: 100 Marks
					Duration of Examination	: 3 Hours

UNIT I

Engineering Materials, Structural properties of materials, Atomic and lattice structure, bonding in Solids, Imperfections in crystals, Solid phase and phase diagrams, mechanical properties and testing, Isotropy, Orthotropy, True stress and strain, Strength and elasticity, Stiffness, Resistance, Plasticity, Ductility, Toughness and Hardness of materials.

UNIT II

Concept of Fatigue and Creep, Mechanical Testing, Factors Affecting Strength, Deformation, Plasticity and Viscoelasticity, Fracture, Heat treatment, Chemical, thermal and Technological Properties, Board classification of aircraft materials. Ferrous materials, nonferrous materials and alloys, ceramic materials and fibre reinforced composite materials, polymers, metal matrix particulate.

UNIT III

Furnishing Materials: Plastic, wood, plywood, glue, dopes and rubber used in aircraft manufacture, Methods of testing and storage, Paints, surface finishes and materials. Specifications: Indian Standard, British, American, French, German, and International specifications.

UNIT IV

Corrosion, its detection and prevention, Protective finishes, Testing: Destructive and non - destructive testing techniques. Crack detection, inspection of parts by hot oil and chalk, dye-penetrant, fluorescent and magnetic particles, X-ray, ultrasonic, eddy current and acoustic emission methods.

Text Books:

1. S K Hajra Chowdhary, Materials, Science and Engineering Processes, Media Promoters
2. George E. F. Titterton, Aircraft Materials, English Book Stores, Delhi
3. M L Begman, Manufacturing Processes, Asia Publishing House, Bombay

Reference Books:

1. King and Butler, Principles of Engineering Inspection, Clever Humes Press.
2. C G K Nair, Aircraft Materials, Interline
3. Balram Gupta, Aerospace Materials, S Chand

Note:

1. In the semester examination, the examiner will set two questions from each unit (total 08 questions in all), covering the entire syllabus. The students will be required to attempt only 5 questions selecting at least one question from each unit.
2. The use of scientific calculator will be allowed in the examination. However, programmable calculator and cellular phone will not be allowed.

AER-206B AIRPLANE PERFORMANCE, STABILITY AND CONTROL						
B. TECH. SEMESTER – IV AERONAUTICAL ENGG.						
L	T	P	Credits		Class Work	: 25 Marks
3	1	--	4		Examination	: 75Marks
					Total	: 100 Marks
					Duration of Examination	: 3 Hours

UNIT 1

Atmosphere : ISA, Geopotential and Geometric altitude, Troposphere and Stratosphere, stability of atmosphere.

Aerodynamic characteristics : Drag Aerodynamics, Drag polar, estimation of drag. Forces and moments from dimensional analysis, pressure distribution over airfoils, variation with angle of attack, aerodynamic centre, centre of pressure - related problems. Estimation of CL, CD and CM from pressure distribution, variation of aerodynamic coefficients with Reynolds number and Mach number. Effect of span, aspect ratio, planform, sweep, taper and twist on aerodynamic characteristics. High lift devices. V/STOL configurations.

UNIT II

Airplane Performance in Steady and Level Flight : Equations of motion of aircraft, variation of drag with flight, power required and power available, minimum drag and minimum power conditions, climbing and gliding performance.

Airplane Performance in Accelerated Flight: Take off and landing distances, Jet Assisted Take off, Range and Endurance. Turning flight performance.

UNIT III

Static longitudinal stability : Stick fixed static longitudinal stability, neutral point, power effects, stick free static longitudinal stability. Hinge moments, Aerodynamic Balancing, Static Margin. In flight measurement of stick fixed and stick free neutral points.

Maneuvering flight : Elevator angle per g and stick force per g maneuver margin.

UNIT IV

Lateral and Directional Stability and Control: Assymmetric flight, weather cock stability, Rudder fixed and Rudder free static directional stability - Rudder lock, dihedral effect. Control in Roll, Aileron control power. Cross coupling of lateral and directional effects. Numerical problems.

Dynamic Stability : Equations of motion of airplane, stability derivatives, split-up of equations in symmetrical and non-symmetric groups of motion.

Analysis of short period and phugoid mode Analysis of roll and spiral modes, Dutch Roll.

Text Books:

1. John D Anderson Jr., Introduction to Flight, McGraw Hill
2. R C Nelson, Flight Stability & Automation Control, McGraw Hill

Reference Books:

1. B Etkins, Dynamics of Flight, John Wiley
2. E L Houghton and N B Caruthers, Aerodynamics for Engineers, Edward Arnold,

Note:

1. In the semester examination, the examiner will set two questions from each unit (total 08 questions in all), covering the entire syllabus. The students will be required to attempt only 5 questions selecting at least one question from each unit.
2. The use of scientific calculator will be allowed in the examination. However, programmable calculator and cellular phone will not be allowed.

AER-208B MAINTENANCE OF RADIO & COMMUNICATION SYSTEMS						
B. TECH. SEMESTER – IV AERONAUTICAL ENGG.						
L	T	P	Credits		Class Work	: 25 Marks
4	-	--	4		Examination	: 75Marks
					Total	: 100 Marks
					Duration of Examination	: 3 Hours

UNIT-I

Basics of the application and identification of electrical cables used in Aircraft radio installation, crimping and soldering techniques, bonding continuity and insulation tests. Composition, performance (stability and tolerance) and limitations of the fixed resistors and varistors (carbon composition, carbon film, wire wound and metallic film).

UNIT-II

AC and DC measuring instruments: Electrical power distribution systems, the operation and construction of static inverters, rotary inverters and transformer rectifier units. Basics of interference caused by electrical and ignition system to radio apparatus, methods of minimizing or suppressing such interference, bonding and screening.

UNIT-III

Construction and Identification of various types of antennas; the voltage and current distribution along antenna of various length; characteristics of ground planes. Very high frequency (VHF) and high frequency (HF) airborne communications; frequency bands allocation; the methods of propagation and the ranges expected, both day and night; calculation of approximate range of communication (line of sight) with given data.

UNIT-IV

The performance levels expected and specifications of typical airborne HF and VHF communication systems; the principle of operation, installation practices and procedures, functioning of the operating controls and indications and maintenance of typical HF and VHF communication transceivers. Theory of operation, performance level and specifications of an Audio Integration System. Working principles and testing of Lead Acid and Nickel Cadmium and Silver Zinc batteries Principles, Characteristics and operation of the under mentioned systems: Automatic Direction Finder (ADF) Systems, Very High Frequency (VHF) Omnidirectional Range System, Instrument Landing Systems, Weather Radar Systems, Omega Navigation System, Radio Altimeter Systems, ‡ Cockpit Voice Recorder, Principles of Satellite Communications and its application to aircraft.

Text Books:

1. RF Hansforde, Heywood and Company London: Radio Aids to Civil Aviation.
2. George Kannedy: Electronic Communication System, McGraw Hill
3. Brian Kendal: Manual of Avionics, Blackwell

Reference Books:

1. Dennis Reddy and John Cooler: Electronic Communication, Prentice Hall of India, New Delhi.
2. J. Powell: Aircraft Radio Systems, Himalayan Books
3. Keith W. Bose: Aviation Electronics, Jeppesen

Note:

1. In the semester examination, the examiner will set two questions from each unit (total 08 questions in all), covering the entire syllabus. The students will be required to attempt only 5 questions selecting at least one question from each unit.
2. The use of scientific calculator will be allowed in the examination. However, programmable calculator and cellular phone will not be allowed.

AER-210B AIRCRAFT INSTRUMENTATION						
B. TECH. SEMESTER – VI AERONAUTICAL ENGG.						
L	T	P	Credits		Class Work	: 25 Marks
4	-	--	4		Examination	: 75Marks
					Total	: 100 Marks
					Duration of Examination	: 3 Hours

UNIT-I

Measurement of circuit Units and Standards, theory of measurement, functional analysis of measurements, errors and error estimation, Measurement of voltage and current in DC and AC, VTVM digital voltmeter, measurement of power, phase angle, power factor, Extension of range by instrument transformers, fluxmeter, measurement of frequency, heterodyne techniques and digital frequency counters, signal generators

UNIT-II

LCR direct and bridge methods, Waveform analysis, Cathode ray oscilloscopes, measurement of harmonic and Intermodulation distortion, distortion analyser, spectrum analyser, configurations and performance characteristics of instruments, motion requirement, relative displacement and velocity, Translational and seismic displacement, velocity and acceleration measurements, Torque measurement and rotating shaft, pressure and flow measurements, , temperature based on expansion, electric resistance and radiation methods, Problems involved in temperature measurements, compensation techniques.

UNIT-III

Electrostatic Sensitive Devices, Electromagnetic Environment Requirements for airborne equipment, sensors for the measurement of altitude, air speed, acceleration, temperature, fuel flow and quantity. Instrument displays, panels and cockpit layout, flight instruments, gyroscopic instruments, power plant instruments, navigation instruments .

UNIT-IV

Moving map displays, multifunction displays, head-up displays, glass cockpit. Cockpit lighting, panels: integral, glopanels, Typical Electronic/ Digital Aircraft Systems: ECAM, (Electronic Centralised Aircraft Monitoring), EFIS (Electronic Flight Instrument Systems), EICAS (Engine Indicating & Crew Alerting Systems), FMS (Flight Management Systems)

Text Books

1. E H J Pallet: Aircraft Instruments - Principles and Applications, Himalayan Books
2. E H J Pallet, Automatic Flight Control, Blackwell
3. Leach Malvino, Digital Principles and Applications, Tata McGraw Hill

Reference Books:

1. A K Sawhney: Electrical Measurements and Measuring Instruments.
2. C.A. Williams: Aircraft Instruments, Galgotia
3. Civil, Aircraft Inspection Procedures (CAP459) Two Volumes, Himalayan Books. 34

Note:

1. In the semester examination, the examiner will set two questions from each unit (total 08 questions in all), covering the entire syllabus. The students will be required to attempt only 5 questions selecting at least one question from each unit.
2. The use of scientific calculator will be allowed in the examination. However, programmable calculator and cellular phone will not be allowed.

AER-212B AIRCRAFT INSTRUMENTATION LAB							
B. TECH. SEMESTER – VI AERONAUTICAL ENGG.							
L	T	P	Credits		Class Work	:	20 Marks
--	--	2	1		Examination	:	30 Marks
					Total	:	50 Marks
					Duration of Examination	:	3 Hours

LIST OF EXPERIMENTS:

1. Charging and discharging of batteries.
2. VTVM digital voltmeter.
3. Load test on dc generator
4. Synchronization of two generators.
5. Study of rectifier.
6. Measurement of power using ammeter, voltmeter method
7. Measurement of power using wattmeter.
8. Study of cables and relays.
9. Measurement of power using instrument transformer
10. Study of oscilloscope
11. Study of starters

NOTE:

1. At least ten experiments have to be performed in the semester.
2. At least seven experiments should be performed from above list. Remaining three experiments may either be performed from the above list or designed & set by the concerned institution as per the scope of the syllabus of AER-308B

ME 218B MANUFACTURING PRACTICE						
B. Tech. Semester – IV (Mechanical Engg & Aeronautical Engg)						
L	T	P	Credits		Class Work	: 20 Marks
--	--	3	1.5		Examination	: 30 Marks
					Total	: 50 Marks
					Duration of Examination	: 3 Hours

LIST OF EXPERIMENTS:

1. To make a pattern for a given casting with all the necessary allowances, parting line, running system details. Prepare the mold and make the casting. Investigate the casting defects and suggest the remedial measures.
2. To make a component involving horizontal and vertical position welding and study the welding defects and suggests their remedies.
3. To prepare a job on surface grinder/cylindrical grinder and measure the various parameters of the finished piece.
4. To cut external threads on a lathe.
5. Manufacture and assembly of a unit consisting of 2 to 3 components to have the concept of tolerances and fits (shaft and bush assembly or shaft, key and bush assembly or any suitable assembly).
6. Leveling of machine tools and testing their accuracy.
7. Disassembly and assembly of small assemblies such as tail stock, bench vice, screw jack etc.
8. Development and manufacture of complex sheet-metal components such as funnel etc.
9. Multi slot cutting on milling machine by indexing.
10. Drilling and boring of a bush.
11. Modeling of 3D runner system and creation of drawing for manufacturing of the casting patterns.
12. Development of blank size for complex sheet metal components using drawing software and compare results with manual calculation method.

Note:

1. At least ten experiments are to be performed in the semester.
2. At least eight experiments should be performed from the above list. Remaining two experiments may either be performed from the above list or designed & set by the department as per the scope of the syllabus (ME 202B).

GES 203B ENVIRONMENTAL STUDIES FIELD WORK						
B. Tech. Semester –III/IV (Common for all Branches)						
L	T	P	Credit		Field Work	: 25Marks
--	--	--	0		Total	: 25 Marks

FIELD WORK:

- Visit to a local area to document environmental assets – river/ forest/ grassland/ hill/ mountain.
- Visit to a local polluted site-Urban/ Rural/ Industrial/ Agricultural.
- Study of common plants, insects, birds.
- Study of simple ecosystems – pond, river, hill slopes, etc. (Field work equal to 5 lectures hours).

Note: The awards of this paper shall not be counted in the award of the Degree/DMC.

GPAER- 202B GENERAL PROFICIENCY AND ETHICS						
B.TECH. SEMESTER – IV AERONAUTICAL ENGG.						
L	T	P	Credits		Examination	: 75 Marks
--	--	--	2		Total	: 75 Marks

The purpose of this course is to inculcate a sense of professionalism in a student along with personality development in terms of quality such as receiving, responding, temperament, attitude and outlook. The student efforts will be evaluated on the basis of his/ her performance / achievements in different walks of life.

A Faculty Counselor will be attached to a group of students which will remain associated with him / her during the entire period of the degree program in the University. Each faculty member will serve as a faculty counselor. They will act like a local guardian for the students associated with him / her and will help them in terms of career guidance, personal difficulties.

A. The student will present a written report before the committee with following in view:

The student will present before the committee his/ her achievements during the current academic session in the form of a written report highlighting followings:

- Academic Performance -----
- Extra Curricular Activities / Community Service, Hostel Activities **(8 Marks)**
- Technical Activities / Industrial, Educational tour **(8 Marks)**
- Sports/games **(14 Marks)**
- Moral values & Ethics **(15 Marks)**

NOTE: Report submitted by the students should be typed on both sides of the paper.

C. A student will support his/ her achievement and verbal & communicative skill through presentation before the committee. **(30 Marks)**

C. **Moral values & Ethics**

Syllabus - Process for Value Education, self-evaluation concept and process.

A minor test will be conducted during the semester and It will be the duty of the concerned teacher assigned to teach Moral values & Ethics to submit the awards to respective chairman of the department / Director/Principal.

The evaluation of this course will be made by the following Committee.

University Departments:

- | | | |
|---|-------------------------------|----------|
| 1 | Chairperson of the Department | Chairman |
| 2 | Senior Most Faculty Counselor | Member |
| 3 | Vice- Chancellor's Nominee | Member |

Affiliated Colleges:

- | | | |
|---|---|----------|
| 1 | Director/Principal | Chairman |
| 2 | Head of the Department/Sr. Faculty | Member |
| 3 | External Examiner to be appointed by the University | Member |

Note: Remuneration will be paid to the external examiner only (at par with the other practical examinations).

Deenbandhu Chhotu Ram University of Science & Technology, Murthal (Sonapat)
SCHEME OF STUDIES & EXAMINATIONS
B.Tech. 3rd YEAR (SEMESTER –V) AERONAUTICAL ENGINEERING
Credit Based Scheme w.e.f. 2014-15

S. No.	Course No.	Course Title	Teaching Schedule			Marks of Class work	Examination Marks		Total	Credit	Duration of Exam
			L	T	P		Theory	Practical			
1	AER-301B	AIRCRAFT PROPULSION-I	3	1	-	25	75	-	100	4	3
2	AER-303B	HELICOPTER DYNAMICS	3	1	-	25	75	-	100	4	3
3	AER-305B	AIRCRAFT STRUCTURE-I	3	1	-	25	75	-	100	4	3
4	AER-307B	ADVANCE AERODYNAMICS	3	1	-	25	75	-	100	4	3
5	ME307B	INTERNAL COMBUSTION ENGINES & GAS TURBINES (AER ,ME)	3	1	-	25	75	-	100	4	3
6	AER-309B	AIRCRAFT DESIGN	3	2	-	25	75	-	100	5	3
7	AER-311B	AERODYNAMICS LAB	-	-	3	20	-	30	50	1.5	3
8	AER-313B	AIRCRAFT STRUCTURE LAB	-	-	3	20	-	30	50	1.5	3
9	ME315B	INTERNAL COMBUSTION ENGINES LAB (AER, ME)	-	-	2	20	-	30	50	1	3
10	AER-315B	PROFESSIONAL TRAINING-I	-	-	2	50	-	-	50	2	3
Total			18	7	10	260	450	90	800	31	

Note:

- 4 Every student has to participate in the sports activities. Minimum one hour is fixed for sports activities either in the morning or evening. Weightage of Sports is given in General Proficiency & Ethics Syllabus.
- 5 The students will be allowed to use non-programmable scientific calculator. However, sharing/exchange of calculator is prohibited in the examination.
- 6 Electronics gadgets including Cellular phones are not allowed in the examination

AER-301B AIRCRAFT PROPULSION – I						
B. TECH. SEMESTER – V AERONAUTICAL ENGG.						
L	T	P	Credits		Class Work	: 25 Marks
3	1	--	4		Examination	: 75Marks
					Total	: 100 Marks
					Duration of Examination	: 3 Hours

UNIT-I

Aircraft Piston Engines: The internal combustion engine process, brief historical sketch, spark ignition and compression ignition, (SI and CI) engines, 4-stroke and 2-stroke engines. Combustion processes various types of arrangements for multi cylinder aircraft engines. Intake and Exhaust manifolds. IHP, BHP and SHP Engine performance, Effect of altitude and speed, power required and power available. Super charging, types of super chargers.

UNIT-II

Propellers : Ideal Froude Momentum theory, blade element theory, vortex theory, relative merits, numerical problems, use of propeller charts. Selection and choice of propellers. Fixed/variable pitch and constant speed propellers, Relative merits and applications, Ducted propellers, prop-fan, Helicopter Rotor in Hover and climbing. Materials for propellers.

UNIT-III

Elements of Heat Transfer: Conduction: Heat Transfer process, Heat conduction, Thermal conductivity, General equation of heat conduction in 1-D and 2-D. Convection and Radiation Heat Transfer: Convection process, free convection heat transfer from vertical flat plate, planes, cylinder and sphere, free convection, Thermal Radiation and Emissive power. The Plank distributive law, Radiation properties

UNIT-IV

Aircraft Gas Turbine Engine: Compressor and Turbine work, compressor and turbine efficiencies, general layout, gas flow diagram. Engine intake and Exhaust nozzles, After burner arrangements for thrust augmentation.

Gas Turbine Systems and Components: Fuel system components, various types of fuel systems, lubricating oils and lubricating systems. Secondary air systems, arrangements of bleeding of compressor air for aircraft pressurization and oxygen systems. Engine starting systems.

Compressors; centrifugal and axial types of compressors, Materials of Construction.

Combustion chambers : Various arrangements, simplex and Duplex type of Burners. Materials for combustion chambers

Expansion process : Turbine and its action, constructional details of turbine. Materials of construction, general arrangement of turbo-prop and turbo-shaft engines. High and Low by pass ratio, turbo-fan engines, dual shaft gas turbine engines, its merits over single shaft engines.

Text Books:

1. J P Holman, Heat Transfer, 2nd Ed., McGraw Hill
2. J D Mattingly, Elements of Gas Turbine Propulsion, McGraw Hill, 1997
3. H. Cohen, G F C Rogers and H I H Sarvanmatto, Gas Turbine Theory, Longman 1987

Reference Books:

1. B Gebhart, Heat Transfer, 2nd Ed., McGraw Hill
2. J L Kererbrock, Aircraft Engine and Gas Turbine, MIT Press, 1991
3. Gordon C Oates, Aircraft Propulsion, System Technology & Design, AIAA Publications

Note:

1. In the semester examination, the examiner will set two questions from each unit (total 08 questions in all), covering the entire syllabus. The students will be required to attempt only 5 questions selecting at least one question from each unit.
2. The use of scientific calculator will be allowed in the examination. However, programmable calculator and cellular phone will not be allowed.

AER-303B HELICOPTER DYNAMICS						
B. TECH. AERONAUTICAL ENGG. SEMESTER – V						
L	T	P	Credits		Class Work	: 25 Marks
3	1	--	4		Examination	: 75Marks
					Total	: 100 Marks
					Duration of Examination	: 3 Hours

UNIT-I

Introduction: Helicopter as an aircraft, Basic features, Layout, Generation of lift, Main rotor, Gearbox, tail rotor, power plant, drive to main and tail rotor, considerations on blade, flapping and feathering, Rotor controls various types of rotor, Geometry of the rotor, Blade loading, Effect of solidity, profile drag, compressibility etc., Blade area required, number of Blades, Blade form, Power losses, Rotor efficiency.

UNIT-II

Aerodynamics of Rotor Blade: Aerofoil characteristics in forward flight, Hovering and Vortex ring state, Blade stall, maximum lift of the helicopter calculation of Induced Power, High speed limitations; parasite drag, power loading, ground effect.

Power Units and Flight Performance: Piston engines, Gas turbines, Ramjet principle, Comparative performance, Horsepower required, Range and Endurance, Rate of Climb, Best Climbing speed, Ceiling in vertical climb, Autorotation.

UNIT-III

Dynamic Stability and Control: Physical description of effects of disturbances, Longitudinal dynamic stability, stick fixed dynamic stability, longitudinal stability characteristics, lateral dynamic stability, lateral stability characteristics, control response. Differences between stability and control of airplane and helicopter.

UNIT-IV

Rotor Vibrations: Dynamic model of the rotor, Motion of the rigid blades, flapping motion, lagging motion, feathering motion, Properties of vibrating system, phenomenon of vibration, fuselage response, vibration absorbers, Measurement of vibration in flight.

Rotor Blade Design: General considerations, Airfoil selection, Blade construction, Materials, Factors affecting weight and cost, Design conditions, Stress analysis.

Text Books:

1. John Fay, The Helicopter and How It Flies, Himalayan Books 1995
2. Lalit Gupta, Helicopter Engineering; Himalayan Books New Delhi 1996

Reference Books:

3. Joseph Schafer, Basic Helicopter Maintenance, Jeppesen 1980
4. R W Prouty, Helicopter Aerodynamics

Note:

1. In the semester examination, the examiner will set two questions from each unit (total 08 questions in all), covering the entire syllabus. The students will be required to attempt only 5 questions selecting at least one question from each unit.
2. The use of scientific calculator will be allowed in the examination. However, programmable calculator and cellular phone will not be allowed.

AER-305 B AIRCRAFT STRUCTURES - I						
B. TECH. SEMESTER – V AERONAUTICAL ENGG.						
L	T	P	Credits		Class Work	: 25 Marks
3	1	--	4		Examination	: 75Marks
					Total	: 100 Marks
					Duration of Examination	: 3 Hours

UNIT-I

V-n diagram for the loads acting on the aircraft, salient features of the V-n diagram, Flight envelope for different flying conditions.

Analysis of statically indeterminate structures: planar and space trusses; Deflection of Beams; Area moment Method, slope-deflection method, moment distribution method, Basic elasticity, stresses and strains, equations of equilibrium, plane stress and plane strain problems, compatibility equations, stress - strain relations.

UNIT-II

Strain energy and complementary energy, total potential energy; principle of virtual work; principle of the stationary value of the total potential energy and total complementary energy. Application to deflection problems, application to statically indeterminate problems, Rayleigh Ritz and Galerkin techniques.

UNIT-III

Bending of open and closed section thin walled beams, shear of open section and closed section beams, shear centre and centre of twist, Torsion of closed and open section beams, membrane analogy. Deflection of open and close section beams.

Aircraft materials-properties of flight vehicle materials importance of strength to weight ratio, temperature variations, factors affecting choice of materials for different part of airplane

UNIT-IV

Light metal alloys: heat treatment, high temperature and corrosion resistant alloys, Aircraft steels, effect of alloying elements, heat treatment, selection of steel for aircraft application composite materials: classification and characteristics of composite materials, strength to weight comparison with metals, fiber reinforced and particulate composites.

Text Books :

1. T H G Megson, Aircraft Structures for Engineering Students, Edward Arnold, U.K.
2. R M Rivello, Theory and Analysis of Flight Structures, McGrawHill Book Co.
3. E F Bruhn, Analysis and Design of Flight Vehicle Structures, Tri State offset Co. USA

Reference Books:

1. G F Titterton, Aircraft Materials and Processes, Himalayan Books, New Delhi
2. E T Hill, The Materials for Aircraft Construction, Pitman, London

AER-307 B ADVANCE AERODYNAMICS						
B. TECH. SEMESTER – V AERONAUTICAL ENGG.						
L	T	P	Credits		Class Work	: 25 Marks
3	1	--	4		Examination	: 75Marks
					Total	: 100 Marks
					Duration of Examination	: 3 Hours

UNIT -I

Conformal Transformation: Complex potential function, Blasius theorem, principles of conformal transformation, Kutta - Joukowski transformation of a circle into flat plate, airfoils & ellipses.

Incompressible Flow Over Airfoils: Glauert's thin airfoil theory, symmetrical airfoil, cambered airfoil, flapped airfoil, determination of mean camber line shapes for uniform & linear distribution of circulation. Description of flow about multi-element airfoils.

UNIT-II

Incompressible Flow Over Finite Wings: Downwash & induced drag, Biot-Savart's law and Helmholtz's theorem, Prandtl's classical lifting line theory, fundamental equations. Elliptic and general lift distribution over finite unswept wings, effect of aspect ratio, Drag polar, Correlation of C_l distribution over other aspect ratios, Lifting Surface theory, Formation Flying, Ground effect.

UNIT-III

Delta Wing Aerodynamics: Polhamus theory, leading edge suction analogy, calculations of lift coefficient, flow field, aspect ratio effect, leading edge extension, HAA aerodynamics

Shock Waves: Introduction and problems related to Normal Shock waves Oblique Shock waves Expansion waves Lift and drag in supersonic flows

UNIT-IV

Compressible Subsonic Flows Over Airfoils: The derivation of velocity potential equation. Linearization, Prandtl-Glauert compressibility correction. Karman -Tsien correction, Critical Mach number, Whitcomb's area rule, Super critical airfoil.

Elements of Compressible Flow : Compressible flow properties: Total Enthalpy, Total Temperature, Temperature and Pressure ratios as a function of Mach No., Mass Flow Parameter (MFP). Isentropic Area ratio (A/A^*), Velocity-Area variations

Text Books:

1. Fundamentals of Aerodynamics : John D. Anderson, 2nd Ed. McGraw Hill, 1991
2. Elements of Gas Dynamics : Lieppmann and Rosheko, John Wiley 1957

Reference Books:

1. Aerodynamics for Engineers : Bertin and Smith, Prentice Hall, 1989
2. Modern compressible Flow with historical perspective: John D. Anderson
3. Experimental Methods in Hypersonic flows: J. Lucasiewicz.

Note:

1. In the semester examination, the examiner will set two questions from each unit (total 08 questions in all), covering the entire syllabus. The students will be required to attempt only 5 questions selecting at least one question from each unit.
2. The use of scientific calculator will be allowed in the examination. However, programmable calculator and cellular phone will not be allowed.

Note:

1. In the semester examination, the examiner will set two questions from each unit (total 08 questions in all), covering the entire syllabus. The students will be required to attempt only 5 questions selecting at least one question from each unit.
2. The use of scientific calculator will be allowed in the examination. However, programmable calculator and cellular phone will not be allowed.

ME 307B INTERNAL COMBUSTION ENGINES AND GAS TURBINES						
B. Tech. Semester – V (Mechanical Engg. & Aeronautical Engg.)						
L	T	P	Credits		Class Work	: 25 Marks
3	1	--	4		Examination	: 75 Marks
					Total	: 100 Marks
					Duration of Examination	: 3 Hours

UNIT I

AIR STANDARD CYCLES: Internal and external combustion engines; classification of I.C. Engines, Cycles of operation in four stroke and two stroke I.C. Engines, Wankel Engines, Assumptions made in air standard cycle; Otto cycle; diesel cycle, dual combustion cycle, comparison of Otto, diesel and dual combustion cycles; sterling and Ericsson cycles; air standard efficiency, specific work output, specific weight; work ratio; mean effective pressure; deviation of actual engine cycle from ideal cycle. Problems.

CARBURETION, FUEL INJECTION AND IGNITION SYSTEMS: Mixture requirements for various operating conditions in S.I. Engines; elementary carburetor, Requirements of a diesel injection system; types of injection systems; petrol injection, Requirements of ignition system; types of ignition systems, ignition timing; spark plugs, Problems.

UNIT II

COMBUSTION IN I.C. ENGINES : S.I. engines; Ignition limits; stages of combustion in S.I. Engines; Ignition lag; velocity of flame propagation; detonation; effects of engine variables on detonation; theories of detonation; octane rating of fuels; pre-ignition; S.I. engine combustion chambers, Stages of combustion in C.I. Engines; delay period; variables affecting delay period; knock in C.I. engines, Cetane rating; C.I. engine combustion chambers.

LUBRICATION AND COOLING SYSTEMS: Functions of a lubricating system, Types of lubrication system; mist, wet sump and dry sump systems; properties of lubricating oil; SAE rating of lubricants, engine performance and lubrication, Necessity of engine cooling; disadvantages of overcooling; cooling systems; air-cooling, water cooling; radiators.

UNIT-III

ENGINE TESTING AND PERFORMANCE: Performance parameters: BHP, IHP, mechanical efficiency, brake mean effective pressure and indicative mean effective pressure, torque, volumetric efficiency; specific fuel consumption (BSFC, ISFC), thermal efficiency; heat balance; Basic engine measurements; fuel and air consumption, brake power, indicated power and friction power, heat lost to coolant and exhaust gases; performance curves. Problems.

AIR POLLUTION FROM I.C. ENGINES AND ITS REMEDIES: Pollutants from S.I. and C.I. Engines, Methods of emission control; alternative fuels for I.C. Engines; the current scenario on the pollution front.

UNIT-IV

ROTARY COMPRESSORS: Root and vane blowers; Static and total head values; Centrifugal compressors- Velocity diagrams, slip factor, ratio of compression, pressure coefficient, pre-whirl; Axial flow compressor- Degree of reaction, polytropic efficiency, surging, choking and stalling, performance characteristics, Problems.

GAS TURBINES: Brayton cycle; Components of a gas turbine plant; open and closed types of gas turbine plants; Optimum pressure ratio; Improvements of the basic gas turbine cycle; multi stage compression with inter-cooling; multi stage expansion with reheating between stages; exhaust gas heat exchanger, Applications of gas turbines. Problems.

TEXT BOOKS:

1. Internal Combustion Engines –V. Ganesan, Pub.-Tata McGraw-Hill.
2. Gas Turbines - V. Ganesan, Pub.- Tata McGraw Hill.
3. Engineering fundamental of the I.C.Engines – Willard W. Pulkrabek Pub.-PHI,India

REFERENCE BOOKS:

1. Internal Combustion Engines & Air pollution- Obert E.F, Pub.-Hopper & Row Pub., New York
2. Internal Combustion Engines Fundamentals- John B. Heywood, Pub.-McGraw Hill, New York

Note:

1. In the semester examination, the examiner will set two questions from each unit (total 08 questions in all), covering the entire syllabus. The students will be required to attempt only 5 questions selecting at least one question from each unit.
2. The use of scientific calculator will be allowed in the examination. However, programmable calculator and cellular phone will not be allowed.

AER-309 B AIRCRAFT DESIGN						
B. TECH. SEMESTER – V AERONAUTICAL ENGG.						
L	T	P	Credits		Class Work	: 25 Marks
3	2	--	5		Examination	: 75Marks
					Total	: 100 Marks
					Duration of Examination	: 3 Hours

UNIT-I

Preliminaries: Aircraft Design Requirements, specifications, role of users, Aerodynamic and Structural Consideration, Importance of weight, Airworthiness requirements and standards, Classifications of airplanes, Special features of modern airplane.

Air Loads in Flight: Symmetrical measuring loads in flight, Basic flight loading conditions, Load factor, Velocity - Load factor diagram, gust load and its estimation, Structural limits.

Airplane Weight Estimation: Weight estimation based on type of airplane, trends in wing loading, weight-estimation based on mission requirements, iterative approach

UNIT-II

Basics of Wing Design: Selection of airfoil selection, influencing factors. Span wise load distribution and planform shapes of airplane wing. Stalling, take off and landing considerations. Wing drag estimation. High lift devices

Structural Design: Cockpit and aircraft passenger cabin layout for different categories, types of associated structure, features of light airplanes using advanced composite materials.

Structural aspects of design of airplane, Bending moment and shear force diagram. Design principles of all metal stressed skin wing for civil and military applications

UNIT-III

Landing Gears: Different kinds of landing gears, and associated arrangement for civil and military airplanes. Preliminary calculations for locating main and nose landing gears.

Integration of Structure and Power Plant: Estimation of Horizontal and Vertical tail volume ratios. Choice of power plant and various options of locations, considerations of appropriate air -intakes. Integration of wing, fuselage, empennage and power plant. Estimation of centre of gravity.

UNIT-IV

Introduction to advanced concepts: Supercritical Wings, relaxed static Stability, controlled configured vehicles, V/STOL aircraft and, rotary wing vehicles. Design and layout of flying controls and engine controls

Text Books:

1. Daniel P Raymer, Aircraft Design: A conceptual approach, AIAA Series, 1992
2. D Stinton, The Design of Airplane, GRANADA, UK 1983
3. John D Anderson (Jr.), Airplane Performance and Design, McGraw Hill 1999

Reference Books:

1. E Torenbeek, Synthesis of Airplane Design
2. L M Nicholai, Fundamentals of airplane Design, Univ. of Dayton DHIO, 1975

Note:

1. In the semester examination, the examiner will set two questions from each unit (total 08 questions in all), covering the entire syllabus. The students will be required to attempt only 5 questions selecting at least one question from each unit.
2. The use of scientific calculator will be allowed in the examination. However, programmable calculator and cellular phone will not be allowed.

AER-311B AERODYNAMICS-LAB						
B. TECH. SEMESTER – V AERONAUTICAL ENGG.						
L	T	P	Credits		Class Work	: 20 Marks
--	--	3	1.5		Examination	: 30 Marks
					Total	: 50 Marks
					Duration of Examination	: 3 Hours

List of Experiments:

1. Use of Anemometer for measuring velocity.
2. Measurement of velocity profile in favourable and adverse pressure gradient.
3. Pressure distribution over a 2D cylinder and to find lift and drag.
4. Pressure distribution over an airfoil and to find lift and drag.
5. Experiments on potential flow Analogy (Hele-Shaw flow).
6. To study shocks using a water table.
7. To find the displacement thickness for the given aerofoil at low Reynolds number.
8. To plot C_p vs angle of attack for a pitching aerofoil.

Reference Books:

1. Low speed wind tunnel testing, Allen Pope, John Willey & sons
2. Low speed wind tunnel testing, W.E. Rae & Allen Pope, John Willey & sons

Note:

1. At least eight experiments are to be performed in the semester.
2. At least six experiments should be performed from the above list. Remaining two experiments may either be performed from the above list or designed & set by the concerned institute as per the scope of the syllabus.

AER-313B AIRCRAFT STRUCTURE LAB						
B. TECH. SEMESTER – V AERONAUTICAL ENGG.						
L	T	P	Credits		Class Work	: 20 Marks
--	--	3	1.5		Examination	: 30 Marks
					Total	: 50 Marks
					Duration of Examination	: 3 Hours

List of experiments

1. Study the construction of fuselage and identify the primary load carrying members
2. Study the construction of wings, ailerons, flaps, slits, slats and spoilers.
3. Study the construction of empennage, stabilizers, rudders adjusting tabs etc with detail of honeycomb structure.
4. Study the construction of landing gears and wheel turning mechanism
5. Study of aileron control linkages including artificial feel mechanism, booster and manual controls and their adjustments
6. Study the measurement techniques with strain gauges
7. Study checks on airframe for life extension
9. Dye penetrant testing for surface crack detection
10. Measurement of deflection of truss using DTI
11. Measurement of deflection of simply supported beam
12. Determination of compressive strength of thin plates

NOTE

- 1 At least ten experiments are to be performed in the semester
- 2 At least six experiments are to be performed from above list. Remaining two experiments may either be performed from above list or designed and set by concerned institute as per the scope of the syllabus

ME 315B I. C. ENGINES LAB						
B. Tech. Semester – V (Mechanical Engg & Aeronautical Engg)						
L	T	P	Credits		Class Work	: 20 Marks
--	--	2	1		Examination	: 30 Marks
					Total	: 50 Marks
					Duration of Examination	: 3 Hours

LIST OF EXPERIMENTS:

1. To study the constructional details & working principles of two-stroke/ four stroke petrol engine.
2. To study the constructional detail & working of two-stroke/ four stroke diesel engine.
3. Analysis of exhaust gases from single cylinder/ multi cylinder diesel/ petrol engine by Orsat Apparatus.
4. To prepare heat balance sheet on multi-cylinder diesel engine/petrol engine.
5. To find the indicated horse power (IHP) on multi-cylinder petrol engine/diesel engine by Morse Test.
6. To prepare variable speed performance test of a multi-cylinder/single cylinder petrol engine/ diesel engine and prepare the curves (i) bhp, ihp, fhp, vs speed (ii) volumetric efficiency & indicated specific fuel consumption vs speed.
7. To find fhp of a multi-cylinder diesel engine/ petrol engine by Willian's line method & by motoring method.
8. To perform constant speed performance test on a single cylinder/ multi-cylinder diesel engine & draw curves of (i) bhp vs fuel rate, air rate and A/ F and (ii) bhp vs mep, mech efficiency & sfc.
9. To measure CO & Hydrocarbons in the exhaust of 2- stroke / 4-stroke petrol engine.
10. To find intensity of smoke from a single cylinder / multi-cylinder diesel engine.
11. To draw the scavenging characteristic curves of single cylinder petrol engine.
12. To study the effects of secondary air flow on bhp, sfc, Mech. Efficiency & emission of a two-stroke petrol engine.

Note:

1. **At least Ten experiments are to be performed in the Semester.**

2. At least eight experiments should be performed from the above list. Remaining two experiments may either be performed from the above list or as designed & set by the department as per the scope of the syllabus (ME307B)

AER-315B PROFESSIONAL TRAINING I						
B. TECH. SEMESTER – V AERONAUTICAL ENGG.						
B. Tech. Semester – V (Mechanical Engineering)						
L	T	P	Credits		Class Work	: 50 Marks
--	--	2	2		Total	: 50 Marks

At the end of 4th semester each student would undergo four weeks Professional Training in an Industry/ Institute/ Professional Organization/ Research Laboratory etc. with the prior approval of the Training and Placement Officer of the University and submit in the department a typed report along with a certificate from the organization.

The typed report should be in a prescribed format.

The report will be evaluated in the V Semester by a Committee consisting of three teachers from different specialization to be constituted by the Chairperson of the department. The basis of evaluation will primarily be the knowledge and exposure of the student towards different processes and the functioning of the organization.

The student will interact with the committee through presentation to demonstrate his/her learning.

Teachers associated with evaluation work will be assigned 2 periods per week load.

Deenbandhu Chhotu Ram University of Science & Technology, Murthal (Sonapat)
SCHEME OF STUDIES & EXAMINATIONS
B.Tech. 3rd YEAR (SEMESTER–VI) AERONAUTICAL ENGINEERING
Credit Based Scheme w.e.f. 2014-15

S. No.	Course No.	Course Title	Teaching Schedule			Marks of Class work	Examination Marks		Total	Credit	Duration of Exam
			L	T	P		Theory	Practical			
1	AER-302B	AIRCRAFT PROPULSION-II	4	1		25	75	-	100	5	3
2	AER 304B	WIND TUNNEL TECHNIQUES	3	1		25	75	-	100	4	3
3	ME 312 B	INDUSTRIAL ENGINEERING (AER, ME)	4	-		25	75	-	100	4	3
4	AER-306B	AIRCRAFT STRUCTURE -II	4	1		25	75	-	100	5	3
5	AER-308B	NON DESTRUCTIVE EVALUATION	4	-		25	75	-	100	4	3
6	ME306B	HEAT TRANSFER (AER , ME)	4	1		25	75	-	100	5	3
7	AER-310B	AIRCRAFT PROPULSION LAB	-	-	3	20	-	30	50	1.5	3
8	ME316B	HEAT TRANSFER LAB (AER , ME)	-	-	2	20	-	30	50	1	3
9	HUM- 302 B	REPORT WRITING SKILLS (Common for all branches)	1	-	-	25	50		75	1	2
10	HUM- 304 B	ORAL PRESENTATION SKILLS (Common for all branches)	-	-	2	20	-	30	50	1	2
11	GPAER302B	GENERAL PROFICIENCY & ETHICS	1	-	-	-	-	75	75	2	-
Total			25	4	7	235	500	165	900	33.5	

Note:

- 5 Every student has to participate in the sports activities. Minimum one hour is fixed for sports activities either in the morning or evening. Weightage of Sports is given in General Proficiency & Ethics Syllabus.
- 6 The students will be allowed to use non-programmable scientific calculator. However, sharing/exchange of calculator is prohibited in the examination.
- 7 Electronics gadgets including Cellular phones are not allowed in the examination
- 8 Each students has to undergo Professional Training of at least 4 weeks from the industry, institute, research lab, training center etc during summer vacation and its evaluation shall be carries out in the VII semester

AER-302B AIRCRAFT PROPULSION – II						
B. TECH. SEMESTER – VI AERONAUTICAL ENGG.						
L	T	P	Credits		Class Work	: 25 Marks
4	1	--	5		Examination	: 75Marks
					Total	: 100 Marks
					Duration of Examination	: 3 Hours

UNIT-I

Steady 1-D Gas Dynamics: Basics, Simple flows; Nozzle flow, nozzle design, nozzle operating characteristics for isentropic flow, nozzle flow and shock waves, Nozzle characteristics of some operational Engines, Rayleigh flow and Fanno flow. Inlet: design, sizing and performance for various flow regimes

Nozzle: C-D Nozzle performance - Effects of back pressure, exit area ratio and mass flow
Combustion Systems: Basics of combustion chamber, Ignition system, Flame stability and after burners.

UNIT-II

Parametric Cycle Analysis of Ideal Engines: Engine cycle analysis and basic assumptions. Applications to (i) Ramjet, (ii) Turbojet with and without after burner, (iii) Turbo fan Engine, optimum by pass ratio (iv) Turbo-Prop Engine Cycle analysis of real engines:

UNIT-III

Axial Flow Compressor: Euler's Turbo-machinery equations. Axial Flow analysis, cascade action, flow field. Velocity diagrams, flow annulus area stage parameters. Degree of reaction, cascade airfoil nomenclature and loss coefficient, diffusion factor, stage loading and flow coefficient, stage pressure ratio, Blade Mach no., Repeating-stage, Repeating-row, Meanline design. Flow path dimensions, number of blades per stage. Radial variation, Design Process, Performance

UNIT-IV

Axial Flow Turbine : Introduction to turbine analysis, mean-radius stage calculations, Stage parameters, stage loading and flow coefficients, degree of reaction, Stage temperature ratio and pressure ratio, Blade spacing, Radial Variation, Velocity ratio. Axial Flow Turbine stage Flow path dimension, stage analysis, Multistage design steps of design - single stage and two - stage. Turbine Performance, Blade Cooling.

Text Books:

1. J D Mattingly, Elements of Gas Turbine Propulsion, McGraw Hill, 1st Ed., 1997
2. H Cohen, G F C Rogers and H I H Sarvanmutto, Gas Turbine Theory, John Wiely
3. P G Hill & C R Peterson, Mechanics and Thermodynamics of Propulsion, Additson-Wesley, 1970

Reference Books:

1. Gorden C Oates, Aircraft Propulsion Systems Technology & Design, AIAA Publication
2. J L Kererbrock, Aircraft Engines and Gas Turbine, MIT Press, 1991

Note:

1. In the semester examination, the examiner will set two questions from each unit (total 08 questions in all), covering the entire syllabus. The students will be required to attempt only 5 questions selecting at least one question from each unit.
2. The use of scientific calculator will be allowed in the examination. However, programmable calculator and cellular phone will not be allowed.

AER-304B WIND TUNNEL TECHNIQUES						
B. TECH. SEMESTER – VI AERONAUTICAL ENGG.						
L	T	P	Credits		Class Work	: 25 Marks
3	1	--	4		Examination	: 75Marks
					Total	: 100 Marks
					Duration of Examination	: 3 Hours

UNIT-I

Wind Tunnel as a Tool: Types of wind tunnels, special purpose wind tunnels

Wind Tunnel Design: Test section, diffuser, fan section, fan design, return passage, cooling, the breather- vibration, test section flow quality, diffuser design, wind tunnel construction, energy ratio, final form.

UNIT-II

Instrumentation and Calibration of Test Section: Measurement of pressure, velocity, turbulence, flow angularity, hot wire anemometry, laser velocimeter, data acquisition, flow visualization techniques, wind tunnel calibration.

Model Forces, Moment and Pressure Measurement: Wind tunnel balances- Internal & External balances design of wind tunnel balances, Wake survey method.

UNIT-III

Wind Tunnel Correction: Method of Images, boundary corrections, buoyancy corrections, wake blockage, solid blockage- (2D & 3D corrections).

UNIT-IV

Non Aeronautical Uses of the Wind Tunnel

Applications in wind engineering, Surface vehicle testing, testing of buildings for wind forces, pollution, other applications at low Reynolds numbers.

Text Book:

1. Low speed wind tunnel testing, : W.E.Rae and A.Pope, John Wiley 1985.

References Book:

1. Measurement of Airflow - Pankhrust and Ower , Pergamon Press

Note:

1. In the semester examination, the examiner will set two questions from each unit (total 08 questions in all), covering the entire syllabus. The students will be required to attempt only 5 questions selecting at least one question from each unit.
2. The use of scientific calculator will be allowed in the examination. However, programmable calculator and cellular phone will not be allowed.

ME-312B INDUSTRIAL ENGINEERING						
B. Tech. Semester – VI (Mechanical Engg & Aeronautical Engg)						
L	T	P	Credits		Class Work	: 25 Marks
4	--	--	4		Examination	: 75 Marks
					Total	: 100 Marks
					Duration of Examination	: 3 Hours

UNIT – I

INTRODUCTION: Definition and brief history of industrial engineering, objectives and relevance of industrial engineering for achieving excellence in industry, decisions in industrial engineering.

PRODUCTION SYSTEM AND PRODUCTIVITY: Value addition, products and services, **conversion** process, production system, types of production system, productivity and its measurement, factors effecting productivity and strategies for improving productivity.

WORKFORCE MANAGEMENT: Teams, employee empowerment, quality circles, incentive plans, job design, job specialization, job enlargement, job rotation, job enrichment.

WORK STUDY: Method study, Principles of motion economy, Techniques of method study- various charts, therbligs, Work measurement- various methods, time study, PMTS, determining time, work sampling, numericals.

UNIT II

MANUFACTURING COST ANALYSIS: Elements of cost, overheads estimation types of costs. Cost variance analysis, Fixed and variable costs, Break even analysis, , numericals.

MATERIALS MANAGEMENT: Strategic importance of materials in industries, pressure for high and low inventory, relevant costs, basic inventory control models-EOQ, EBQ with and without shortage, purchase discounts, sensitivity analysis, inventory control systems- P, Q, Ss systems, service level, stockout risk, determination of order point and safety stock, selective inventory control-ABC, FSN, SDE, VED., numericals.

UNIT III

PRODUCTION PLANNING AND CONTROL(PPC): Introduction to forecasting- Simple and weighted moving average methods, objectives and variables of PPC, Aggregate planning- basic concept and its relation with other decision areas, Master Production Schedule, Scheduling operations, various methods for line and intermittent production systems, Gantt chart, Sequencing- Johnson algorithm for n jobs and 2 machines, n jobs & 3 machines, 2 jobs & n machines, n jobs & m machines, Various means of measuring effectiveness of PPC, numericals.

UNIT IV

Product Design and Development: Varios approaches, Product life cycle, Role of 3S's – Standardization, Simplification, Specialization, Introduction to value engineering, role of ergonomics in product design.

Manufacturing Strategies: Intoduction to JIT, TPM, fundamental of quality & TQM, Kaizan- elements, benefits and implementation aspects. Overview of Supply Chain Management, Management Information system (MIS) and its role in decision making.

Text Books

1. Production and Operations Management by Chary- TMH
2. Industrial Engineering and Management by O.P. Khanna- Dhanpat Rai Publications

Reference Books:

1. Modern Production Management- S.S. Buffa- John Wiley
2. Operations Management for competitive advantage by Chase-Jacob-Aquilino- TMH

Note:

1. In the semester examination, the examiner will set two questions from each unit (total 08 questions in all), covering the entire syllabus. The students will be required to attempt only 5 questions selecting at least one question from each unit.
2. The use of scientific calculator will be allowed in the examination. However, programmable calculator and cellular phone will not be allowed.

AER-306B AIRCRAFT STRUCTURES – II						
B. TECH. SEMESTER – VI AERONAUTICAL ENGG.						
L	T	P	Credits		Class Work	: 25 Marks
4	1	--	5		Examination	: 75Marks
					Total	: 100 Marks
					Duration of Examination	: 3 Hours

UNIT-I

Bending of thin plates; pure bending, plate subjected to bending and twisting, plates subjected to distributed load, combined bending and in-plane loading of a thin rectangular plate, energy method for bending of thin plates.

UNIT-II

STRUCTURAL STABILITY: Euler buckling of columns: inelastic stability of columns, effect of initial imperfections, energy method for the calculation of buckling loads in columns, flexural and torsional buckling of the thin walled columns, buckling of stiffened plates, local instability.

UNIT-III

Stress analysis of aircraft components: tapered beams, fuselages, wings, fuselage frames, wing ribs, shear lag.

Matrix methods of structural analysis: stiffness matrix for an elastic springs, pin jointed frame work, application to statically indeterminate frame works, matrix analysis of space frames, stiffness matrix for a beam. Concept and introduction to finite element methods.

UNIT-IV

Introduction to vibration: Free and forced vibration of single, two and multiple degrees of freedom systems, Principal modes, normal modes, static coupling and dynamic coupling.

Text Books:

1. T H G Megson, Aircraft Structures for Engineering Students, Edward Arnold, U.K.
2. R M Rivello, Theory and Analysis of Flight Structure, McGraw Hill Book Co.
3. N G R Iyengar, Structural Stability of Columns and Plates, Affiliated East West Press (P) Ltd, New Delhi.

Reference Books:

1. W T Thomson, Vibration Theory and Application
2. Perry, D.E Azar, Aircraft Structures, McGraw Hill
3. Bruhn, Fundamentals of Aircraft Structures, McGraw Hill

Note:

1. In the semester examination, the examiner will set two questions from each unit (total 08 questions in all), covering the entire syllabus. The students will be required to attempt only 5 questions selecting at least one question from each unit.
2. The use of scientific calculator will be allowed in the examination. However, programmable calculator and cellular phone will not be allowed.

AER- 308B NON DESTRUCTIVE EVALUATION						
B. TECH. SEMESTER – VIII AERONAUTICAL ENGG.						
L	T	P	Credits		Class Work	: 25 Marks
4	-	--	4		Examination	: 75Marks
					Total	: 100 Marks
					Duration of Examination	: 3 Hours

UNIT-I

Importance of NDT in quality assurance. Different types of non destructive techniques to obtain information regarding size, location and orientation of damage or cracks.
Visual inspection techniques coin tapping technique for composite structures and adhesive bonds.

UNIT-II

Ultrasonic testing : Pulse echo technique, pitch-catch technique, through transmission technique, A-scan, B-Scan, C-scan.
Acoustic emission: Sources of acoustic emission in composites, peak amplitude, rise time during events, ring-down counts duration of events.

UNIT-III

X-ray radiography: Absorption spectra, short wave length, X-ray for detection of voids. Die penetration technique, Magnetic particle testing

UNIT-IV

In each of the above techniques, (i) theory and basic principles, (ii) advantages/disadvantages, (iii) material of parts that can be inspected, (iv) physical size and shape limitation, (v) economics of process, (vi) types of defects that can be detected, (vii) environment limitation are to be discussed alongwith equipment used for each of the techniques.

Text Books

1. Non destructive Testing, Edward Arnold U.K.

Reference Books:

2. Introduction of Nondestructive testing - A training guide, John Wiley & Sons.
3. Douglas C Lalia, NDT for Aircraft, Jeppesen
4. NDT and Ultrasonic Testing for Aircraft, FAA-AC 43-3

ME-306B HEAT TRANSFER						
B. Tech. Semester – VI (Mechanical Engg & Aeronautical Engg)						
L	T	P	Credits		Class Work	: 25 Marks
4	1	--	5		Examination	: 75 Marks
					Total	: 100 Marks
					Duration of Examination	: 3 Hours

UNIT I

BASICS CONCEPTS: Thermodynamics Vs Heat transfer, Define Heat Transfer, thermal conductivity Vs diffusivity, basic modes of heat transfer, Combined heat transfer.

STEADY STATE HEAT CONDUCTION: Introduction, I-D heat conduction through a plane wall, long hollow cylinder, hollow sphere, Conduction equation in Cartesian, polar and spherical coordinate systems, Numericals.

UNIT II

STEADY STATE CONDUCTION WITH HEAT GENERATION: Introduction, 1-D heat conduction with heat sources, Extended surfaces (fins)- Fins with uniform cross-sectional area, Fin effectiveness, Brief introduction of 2-D heat conduction, Numericals.

TRANSIENT HEAT CONDUCTION (1-D): Lumped capacitance, semi-infinite and infinite solid conduction modes for walls, cylinders, spheres; Chart solution, Relaxation Method, Numericals.

UNIT III

CONVECTION: Forced convection-Thermal and hydro-dynamic boundary layers, Equation of continuity, Momentum and Energy equations, Internal flow through circular tube and external flow over a flat plate, Fluid friction and heat transfer (Colburn analogy), Free convection from a vertical flat plate, Empirical relations for free convection from vertical and horizontal planes & cylinders, Numericals.

THERMAL RADIATION: Basic laws, Black body radiation, intensity and emissive power, diffuse and gray surfaces, Shape factors and network analogy, Radiation shields, applications to two and three surface enclosures, introduction to participating media, Numericals.

UNIT IV

HEAT EXCHANGERS: Classification, Performance variables, Analysis of a parallel/ counter flow heat exchanger, Heat exchanger effectiveness, pressure drop, Numericals.

HEAT TRANSFER WITH CHANGE OF PHASE: Laminar film condensation on a vertical plate, Drop-wise condensation, Pool boiling regimes, Nucleate boiling and critical heat flux, film boiling and minimum heat flux, Flow boiling.

Text Books :

1. Heat Transfer – J.P. Holman, John Wiley & Sons, New York.
2. Fundamentals of Heat & Mass Transfer–Incropera, F.P. & Dewill, D.P –John Willey New York.
3. Heat transfer –P.K. Nag, McGraw Hill

Reference Books :

1. Heat Transfer – A. Bejan, John Wiley & Sons, Inc.
2. Conduction of Heat in Solids – Carslow, H.S. and J.C. Jaeger – Oxford Univ. Press.
3. Conduction Heat Transfer – Arpasi, V.S. – Addison – Wesley.
4. Compact Heat Exchangers – W.M. Keys & A.L. Landon, Mc. Graw Hill.
5. Thermal Radiation Heat Transfer – Siegel, R. and J.R. Howell, Mc. Graw Hill.
6. Heat Transmission – W.M., Mc.Adams , Mc Graw Hill.

Note:

1. In the semester examination, the examiner will set two questions from each unit (total 08 questions in all), covering the entire syllabus. The students will be required to attempt only 5 questions selecting at least one question from each unit.
2. The use of scientific calculator will be allowed in the examination. However, programmable calculator and cellular phone will not be allowed.

The paper setter will be required to mention in the note of question paper that the use of Steam tables, Charts, Graphical plots is permitted.

AER-310B AIRCRAFT PROPULSION LAB						
B. TECH. SEMESTER – VI AERONAUTICAL ENGG.						
L	T	P	Credits		Class Work	: 20 Marks
--	--	3	1.5		Examination	: 30 Marks
					Total	: 50 Marks
					Duration of Examination	: 3 Hours

List of Experiments:

1. Study the constructional details of axial flow compressor
2. Study the constructional details of centrifugal compressor
3. Study of accessory gear box and its construction
4. Study the constructional details of main fuel pump
5. Study the constructional details of combustion chamber
6. Study the constructional details of after burning system
7. Study the constructional details of piston engines
8. Study the functioning of complete jet engine
9. Study the constructional details of propellers

NOTE

- 1 At least eight experiments are to be performed in the semester
- 2 At least six experiments are to be performed from above list. Remaining two experiments may either be performed from above list or designed and set by concerned institute as per the scope of the syllabus
- 3 Students will be taken to HAL/ Air Force Station to witness Aero-engine run on test bed

ME-316B HEAT TRANSFER LAB						
B. Tech. Semester – VI (Mechanical Engg & Aeronautical Engg)						
L	T	P	Credits		Class Work	: 20 Marks
--	--	2	1		Examination	: 30 Marks
					Total	: 50 Marks
					Duration of Examination	: 3 Hours

LIST OF EXPERIMENTS:

1. To determine the thermal conductivity of a metallic rod.
2. To determine the thermal conductivity of an insulating power.
3. To determine the thermal conductivity of a solid by the guarded hot plate method.
4. To find the effectiveness of a pin fin in a rectangular duct natural convective condition and plot temperature distribution along its length.
5. To find the effectiveness of a pin fin in a rectangular duct under forced convective and plot temperature distribution along its length.
6. To determine the surface heat transfer coefficient for a heated vertical tube under natural convection and plot the variation of local heat transfer coefficient along the length of the tube. Also compare the results with those of the correlation.
7. To determine average heat transfer coefficient for a externally heated horizontal pipe under forced convection & plot Reynolds and Nusselt numbers along the length of pipe. Also compare the results with those of the correlations.
8. To measure the emissivity of the gray body (plate) at different temperature and plot the variation of emissivity with surface temperature.
9. To find overall heat transfer coefficient and effectiveness of a heat exchange under parallel and counter flow conditions. Also plot the temperature distribution in both the cases along the length of heat of heat exchanger.
10. To verify the Stefan-Boltzmann constant for thermal radiation.
11. To demonstrate the super thermal conducting heat pipe and compare its working with that of the best conductor i.e. copper pipe. Also plot temperature variation along the length with time or three pipes.
12. To determine the critical heat flux using two phase heat transfer apparatus.
13. To determine the water side overall heat transfer coefficient on a U-tube heat exchanger.
14. Design of Heat exchanger using CAD and verification using thermal analysis package eg. ANSYS software etc.

- Note:**
1. **Ten experiments are to be performed in the Semester.**
 2. **At least seven experiments should be performed from the above list. Remaining three experiments should be performed as designed & set by the department as per the scope of the syllabus (ME306B).**

HUM- 302 B REPORT WRITING SKILLS						
B. Tech. Semester – VI (Common for all branches)						
L	T	P	Credit		Class Work	: 25 Marks
1	-	--	1		Examination	: 50 Marks
					Total	: 75 Marks
					Duration of Examination	: 2 Hours

OBJECTIVE

The course aims at developing competence for report writing with a focus on its complex writing techniques and procedures.

COURSE CONTENT

UNIT I

Report Writing

Reports: meaning, their importance and types, Structure of reports, Formats of reports, Use of illustrations

UNIT II

Writing of Business and Technical Reports:

Preliminary steps and procedure of writing report, writing various types of reports on technical, business related topics

RECOMMENDED READING

1. Borowick, Jerome. N. *Technical Communication and its Applications*. New Delhi: PHI, 2000
2. Guffey, Mary Ellen. *Business Communication: Process & Product*. USA: South western College Publishing, 2000.
3. Kumar, Sanjay and Pushp Lata. *Communication Skills*. Delhi: OUP, 2011

SCHEME OF END SEMESTER EXAMINATION (MAJOR TEST) AND INSTRUCTIONS FOR THE EXAMINER

1. The duration of the exam will be 2 hours.
2. The Question Paper for this theory course shall have three questions in all covering both the units. All will be compulsory with internal choice.
3. Question no. 1 will be of 10 marks. The question may have two/ three parts with enough internal choice, covering various components of both the Units.

4. Question no 2 with internal choice will be of 10 marks covering contents of the Unit I. It will be theoretical in nature.
5. Question no 3 will have two parts of 15 marks each. The student will be asked to write reports on business and technical subject/ issue covering contents of Unit II. The emphasis would be on testing the actual report writing on a given business and technical situation/ subject in letter format.

HUM- 304 B ORAL PRESENTATION SKILLS						
B. Tech. Semester – VI (Common for all branches)						
L	T	P	Credits		Class Work	: 20 Marks
--	--	2	1		Examination	: 30 Marks
					Total	: 50 Marks
					Duration of Examination	: 2 Hours

OBJECTIVE

To enable students to develop their speaking skills with professional proficiency

COURSE CONTENT

Oral Presentations:

Group Discussion; Mock interviews

Note for the Teacher:

The teacher concerned, by devising her/ his method, must preview and review the student's spoken proficiency at the beginning and end of the semester respectively to find the efficacy of the course and degree of improvement in the student.

RECOMMENDED READING

1. Konar, Nira. *English Language Laboratories: A Comprehensive Manual*. Delhi: PHI, 2011
2. Kumar, Sanjay and Pushp Lata. *Communication Skills*. Delhi: OUP, 2011

SCHEME OF END SEMESTER EXAMINATION (Practical)

An external Practical exam of 30 marks of 2 hour duration for the course will be conducted by an external examiner appointed by the competent authority of the University's.

NOTE: Students will be tested for their oral communication competence making them participate in Group discussion, mock situations for interview. Students may also be evaluated through a viva conducted by an external examiner.

GPAER- 302B GENERAL PROFICIENCY AND ETHICS						
B. Tech. Semester – VI (Aeronautical Engineering)						
L	T	P	Credits		Class Work	: 75Marks
--	--	--	2		Total	: 75 Marks

The purpose of this course is to inculcate a sense of professionalism in a student along with personality development in terms of quality such as receiving, responding, temperament, attitude and outlook. The student efforts will be evaluated on the basis of his/ her performance / achievements in different walks of life.

A Faculty Counselor will be attached to a group of students which will remain associated with him / her during the entire period of the degree program in the University. Each faculty member will serve as a faculty counselor. They will act like a local guardian for the students associated with him / her and will help them in terms of career guidance, personal difficulties.

B. The student will present a written report before the committee with following in view:

The student will present before the committee his/ her achievements during the current academic session in the form of a written report highlighting followings:

- | | | |
|------|--|-------------------|
| I. | Academic Performance | ----- |
| II. | Extra Curricular Activities / Community Service, Hostel Activities | (8 Marks) |
| III. | Technical Activities / Industrial, Educational tour | (8 Marks) |
| IV. | Sports/games | (14 Marks) |
| V. | Moral values & Ethics | (15 Marks) |

NOTE: Report submitted by the students should be typed on both sides of the paper.

- D.** A student will support his/ her achievement and verbal & communicative skill through presentation before the committee. **(30 Marks)**

C. Moral values & Ethics

Syllabus - A few topics from the below mentioned books

1. R.R.Gaur, R. Sangal and G.P. Bagaria, “ Bagaria, “ A foundation course in Human Values and Professional Ethics”, Pub: Excel Books, New Delhi-110028.
2. M. Govindrajan, S Natrajan & V.S. Senthil Kumar, “ Engineering Ethics (including Human Values)” Eastern Economy Edition, Prentics Hall of India Ltd.

A minor test/ Quiz will be conducted during the semester and It will be the duty of the concerned teacher assigned to teach Moral values & Ethics to submit the awards to respective chairman of the department / Director/Principal.

The evaluation of this course will be made by the following Committee.

University Departments:

- | | | |
|---|-------------------------------|----------|
| 1 | Chairperson of the Department | Chairman |
| 2 | Senior Most Faculty Counselor | Member |
| 3 | Vice- Chancellor’s Nominee | Member |

Affiliated Colleges:

- | | | |
|---|---|----------|
| 1 | Director/Principal | Chairman |
| 2 | Head of the Department/Sr. Faculty | Member |
| 3 | External Examiner to be appointed by the University | Member |

Note: Remuneration will be paid to the external examiner only (at par with the other practical examinations).

Deenbandhu Chhotu Ram University of Science & Technology, Murthal (Sonapat)
SCHEME OF STUDIES & EXAMINATIONS
B.Tech. Final YEAR (SEMESTER–VII) AERONAUTICAL ENGINEERING
Credit Based Scheme w.e.f. 2015-16

S. No.	Course No.	Course Title	Teaching Schedule			Marks of Class work	Examination Marks		Total	Credit	Duration of Exam
			L	T	P		Theory	Practical			
1	AER-401B	COMPUTATION FLUID DYNAMICS	3	1		25	75	-	100	4	3
2	AER-403B	SPACE DYNAMICS	3	1		25	75	-	100	4	3
3	ME-403B	REF & AIR CONDITIONING (AER, ME)	3	1		25	75	-	100	4	3
4	ME 405B	OPERATION RESEARCH (AER, ME)	3	1		25	75	-	100	4	3
5		OPEN ELECTIVE*	4	0		25	75	-	100	4	3
6	AER-405B	COMPUTATIONAL LAB	-	-	3	20		30	50	1.5	3
7	ME-411B	R.A.C.LAB (AER, ME)	-	-	2	20		30	50	1	3
8	AER-407B	PROJECT	-	-	4	100	-	--	100	4	-
9	AER-409B	PROFESSIONAL TRAINING-II	-	-	2	50	-	-	50	2	-
Total			16	4	11	315	375	60	750	28.5	

*** List of Open Electives**

1	MEI 623B	ENTREPRENEURSHIP	6	BT401B	BIOINFORMATICS
2	BME451B	MEDICAL INSTRUMENTATION	7	AE417B	MODERN VEHICLE TECHNOLOGY
3	ECE305B	CONSUMER ELECTRONICS	8	CE451B	POLLUTION & CONTROL
4	EE451B	ENERGY AUDIT	9	CSE-411B	MANAGEMENT INFORMATION SYSTEM
5	EEE457B	ENERGY RESOURCES & TECHNOLOGY	10	IT-413B	CYBER SECURITY

Note:

- 5 Every student has to participate in the sports activities. Minimum one hour is fixed for sports activities either in the morning or evening. Weightage of Sports is given in General Proficiency & Ethics Syllabus.
- 6 Students will be permitted to opt for any one elective run by the other department. However, the department shall offer those elective for which they have expertise. The choice of the students for any elective shall not be binding for the department to offer, if the department does not have expertise. The minimum strength of students should be 20 to run an elective course.
- 7 Assessment of Professional Training-II, undergone at the end of VI semester, will be based on seminar, viva-voce, report and certificate of Professional Training obtained by the student from the industry, , institute, research lab, training center etc
- 8 The students will be allowed to use non-programmable scientific calculator. However, sharing/exchange of calculator is prohibited in the examination.
13. Electronics gadgets including Cellular phones are not allowed in the examination
14. Project coordinator will be assigned the project load of maximum of 2 hrs. per week including his own guiding load of one hr. However, the guiding teacher will be assigned maximum of one period of teaching load irrespective of number of students/groups under him/her.

AER-401B COMPUTATIONAL FLUID DYNAMICS						
B. TECH. SEMESTER – VII AERONAUTICAL ENGG.						
L	T	P	Credits		Class Work	: 25 Marks
3	1	--	4		Examination	: 75Marks
					Total	: 100 Marks
					Duration of Examination	: 3 Hours

UNIT-I

Finite difference schemes: Projection and truncation error, Stability, consistency, accuracy and convergence of numerical schemes. Time marching methods, FDM applied to linear advection - diffusion equation, MacCormack scheme and its application to Euler and N-S equations. Equations of Fluid Dynamics and their classification. Boundary conditions.

UNIT-II

Basics of Finite Volume Method: Equations in integral form, numerical flux at cell faces, upwind methods, flux - vector splitting, flux- difference splitting, shock capturing methods.

UNIT-III

Basics of Finite Element Method: Isoparametric elements, bilinear and tri-linear elements. Numerical Integration, space function, Petrov- Galerkin method, Computation of turbulent flows; RANS, turbulence modelling.

UNIT-IV

Grid generation: algebraic and pde based methods, O-, C-, H-type topologies, unstructured meshes, hybrid meshes, Large scale problems in CFD, iterative solvers, preconditioning techniques, vector and parallel computing, post- processing for visualisation.

Text Books

1. T J R Hughes, The Finite Element Method: Linear Static and Dynamic Finite Element Analysis, Prentice Hall
2. O C Zienkiewicz and RL Taylor, The Finite Element Method, Vol I&II, McGraw Hill, Indian Ed.

Reference Books

3. John D Anderson Jr., Computational Fluid Dynamics: The Basics with Applications, McGraw Hill, Indian Edition
4. Charles Hirsch, Numerical Computation of Internal and External Flows, Wiley Series in Numerical Methods in Engineering, Indian Edition

AER-403B SPACE DYNAMICS						
B. TECH. SEMESTER – VII AERONAUTICAL ENGG.						
L	T	P	Credits		Class Work	: 25 Marks
3	1	--	4		Examination	: 75Marks
					Total	: 100 Marks
					Duration of Examination	: 3 Hours

UNIT-I

INTRODUCTION Initial works in Germany for space travel. Russian and American campaigns, man in space, profile of flight from earth to a destination in space and back. The space shuttle.

PARTICLE DYNAMICS Introduction, Newton's laws, velocity and acceleration, coordinates and rotation, the spherical pendulum, energy for one particle, angular momentum, energy for systems of particles, angular momentum, the N-body problem.

UNIT-II

THE TWO-BODY PROBLEM: Introduction, the two body problem, energy and angular momentum, orbit equation, Kepler's laws, orbit determination and satellite tracking.

THE EARTH SATELLITE OPERATIONS: The Hohmann transfer, inclination-change maneuver, launch to rendezvous, decay life time, earth oblateness effect, low thrust orbit transfer.

UNIT-III

RIGID BODY DYNAMICS: Introduction, choice of origin, angular momentum and energy, principal-body-axis frame, particle axis theorem, Euler's equations, Orientational angle, the simple Top.

SATELLITE ATTITUDE DYNAMICS: Torque –Free-axisymmetric Rigid body, The general torque free rigid body, semi-rigid space craft, attitude control: Spinning and Non spinning space craft. The Yo-Yo mechanism, gravity gradient satellite, The dual spin space craft.

UNIT-IV

RE-ENTRY DYNAMICS Introduction, ballistic re-entry, skip re-entry, double dip re-entry, Aero braking, lifting re-entry.

THE SPACE ENVIRONMENT Introduction, The atmosphere, Light and space craft temperature, charged particle motion, magnetic mirrors, The van-Allen Belts, radiation effects, Meteors, Meteorites and impact. Our local neighborhood

Text Books:

1. Elements of Gas Turbine Propulsion: J.D. Mattingly, McGraw Hill.
2. Gas Turbine Theory: Cohen, Rogers and Sarvanmatt, John Wiley.
3. Mechanics and Thermodynamics of Propulsion: P.G. Hill & Peterson, Addison-Wesley, 1970
4. Rocket Propulsion Elements: George P. Sutton, Oscar Biblarz, John Wiley & Sons.

ME 403B REFRIGERATION & AIR CONDITIONING						
B. Tech. Semester – VII (Mechanical Engineering& Aeronautical Engg.)						
L	T	P	Credits		Class Work	: 25 Marks
3	1	--	4		Examination	: 75 Marks
					Total	: 100 Marks
					Duration of Examination	: 3 Hours

UNIT-I

INTRODUCTION: Definition of refrigeration & air conditioning; Necessity; Methods of refrigeration; Unit of refrigeration; Coefficient of performance (COP), Fundamentals of air-conditioning system; Refrigerants- Definition, Classification, Nomenclature, Desirable properties; Secondary refrigerants; Eco-friendly refrigerants and environmental issues of refrigeration & air conditioning industry.

AIR REFRIGERATION SYSTEM: Carnot refrigeration cycle, temperature limitations; Brayton refrigeration or the Bell Coleman air refrigeration cycle; Necessity of cooling the aero plane; Air craft refrigeration systems, Simple cooling and Simple evaporative types, Boot strap and Boot strap evaporative types, Regenerative type and Reduced Ambient type system; problems.

UNIT II

VAPOR COMPRESSION REFRIGERATION (VCR) Systems: Simple Vapor Compression (VC) Refrigeration systems, Limitations of Reversed Carnot cycle with vapor as the refrigerant; analysis of VCR cycle considering degrees of sub cooling and superheating; VCR cycle on p-v, t-s and p-h diagrams; Effects of operating conditions on COP; Liquid suction heat exchanger; actual VCR cycle; comparison of VC cycle with Air Refrigeration cycle, Problems.

MULTISTAGE REF. SYSTEMS- Necessity of compound compression, Compound VC cycle , Inter-cooling with liquid sub –cooling and / or water inter cooler: Multistage compression with flash inter-cooling and / or water inter-cooling; systems with individual or multiple expansion valves; Individual compression system with individual or multiple expansion valves; Individual compression systems with individual or multiple expansion valves but with and without intercoolers. Cascade refrigerating systems and its necessity; selection of pairs of refrigerants for the system; concept of cascade temperature, analysis, multistaging, applications, problems.

UNIT III

PSYCHROMETRY of Air & Air Conditioning Processes: properties of moist Air, Gibbs Dalton law, Sp. humidity, Dew point temperature, Degree of saturation, Relative humidity, Enthalpy, Humid specific heat, Wet bulb temperature. Psychrometric chart; Psychrometry of air-conditioning processes- Mixing Process and other basic processes in conditioning of air; Psychrometric processes in air-conditioning equipment like in air washer etc, Problems.

AIR- CONDITIONING LOAD CALCULATIONS: Outside and inside design conditions; Sources of heating load; Sources of cooling load; Heat transfer through structure, Solar radiation, Electrical applications, Infiltration and ventilation, Heat generation inside conditioned space; Comfort chart, Design of summer air-conditioning and Winter air conditioning systems, Problems. Air Conditioning Systems with Controls & Accessories: Classifications, Layout of plants; Equipment selection; Air distribution system; Duct systems Design; Filters; Refrigerant piping. Temperature, Pressure, Humidity sensors; Actuators and Safety controls, Accessories.

UNIT IV

OTHER REFRIGERATION SYSTEMS: Vapor Absorption Refrigeration Systems – Basic Systems; COP of the System, Performance, Relative merits and demerits; Properties of aqua ammonia; Electrolux Refrigeration; Study of Lithium bromide water system. Steam Jet Refrigerating System- Introduction, Analysis, Relative merits and demerits, Performance Applications; problems

REFRIGERATION AND AIR CONDITIONING EQUIPMENTS: Type of compressors and their performance curves; types of Condensers; types of expansion devices; types of evaporators. Cooling and dehumidifying coils and cooling towers.

TEXT BOOKS:

1. Refrigeration & Air conditioning –R.C. Jordan and G.B. Priester, Prentice Hall of India.
2. Refrigeration & Air conditioning –C.P. Arora, TMH, New Delhi.

REFERENCE BOOKS:

1. A course in Refrigeration & Air Conditioning – Arora & Domkundwar, Dhanpat Rai & Sons.
2. Refrigeration & Air conditioning –W.F. Stocker and J.W. Jones, TMH, New Delhi.
3. Refrigeration & Air conditioning- Manohar Prasad, Wiley Eastern limited, New Delhi.

Note:

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2. The use of scientific calculator will be allowed in the examination. However, programmable calculator and cellular phone will not be allowed.

ME 405B OPERATIONS RESEARCH							
B. Tech. Semester – VII (Mechanical Engg & Aeronautical Engg)							
L	T	P	Credits		Class Work	:	25 Marks
3	1	--	4		Examination	:	75 Marks
					Total	:	100 Marks
					Duration of Examination	:	3 Hours

UNIT-I

OPERATIONS RESEARCH –AN OVERVIEW- Introduction, history, approach, techniques and tools, applications of OR, phases and processes of OR study, limitations of OR.

LINEAR PROGRAMMING- Introduction, Formulation, redundant constraints, Solution-Graphical and Simplex, Gauss-Jordan reduction process in simplex methods, BIG M methods computational problems.

UNIT II

TRANSPORTATION PROBLEM- Introduction, , Basic feasible solution of a transportation problem- North-West corner, matrix minimum and Vogel's Approximation method, Methods for checking optimality of the solution- Stepping stone and MODI method, Unbalanced Transportation problem Degenerate transportation problem. Maximisation in Transportation Problem, computational problems.

ASSIGNMENT PROBLEM- Introduction, solution of an assignment problem- Hungarian Method, Unbalanced Assignment problem, computational problems

ADVANCED TOPICS IN O.R. - Duality, Primal- Dual relationship, Economic interpretation, Shadow price, Post optimality and sensitivity analysis, problems

UNIT III

WAITING LINE MODELS- Introduction, Elements of a queuing system, operating characteristics of a queuing system, queue parameters, M/M/1 queue, problems

NETWORK ANALYSIS IN PROJECT PLANNING (PERT AND CPM)- Introduction, network diagram, event activity, critical path method, PERT, Cost analysis and Crashing the Network, Problems.

UNIT IV

SIMULATION- Introduction, advantages of simulation, limitations of simulation, Monte Carlo Simulation and its application in industries, Problems.

DECISION THEORY- Decision Process, SIMON model, types of decision making environment-certainty, risk, uncertainty, decision making with utilities, problems.

Text Books:

1. Quantitative Techniques by N.D.Vohra, TMH New Delhi
- 2, Operations Research Theory and applications by J.K.sharma, Macmillan

Reference Books:

1. Operations Research by Handy A. Taha- PHI New Delhi

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AER-405B COMPUTATIONAL LAB						
B. Tech. Semester – VII (AERONAUTICAL ENGINEERING)						
L	T	P	Credits		Class Work	: 20 Marks
--	--	3	1.5		Examination	: 30 Marks
					Total	: 50 Marks
					Duration of Examination	: 3 Hours

LIST OF EXPERIMENTS:

1. Point relaxation method for Laplace equation for the flow over airfoil
2. Successive Line Relaxation for the Laplace equation over airfoil
3. Structural grid generation over NACA 0012
4. Relaxation method for subsonic full potential equation for flow over airfoil with zero angle of attack
5. Lifting subsonic incompressible potential flow over airfoil
6. Two dimensional Panel method for subsonic incompressible flow over NACA 0012
7. Zoukowski transformation for subsonic incompressible flows

Refrence

1. Jack Moran, Theoretical and Computational Aerodynamics
2. Anderson, Computational Fluid Mechanics

Note:

1. Eight experiments are to be performed in the Semester.
2. At least six experiments should be performed from the above list. Remaining two experiments may either be performed from the above list or designed & set by the concerned institute as per the scope of the syllabus.

ME 411B REFERIGERATION & AIR CONDITIONING.LAB (Common with AER)						
B. Tech. Semester – VII (Aeronautical Engg. & Mechanical Engg.)						
L	T	P	Credits		Class Work	: 20 Marks
--	--	2	1		Examination	: 30 Marks
					Total	: 50 Marks
					Duration of Examination	: 3 Hours

LIST OF EXPERIMENTS:

1. To study the Vapor Compression Refrigeration (VCR) System and determine its C.O.P. Draw the cycle on P-H and T-S diagrams.
2. To Study the Mechanical heat pump and find its C.O.P.
3. To study the cut- sectional models of Reciprocating, Rotary and Screw type refrigerant compressors.
4. To study the various controls used in Refrigerating & Air Conditioning systems.
5. To study the Ice- plant, its working cycle and determine its C.O.P and capacity.
6. To study the mixing process for different inlet conditions and plot them on Psychrometric charts and understand the concept of recirculation of air on re-circulated air-conditioning set up.
7. To study the basic air conditioning processes like heating, cooling, humidification, cooling and dehumidification and plot them on Psychrometric chart.
8. To determine the By-pass factor of cooling coil and plot them on Psychrometric charts for different inlet conditions.
9. To study the chilling plant and its working cycle.
10. To study the aqua- ammonia absorption system and find its COP.

- Note:
1. Ten experiments are to be performed in the Semester.
 2. At least eight experiments should be performed from the above list. Remaining two experiments may either be performed from the above list or designed & set by the concerned institute as per the scope of the syllabus.

AER 407B PROJECT						
B. Tech. Semester – VII (Aeronautical Engg.)						
L	T	P	Credits		Class Work	: 100 Marks
--	--	4	4			

The primary objective of this course is to develop in students the professional quality of synthesis employing technical knowledge obtained in the field of Engineering & Technology through a project work involving design, analysis augmented with creativity, innovation and ingenuity.

Project involving design/ fabrication/ testing/ computer simulation/ case studies etc. which commences in the VII Semester will be completed in VIII Semester and will be evaluated through a panel of examiners consisting of the following:

Chairman of Department	: Chairperson
Project coordinator	: Member Secretary
Respective project supervisor	: Member

The student will be required to submit two copies of his/her project report to the department for record (one copy each for the department and participating teacher).

Project coordinator will be assigned the project load of maximum of 2 hrs. per week including his own guiding load of one hr. However, the guiding teacher will be assigned maximum of one period of teaching load irrespective of number of students/groups under him/her.

The format of the cover page and the organization of the body of the report for all the B.Tech. will be finalized and circulated by the Dean, Faculty of Engineering and Technology.

AER 409B PROFESSIONAL TRAINING -II						
B. Tech. Semester – VII (Aeronautical Engg.)						
L	T	P	Credits		Class Work	: 50 Marks
--	--	2	2		Total	: 50 Marks

- At the end of 6th semester each student would undergo four weeks Professional Training in an Industry/ Institute/ Professional / Organization/ Research Laboratory etc. with the prior approval of the Training and Placement Officer of the University and submit in the department a typed report along with a certificate from the organization.
- The typed report should be in a prescribed format.
- The report will be evaluated in the VII Semester by a Committee consisting of three teachers from different specialization to be constituted by the Chairperson of the department. The basis of evaluation will primarily be the knowledge and exposure of the student towards different processes and the functioning of the organization.
- The student will interact with the committee through presentation to demonstrate his/ her learning.
- Teachers associated with evaluation work will be assigned 2 periods per week load.

MEI 623B ENTREPRENEURSHIP							
B. Tech. Semester – VII (Aeronautical Engineering)- Open Elective							
L	T	P	Credits		Class Work	:	25 Marks
4	-	--	4		Examination	:	75 Marks
					Total	:	100 Marks
					Duration of Examination	:	3 Hours

UNIT-I

ENTREPRENEURIAL DEVELOPMENT PERSPECTIVE: Concepts of Entrepreneurship Development, Evolution of the concept of Entrepreneur, Entrepreneur Vs. Intrapreneur, Entrepreneur Vs. Entrepreneurship, Entrepreneur Vs. Manager, Attributes and Characteristics of a successful Entrepreneur, Role of Entrepreneur in Indian economy and developing economies with reference to Self-Employment Development, Entrepreneurial Culture

UNIT II

CREATING ENTREPRENEURIAL VENTURE: Business Planning Process, Environmental Analysis - Search and Scanning, Identifying problems and opportunities, Defining Business Idea, Basic Government Procedures to be complied with.

UNIT III

ENTREPRENEURSHIP DEVELOPMENT AND GOVERNMENT: Role of Central Government and State Government in promoting Entrepreneurship - Introduction to various incentives, subsidies and grants - Export Oriented Units - Fiscal and Tax concessions available; Role of Central/State agencies in the Entrepreneurship Development - District Industries Centers (DIC), Small Industries Service Institute (SISI), Entrepreneurship Development Institute of India (EDII), National Institute of Entrepreneurship & Small Business Development (NIESBUD), National Entrepreneurship Development Board (NEDB).

UNIT IV

PROJECT MANAGEMENT AND CASE STUDIES: Technical, Financial, Marketing, Personnel and Management Feasibility, Estimating and Financing funds requirement - Schemes offered by various commercial banks and financial institutions like IDBI, ICICI, SIDBI, SFCs, Venture Capital Funding, Why do Entrepreneurs fail - The Four Entrepreneurial Pitfalls (Peter Drucker), Case studies of Successful Entrepreneurial Ventures, Failed Entrepreneurial Ventures and Turnaround Ventures.

Texts and References:

1. Entrepreneurship: New Venture Creation - David H. Holt.
2. Entrepreneurship - Hisrich Peters.
3. The Culture of Entrepreneurship - Brigitte Berger.
4. Project Management - K. Nagarajan.
5. Dynamics of Entrepreneurship Development - Vasant Desai.
6. Entrepreneurship Development - Dr. P.C.Shejwalkar.
7. Thought Leaders - Shrinivas Pandit.
8. Entrepreneurship, 3rd Ed. - Steven Brandt.
9. Business Gurus Speak - S.N.Char.
10. The Entrepreneurial Connection - Gurmit Narula.

Note:

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2. The use of scientific calculator will be allowed in the examination. However, programmable calculator and cellular phone will not be allowed.

BME 451B MEDICAL INSTRUMENTATIONS							
B. Tech. Semester – VII (Aeronautical Engineering) – Open Elective							
L	T	P	Credits		Class Work	:	25 Marks
4	-	--	4		Examination	:	75 Marks
					Total	:	100 Marks
					Duration of Examination	:	3 Hours

UNIT-I

PHYSIOLOGY AND TRANSDUCERS: Cell and its structure – Action and resting – Potential propagation of action potential – Sodium pump – Nervous system – CNS – PNS – Nerve cell – Synapse – Cardio pulmonary system – Physiology of heart and lungs – Circulation and respiration – Transducers – Different types – Piezo-electric, ultrasonic, resistive, capacitive, inductive transducers – Selection criteria.

UNIT-II

ELECTRO – PHYSIOLOGICAL AND NON-ELECTRICAL PARAMETER MEASUREMENTS: Basic components of a biomedical system – Electrodes – Micro, needle and surface electrodes – Amplifiers – Preamplifiers, differential amplifiers, chopper amplifiers – Isolation amplifier. ECG – EEG – EMG – ERG – Lead systems and recording methods – Typical waveforms. Measurement of blood pressure – Cardiac output – Cardiac rate – Heart sound – Respiratory rate – Gas volume – Flow rate of CO₂, O₂ in exhaust air – PH of blood, ESR, GSR measurements – Plethysmography.

UNIT-III

MEDICAL IMAGING AND PATIENT MONITORING SYSTEMS: X-ray machine - Radio graphic and fluoroscopic techniques – Computer tomography – MRI – Ultrasonography – Endoscopy – Thermography – Different types of biotelemetry systems and patient monitoring – Electrical safety. Biological effects of X-rays and precautions.

UNIT-IV

ASSISTING AND THERAPEUTIC EQUIPMENTS: Pacemakers – Defibrillators – Ventilators – Nerve and muscle stimulators – Diathermy – Heart – Lung machine – Audio meters – Dialyzers. Respiratory Instrumentation - Mechanism of respiration, Spirometry, Pneumotachograph Ventilators.

TEXT BOOKS

1. Biomedical Instrumentation and Measurements – Leslie Cromwell and F.J. Weibell, E.A. Pfeiffer, PHI, 2nd Ed, 1980.
2. Medical Instrumentation, Application and Design – John G. Webster, John Wiley, 3rd Ed., 1998.

REFERENCE BOOKS

1. Principles of Applied Biomedical Instrumentation – L.A.Geoddes and L.E. Baker, John Wiley, 1975.
2. Hand-book of Biomedical Instrumentation – R.S. Khandpur, TMH, 2nd Ed., 2003.
3. Biomedical Telemetry – Mackay, Stuart R., John Wiley, 1

Note:

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ECE 305B CONSUMER ELECTRONICS							
B. Tech. Semester – VII (Aeronautical Engineering) – Open Elective							
L	T	P	Credits		Class Work	:	25 Marks
4	-	--	4		Examination	:	75 Marks
					Total	:	100 Marks
					Duration of Examination	:	3 Hours

UNIT I

MONOCHROME TV (INTRODUCTION): Elements of a TV System,Picture transmission,Sound transmission,Picture reception,Sound reception,Synchronization,Receiver control,Image continuity, Scanning Process, Aspect Ratio, Flicker, Composite Video Signal, Picture Elements,Kell factor, Vertical Resolution,Horizontal Resolution,Video bandwidth,Interlacing, 625 Line System,Bandwidths for TV Transmission,Vertical and horizontal synch detail,Vestigial Side Band transmission(Advantages and Disadvantages)

MONOCHROME TV (PICTURE AND CAMERA TUBES): Monochrome picture tube,beam reflection,Beam focussing,Screen Phosphor,Face plate,Picture tube characteristics,picture tube circuit controls,Monochrome Camera Tubes:Basic principle,Image Orthicon, Vidicon,Plumbicon

UNIT II

COLOUR TV ESSENTIALS: Compatibility , Colour perception,Three Colour theory,Luminance,Hue and Saturation, Dispersion and Recombination of light,Primary and secondary colours,luminance signal,Chrominance Signal, Colour picture tube,colour TV Camera,Colour TV display Tubes,colour Signal Transmission,Bandwidth for colour signal transmission,Colour TV controls. Cable TV,Block Diagram and principle of working of cable TV.

PLASMA AND LCD: Introduction,liquid crystals,types of LCD's,TN,STN,TFT,Power requirements,LCD working,Principle of operation of TN display,Construction of TN display,Behaviour of TN liquid crystals,Viewing angle,colour balance, colour TN display, limitations, advantages, disadvantages, applications.

UNIT III

LED AND DMD : Introduction to LED Television , comparison with LCD and Plasma TV's, schematic of DMD, introduction to Digital MicroMirror device, Diagram of DMD, principle of working, emerging applications of DMD.

MICROWAVE OVENS AND AIR CONDITIONERS: Microwaves, Transit Time, Magnetron, Waveguides, Microwave Oven, Microwave Cooking. Air conditioning,Components of air conditioning systems,all water Air conditioning systems,all air air conditioning Systems,Split air conditioner.

UNIT IV

MICROPHONES: Introduction, characteristics of microphones,types of microphone:carbon,moving coil,wireless,crystal,introduction to tape recorder.

LOUDSPEAKER: Introduction to ideal and basic loudspeaker,loudspeaker construction types of loudspeaker: Dynamic and permanent magnet,woofers,tweeters,brief introduction to baffles,equalisers.

Text Books :

- 1.Consumer Electronics by S. P. Bali(Pearson Education)
- 2.Complete Satellite and Cable T.V by R.R Gulati(New Age International Publishers)

Reference Books:

1. Monochrome and Colour Television by R. R. Gulati

Note:

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EE 451B ENERGY AUDIT							
B. Tech. Semester – VII (Aeronautical Engineering) – Open Elective							
L	T	P	Credits		Class Work	:	25 Marks
4	-	--	4		Examination	:	75 Marks
					Total	:	100 Marks
					Duration of Examination	:	3 Hours

UNIT I

INTRODUCTION TO THE POWER DISTRIBUTION SYSTEM: Description of the power distribution system- voltage levels, Components of the distribution system- Substation, Transformer, feeders, distribution system planning, operation & maintenance objectives, activities involved in O&M, grid management, load scheduling & dispatch, load balancing, 66-33/ 11 KV substation equipment, 11/ 0.4 KV substation equipment, Distribution transformers- reasons for DT failures.

UNIT II

ENERGY ACCOUNTING & ENERGY AUDIT: Need for energy accounting, objectives & functions of energy accounting, Energy flow diagram in power distribution system, energy accounting procedure- Energy measurement, and problems in energy accounting & overcoming these problems in energy accounting, Definition, need and types of energy audit, energy audit instruments, procedure for conducting an energy audit.

UNIT III

AT&C LOSS REDUCTION & EFFICIENCY IMPROVEMENT: Concepts and principles of distribution losses- transmission & distribution losses, AT&C losses in power distribution network, factors contributing to high technical & commercial losses. Technical loss reduction- Short term measures for technical loss reduction, long term plans for technical loss reduction, Commercial loss reduction- reasons for commercial losses, measures for commercial loss reduction.

UNIT IV

DEMAND SIDE MANAGEMENT: An introduction, Why DSM?, Benefits of DSM, DSM in power systems: load management, DSM techniques and emerging trends, EC Act 2001, DSM on consumer side – the industrial sector, the agricultural sector, the domestic & commercial sectors, ESCO-a route for DSM.

TEXT BOOKS:

1. Handbook of Energy Engineering, The Fairmont Press, INC.-Albert Thumann& Paul Mehta.
2. Energy Management Supply & Conservation, Butterworth Heinemann, 2002-dr. Clive Beggs.

REFERENCE BOOKS:

1. Hand book on energy audit & environment management by ISBN 81-1993.0920 TERI

Note:

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EEE457B ENERGY RESOURCES & TECHNOLOGY							
B. Tech. Semester – VII (Aeronautical Engineering) – Open Elective							
L	T	P	Credits		Class Work	:	25 Marks
4	-	--	4		Examination	:	75 Marks
					Total	:	100 Marks
					Duration of Examination	:	3 Hours

UNIT-I

ENERGY SOURCES & AVAILABILITY: World energy situation. Indian energy scenario. Comparative study of thermal, hydro, nuclear and gas power plants. Impact of thermal, gas, hydro and nuclear power stations on environment, air and water pollution, green house effect (global warning), Plasma confinement - magnetic confinement and inertial confinement, geothermal, hydrogen energy, fuel cells, Alkaline fuel cells (AFC), Solid oxide fuel cell (SOFC), Molten carbonate fuel cells (MCFC), thermo-electric power, MHD power generation OTEC & tidal waves.

UNIT-II

SOLAR ENERGY: Solar constant, solar radiation geometry, local solar time, day length, solar radiation measurement, radiation on inclined surface, solar radiation data & solar charts. Flat plate collectors , liquid and air type. Theory of flat plate collectors, advanced collectors, optical design of concentrators, selective coatings, solar water heating, solar dryers, solar stills, solar cooling and refrigeration. Thermal storage. Conversion of heat into mechanical energy. Active and passive heating of buildings. Solar cells.

UNIT-III

WIND ENERGY: Wind as a Source of Energy, Characteristics of wind, wind data. Horizontal & Vertical axis wind Mills, Wind Energy: Wind energy potential measurement, general theories of wind machines, basic laws and concepts of aerodynamics, wind mill and wind electric generator. Basic electric generation schemes- constant speed constant frequency, variable speed constant frequency and variable speed variable frequency schemes. Applications of wind energy.

UNIT-IV

BIOMASS ENERGY: Introduction to biomass, biofuels & their heat content, biomass conversion

technologies. Aerobic & anaerobic digester, Factors affecting biogas production, biogas plants - types & description. Utilisation of biogas - Gasifiers, direct thermal application of Gasifiers. Advantages & problems in development of Gasifiers, use in I.C. engines, Energy plantation. Pyrolysis scheme. Alternative liquid fuels – ethanol and methanol. Ethanol production.

TEXT BOOKS:

1. Electric Power Generation, B.R.Gupta
2. Power Generation, Operation and Control, Wood and Wollenberg, John Wiley & Sons,1984.
3. Power Plant Engg: G.D. Rai

REFERENCE BOOKS:

1. Renewable Energy Resources: John Twidell and Tony Weir
2. Renewable Energy Resources Conventional & Non- Conventional: M.V.R Koteswara Rao
3. Science & Technology of Photovoltaics: Jayarama Reddy P.

Note:

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BT401B BIOINFORMATICS							
B. Tech. Semester – VII (Aeronautical Engineering) – Open Elective							
L	T	P	Credits		Class Work	:	25 Marks
4	-	--	4		Examination	:	75 Marks
					Total	:	100 Marks
					Duration of Examination	:	3 Hours

UNIT-I

INTRODUCTION: Internet, intranet and extranet, networking, protocols, genomic data, organization, representation, data base management systems.

SEQUENCING DATA BANK: Introduction, collecting and storing sequence in laboratory, Nucleic acid data bank – Gen Bank, EMBL, AIDS and rNA, protein data bank (PDB), Cambridge Structural Database CSD, genome data bank, hybridoma data bank structure and others.

UNIT-II

SEQUENCE ANALYSIS: Analysis tools for sequence data banks, Pair wise alignment: NEEDLEMAN and WUNSCH algorithms, Smith Waterman, Multiple alignment – CLUSTAL-W, BLAST, FASTA, sequence patterns and motifs and profiles

PREDICTIONS: Secondary and Tertiary structure: algorithms Chao-Fasman algorithm, hidden Markov model, Neural Networking, Protein classification, fold libraries, fold recognition

(threading), homology detection, SRS-Access to biological data banks and integrated data analysis tools.

UNIT-III

MANAGING SCIENTIFIC DATA: Introduction, challenges faced in integration of Biological information, SRS, Kleisli Query System TAMBIS, P/FDM Mediator for a Bioinformatics Database. Federation, Discovery link and Data management

TEXT / REFERENCE BOOKS

- Developing Bioinformatics Computer Skill, ed. Gibes & Jombeck, Shroff Publication
- Bioinformatics, ed. David W. Mount

Note:

1. In the semester examination, the examiner will set two questions from each unit (total 08 questions in all), covering the entire syllabus. The students will be required to attempt only 5 questions selecting at least one question from each unit.
2. The use of scientific calculator will be allowed in the examination. However, programmable calculator and cellular phone will not be allowed.

AE 417B MODERN VEHICLE TECHNOLOGY						
B. Tech. Semester – VII (Aeronautical Engineering) – Open Elective						
L	T	P	Credits		Class Work	: 25 Marks
4	-	--	4		Examination	: 75 Marks
					Total	: 100 Marks
					Duration of Examination	: 3 Hours

UNIT I

TRENDS IN POWER PLANTS: Hybrid vehicles – stratified charged / lean burn engines – Hydrogen engines – battery vehicles – Electric propulsion with cables – magnetic track vehicles.

UNIT II

SUSPENSION BRAKES AND SAFETY: Air suspension – Closed loop suspension – antiskid braking system, Retarders, Regenerative braking safety cage – air bags – crash resistance – passenger comfort

UNIT III

NOISE & POLLUTION: Reduction of noise – Internal & external pollution control through alternate fuels / power plants – Catalytic converters and filters for particulate emission.

UNIT IV

VEHICLE OPERATION AND CONTROL: Computer control for pollution and noise control and for fuel economy – Transducers and actuators – Information technology for receiving proper information and operation of the vehicle like optimum speed and direction.

VEHICLE AUTOMATED TRACKS: Preparation and maintenance of proper road network – National highway network with automated roads and vehicles – Satellite control of vehicle operation for safe and fast travel.

TEXT BOOKS

1. Heinz Heisler, “Advanced Vehicle Technology” - Arnold Publication.

REFERENCES

1. Beranek.L.L., Noise reduction, McGraw Hill Book Co., Inc., Newyork, 1993.
2. Bosch Hand Book, 3rd Edition, SAE, 1993.

Note:

1. In the semester examination, the examiner will set two questions from each unit (total 08 questions in all), covering the entire syllabus. The students will be required to attempt only 5 questions selecting at least one question from each unit.
2. The use of scientific calculator will be allowed in the examination. However, programmable calculator and cellular phone will not be allowed.

CE 451B POLLUTION & CONTROL							
B. Tech. Semester – VII (Aeronautical Engineering) – Open Elective							
L	T	P	Credits		Class Work	:	25 Marks
4	-	--	4		Examination	:	75 Marks
					Total	:	100 Marks
					Duration of Examination	:	3 Hours

UNIT – I

WATER POLLUTION – Classification of water pollutants, water characteristics, effluent standards, primary treatment, secondary treatment – aerobic (activated sludge, aerated lagoons, trickling filter, roughing filter, rotating biological contactor) anaerobic (contact process, UASB).

UNIT – II

AIR POLLUTION: Classification of air pollutants, Particulates: Physical characteristics, mode of formation, setting properties, Control measures.

HYDROCARBONS: Nature; sources, control, Carbon Monoxide: Source, harmful effects on human health, control measures. Oxides of Sulphur and Nitrogen Sources, effects on human health and plants. Control measure.

UNIT – III

SOLID WASTE: Types, sources and properties of solid waste, methods of solid waste treatment and disposal

SOLID WASTE MANAGEMENT – Generation, Collection and techniques for ultimate disposal, Elementary discussion on resource and energy recovery.

UNIT – IV

Elementary treatment of nuclear pollution, metal pollution, noise pollution their effects & control.

Trace element: Mechanism of distribution, essential and non essential elements, trace of element in marine environment, its ecological effects and biological effects.

Suggested Books:

1. Environmental Engg.: by Howard s. Peavy & Others, MGH International.
2. Metacaf – EDDY – Waste-water engineering revised by George Teholonobus (TMH)
3. Environmental Chemistry by B.K. Sharma, Goel Publishing, Meerut.

4. Environmental Chemistry, A.K.DE, Wiley Eastern.

5. Air Pollution: H.C. Perking – Mc Graw Hill.

Note:

1. In the semester examination, the examiner will set two questions from each unit (total 08 questions in all), covering the entire syllabus. The students will be required to attempt only 5 questions selecting at least one question from each unit.
2. The use of scientific calculator will be allowed in the examination. However, programmable calculator and cellular phone will not be allowed.

CSE 411B MANAGEMENT INFORMATION SYSTEM							
B. Tech. Semester – VII (Aeronautical Engineering) – Open Elective							
L	T	P	Credits		Class Work	:	25 Marks
4	-	--	4		Examination	:	75 Marks
					Total	:	100 Marks
					Duration of Examination	:	3 Hours

UNIT I

FOUNDATIONS:-

INFORMATION SYSTEM: Introduction to Information System and MIS, Decision support and decision making systems, systems approach, the systems view of business, Managing the digital firm, Electronic Commerce and Electronic business, DBMS, RDBMS , introduction to Telecommunication and Networks

IT.INFRASTRUCTURE:- Managing Hardware Assets, Managing Software Assets, Managing Data Resources. Internet And New It Infrastructure .

UNIT II

CONCEPTUAL SYSTEM DESIGN: Define the problems, set systems objective, establish system constraints, determine information needs determine information sources, develop alternative conceptual design and select one document the system concept, and prepare the conceptual design report. Information Systems Security and Control, Ethical and Social Impact of Information Systems.

UNIT III

DETAILED SYSTEM DESIGN: Inform and involve the organization, aim of detailed design, project management of MIS detailed design , identify dominant and trade of criteria, define the sub systems, sketch the detailed operating sub systems and information flow, determine the degree of automation of each operation, inform and involve the organization again, inputs outputs and processing, early system testing, software, hardware and tools propose an organization to operate the system, documentation of detailed design

UNIT IV

IMPLEMENTATION, EVALUATION AND MAINTENANCE OF THE MIS: Plan the implementation, acquire floor space and plan space layouts, organize for implementation, develop procedures for implementation, train the operating personnel, computer related acquisitions, develop forms for data collection and information dissemination, develop the files test the system, cut-over, document the system, evaluate the MIS control and maintain the system. Pitfalls in MIS development, Redesigning the organization with Information systems, Managing Knowledge Work.

TEXT BOOKS:

1. Management Information System by W. S. Jawadekar, 2002, Tata McGraw Hill.
2. Management Information System by K.C. Laudon & J.P. Laudon 7th Edition 2003 Pearson Education Publishers Indian Reprint.
3. Information System for Modern Management (3rd edition)- Robert G. Murdick, Loel E. Ross & James R. Claggett. PHI

REFERENCE BOOKS:

1. Management Information System; O Brian; TMH
2. Management Information System by Davis Olson Mac Graw Hill
3. Management Information System by Stallings, (Maxwell Mc Millman Publishers)

Note:

1. In the semester examination, the examiner will set two questions from each unit (total 08 questions in all), covering the entire syllabus. The students will be required to attempt only 5 questions selecting at least one question from each unit.
2. The use of scientific calculator will be allowed in the examination. However, programmable calculator and cellular phone will not be allowed.

IT 451B CYBER SECURITY						
B. Tech. Semester – VII (Aeronautical Engineering) – Open Elective						
L	T	P	Credits		Class Work	: 25 Marks
4	-	--	4		Examination	: 75 Marks
					Total	: 100 Marks
					Duration of Examination	: 3 Hours

UNIT I

INTRODUCTION TO CYBERCRIME: Cybercrime and Information Security, Classifications of Cybercrimes, The need for Cyberlaws, The Indian IT Act Challenges to Indian Law and Cybercrime Scenario in India, Weakness in Information Technology Act and its consequences, Digital Signatures and the Indian IT Act, Cybercrime and Punishment; Technology, Students and Cyberlaw; Survival tactics for the Netizens, Cyber-offenses: Cyberstalking, Cybercafe and Cybercrimes, Botnets, Attack Vector, Cloud Computing;

UNIT II

TOOLS AND METHODS USED IN CYBERCRIME: Proxy Servers and Anonymizers, Phishing and identity theft, Password Cracking, Keyloggers and Spywares, Virus and Worms, Trojan Horses and Backdoors, Steganography, DoS and DDoS Attacks, SQL Injection, Buffer Overflow; Cybercrime: Mobile and Wireless Devices: Trends in Mobility, Attacks on Wireless Networks, Credit Card Frauds in Mobile and Wireless Computing Era, Security Challenges, Registry Settings for Mobile Devices, Authentication Service Security, Attacks on Mobile/ Cell Phones.

UNIT III

UNDERSTANDING COMPUTER FORENSICS: The Need for Computer Forensics, Cyberforensics and Digital Evidence, Forensics Analysis of E-Mail, Digital Forensics Life Cycle, Chain of Custody Concept, Network Forensics, Computer Forensics and Steganography, Relevance of the OSI 7 Layer Model to Computer Forensics, Forensics and Social Networking Sites: The Security/ Privacy Threats, Challenges in Computer Forensics, Forensics Auditing, Antiforensics.

UNIT IV

CYBERSECURITY: ORGANIZATIONAL IMPLICATIONS: Cost of Cybercrimes and IPR Issues, Web Threats for Organizations, Security and Privacy Implications from Cloud Computing, Social Media Marketing, Social Computing and the Associated Challenges for Organizations, Protecting People's Privacy in the Organization, Organizational Guidelines for Internet Usage, Safe Computing Guidelines and Computer Usage Policy, Incident Handling, Forensics Best Practices, Media and Asset Protection, Importance of Endpoint Security in Organizations.

TEXT BOOKS:

- “Cyber Security Understanding Cyber Crimes, Computer Forensics and Legal Perspectives”, Nina Godbole, Sunit Belapur, Wiley India Publications, April, 2011

Note:

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2. The use of scientific calculator will be allowed in the examination. However, programmable calculator and cellular phone will not be allowed.

Deenbandhu Chhotu Ram University of Science & Technology, Murthal (Sonapat)
SCHEME OF STUDIES & EXAMINATIONS
B.Tech. Final YEAR (SEMESTER – VIII) AERONAUTICAL ENGINEERING
Credit Based Scheme w.e.f. 2015-16

S. No.	Course No.	Course Title	Teaching Schedule			Marks of Class work	Examination Marks		Total	Credit	Duration of Exam
			L	T	P		Theory	Practical			
1	AER-402B	ROCKETS AND MISSILES	3	1		25	75	-	100	4	3
2	AER-404B	GAS DYNAMICS	3	1		25	75	-	100	4	3
3		ELECTIVE I	4	-		25	75	-	100	4	3
4		ELECTIVE II	4	-		25	75	-	100	4	3
5	AER-406B	SEMINAR	-	-	2	50	-	-	50	2	3
6	AER-407B	PROJECT	-	-	8	75	-	125	200	8	3
7	GFAER408B	GENERAL FITNESS FOR THE PROFESSION	1	-	-		-	100	100	4	3
Total			15	2	10	225	300	225	750	30	

Elective - I		Elective -II	
AER- 432B	THEORY OF ELASTICITY	AER-442B	ROBOTICS ENGINEERING
AER-434B	KINEMATICS AND DYNAMICS OF MACHINE	AER-444B	AIR TRANSPORTATION AND AIR CRAFT MAINTENANCE
AER-436B	AVIONICS	AER-446B	MODERN MANUFACTURING PROCESSES
AER-438B	FLEXIBLE MANUFACTURING SYSTEM	AER-448B	WIND ENERGY CONVERSION

Note:

- 5 Every student has to participate in the sports activities. Minimum one hour is fixed for sports activities either in the morning or evening. Weightage of Sports is given in General Proficiency & Ethics Syllabus.
- 6 The students will be allowed to use non-programmable scientific calculator. However, sharing/exchange of calculator is prohibited in the examination.
- 7 Electronics gadgets including Cellular phones are not allowed in the examination.
- 8 The minimum strength of students should be 20 to run an elective course.
6. The choice of students for any elective subject shall not be binding for the department offer, if the department does not have expertise.

AER-402B ROCKETS AND MISSILES						
B. TECH. SEMESTER – VIII AERONAUTICAL ENGG.						
L	T	P	Credits		Class Work	: 25 Marks
3	1	--	4		Examination	: 75Marks
					Total	: 100 Marks
					Duration of Examination	: 3 Hours

UNIT-I

General Introduction : Difference between Rockets and Missiles, Types of Rockets and Missiles, Satellite launch vehicles. Manned Rockets.

Aerodynamics Characteristics of Air Frame Components: Introduction, Bodies of revolution. Different forebody shapes. Summary of characteristics of bodies of revolution, Base pressure. Aerodynamic controls. Jet control.

UNIT-II

Performance of Missiles and Rockets: Introduction, various types of drags. Boost glide trajectory, Graphical solution, Boost sustainer trajectory, long range cruise trajectory, long range Ballistic trajectory. Powered and unpowered flight. Brief description of Fin stabilized and spin stabilized rockets and their force systems. Thrust misalignment.

UNIT-III

Stability and Control: Longitudinal: Two degrees of freedom analysis, complete missile aerodynamics with forward and rear control, Static stability margin

Directional: Introduction, cruciform configuration, Body, Wind and Tail contribution on directional control. Lateral: Induced Roll, Internal control and design consideration for cruciform and monowing; Damping in Roll.

UNIT-IV

Manoeuvring Flight: Introduction, Flat turns for cruciform and monowing. Pull ups Relationship of manoeuvrability and static stability margin.

Dynamic Stability : Equations of motion, longitudinal and lateral dynamics.

Miscellaneous : Launching problems. Re-entry and Recovery of Space Vehicles, Modern Concepts, Manned Missions.

Text Books

1. S S Chin, Missile configuration Design, McGraw Hill

Reference Books

1. Davis Follin & Blitzer Van, Exterior Ballistics of Rockets, Nostrand
2. Seifert & Brown, Ballistic Missiles and Space Vehicle Systems, John Wiley
3. Ed. Seifert, Space Technology, John Wiley

AER-404 B GAS DYNAMICS						
B. TECH. SEMESTER – IV AERONAUTICAL ENGG.						
L	T	P	Credits		Class Work	: 25 Marks
3	1	--	4		Examination	: 75Marks
					Total	: 100 Marks
					Duration of Examination	: 3 Hours

UNIT-1

Normal Shock Waves : Equation of motion for a normal shock, normal shock relations for a perfect gas, stagnation conditions, Rankine-Hugoniot relations Propagating shock waves, weak shock, Reflected shock wave, centered expansion waves, shock tube.

Oblique Shock Waves : Introduction, oblique shock relations, relation between shock angle and turning angle, use of oblique shock chart, Supersonic flow over a wedge, weak oblique shocks, Supersonic compression, Detached shock.

UNIT-II

Expansion Waves: Supersonic expansion by turning, Prandtl-Meyer flow. Simple and non-simple regions, Reflection and interaction of shocks and expansion waves, Mach reflection, method of characteristics.

Airfoils in Compressible Flow : Introduction: Linearized compressible flow, Airfoils in subsonic flow, Prandtl-Glauert transformation, critical Mach number, supercritical flow, Airfoils in Transonic flow, Governing equation, Shock wave-boundary layer interaction, stability and control problems.

UNIT-III

Lift and drag in supersonic flow: Shock expansion theory, Flow field in supersonic flow. Thin airfoil theory, Analytical determination of lift, drag coefficients on flat plate, bi-convex, diamond-shaped profiles in supersonic flow, supersonic flow past wings.

Potential equation for compressible flows: Introduction, Crocco's theorem, derivation of basic potential equation for compressible flow, linearization of potential equation & boundary conditions. Small perturbation theory, application to wavy wall and bodies of revolution.

UNIT-IV

Measurements in compressible flows: Instruments used in compressible flow; Rayleigh - Pitot-formula, Subsonic, transonic and supersonic wind tunnels- Design and operation of supersonic wind tunnel. Flow visualization by interferometer, schlieren and shadow graph methods. Instrumentation for Hypersonic wind and shock tunnels, Aeroballistic range, Terminal ballistic range. Rocket-sled facility.

Text Books:

1. John D Anderson, Modern Compressible Flow with Historical Perspective
2. E Rathakrishnan, Gas Dynamics
3. Arnold M Kuethe Chuenyen, Chow, Foundations of Aerodynamics, 4th Ed., John Wiley & Sons

Reference Books:

1. M J Zucrow and Hoffman, Gas Dynamics
2. A Pope & K L Goin, High Speed Wind Tunnel Testing
3. J Lucasiwicz. Experimental Methods in Hypersonics

Note:

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2. The use of scientific calculator will be allowed in the examination. However, programmable calculator and cellular phone will not be allowed.

AER 406B SEMINAR						
B. Tech. Semester – VIII (Aeronautical Engineering)						
L	T	P	Credits		Class Work	: 50 Marks
--	--	2	2			

The objectives of the course remains

- To learn how to carry out literature search
- To learn the art of technical report writing
- To learn the art of verbal communication with the help of modern presentation techniques

A student will select a topic in emerging areas of Engineering & Technology and will carry out the task under the observation of a teacher assigned by the department.

He/ She will give a seminar talk on the same before a committee constituted by the chairperson of the department. The committee should comprise of three faculty members from different specializations. The teacher associated in the committee will be assigned 2 hours teaching load per week.

However, guiding students' seminar will not be considered towards teaching load.

The format of the cover page and the organization of the body of the seminar report for all the undergraduate programs will be finalized and circulated by the Dean, Faculty of Engineering and Technology.

AER 407B PROJECT						
B. Tech. Semester – VIII (Aeronautical Engineering)						
L	T	P	Credits		Class Work	: 75 Marks
--	--	8	8		Examination	: 125Marks
					Total	: 200 Marks
					Duration of Examination	: 3 Hours

The project started in VII Semester will be completed in VIII Semester and will be evaluated through a panel of examiners consisting of the following:

Chairperson of Department	: Chairperson
Project coordinator	: Member
External expert	: To be appointed by the University

The student will be required to submit two copies of his/her project report to the department for record (one copy each for the department and participating teacher).

Project coordinator will be assigned the project load of, maximum of 2 hrs. per week including his own guiding load of one hr. However, the guiding teacher will be assigned maximum of one period of teaching load irrespective of number of students/groups under him/her.

The format of the cover page and the organization of the body of the report for all the B. Tech. will be finalized and circulated by the Dean, Faculty of Engineering and Technology.

GFAER – 408B GENERAL FITNESS FOR THE PROFESSION						
B. Tech. Semester – VIII (Mechanical Engineering)						
L	T	P	Credits		Examination	: 100 Marks
--	--	--	4		Total	: 100 Marks

The purpose of this course is to inculcate a sense of professionalism in a student along with personality development in terms of quality such as receiving, responding, temperament, attitude and outlook. The student efforts will be evaluated on the basis of his/ her performance / achievements in different walks of life.

The evaluation will be made by the committee of examiners constituted as under:

1. Dean, Faculty of Engineering & Technology/ Director
/Principal of affiliated college : Chairperson
2. Chairperson of the department : Member
3. External expert : Appointed by the university

A. The student will present a written report before the committee with following in view:

The student will present before the committee his/her achievements during the current academic session in the form of a written report highlighting followings:

- I. Academic Performance -----
- II. Extra Curricular Activities / Community Service, Hostel Activities (12 Marks)
- III. Technical Activities / Industrial, Educational tour (12 Marks)
- IV. Sports/games (16Marks)

Note: Report submitted by the students should be typed on both sides of the paper.

- B.** A student will support his/ her achievement and verbal & communicative skill through presentation before the examiners. (40 Marks)

C. Faculty Counselor Assignment (20 Marks)

It will be the duty of the student to get evaluated by respective faculty counselor and to submit the counselor assessment marks in a sealed envelope to the committee.

A counselor will assess the student which reflects his/ her learning graph including

followings:

1. Discipline throughout the year
2. Sincerity towards study
3. How quickly the student assimilates professional value system etc.
4. Moral values & Ethics

AER-432 B THEORY OF ELASTICITY						
B. TECH. SEMESTER – VIII AERONAUTICAL ENGG.						
L	T	P	Credits		Class Work	: 25 Marks
3	1	--	4		Examination	: 75Marks
					Total	: 100 Marks
					Duration of Examination	: 3 Hours

UNIT-I

2-D PROBLEMS IN RECTANGULAR COORDINATES: Solution by polynomials, bending of cantilever loaded at end, bending of beam by uniform load, 2-D problems in polar coordinates, general equations in polar coordinates, stress distribution symmetrical about an axis.

PHOTOELASTICITY: Photoelastic stress measurement, circular polariscope, photoelastic stress determination, determination of principal stresses, 3-D photoelasticity

UNIT-II

2-D PROBLEMS IN POLAR COORDINATES: Pure bending of curved bars, strain components in polar coordinates, displacements for symmetrical stress distributions, rotating disks, bending of curved bar by a force at the end, effect of circular holes on stress distribution in plates, concentrated force at a point of a straight boundary.

UNIT-III

3-D STRESS-STRAIN ANALYSIS: Introduction, stress ellipsoid and stress-director surface, determination of principal stresses, stress invariants, determination of maximum shearing stresses, homogeneous deformation, strain at a point, principal axes of strain, rotation.

3-D PROBLEMS OF ELASTICITY: uniform stress, stretching of prismatic bar, twist of circular shafts, pure bending of prismatic bars and plates.

UNIT-IV

TORSION: Torsion of straight bars, elliptic cross section and other elementary solutions, membrane analogy, torsion of bar of narrow rectangular cross section, torsion of rectangular

bars, torsion of rolled profile sections, torsion of hollow shafts, torsion of thin tubes, torsion of circular shafts of variable diameter.

TEXT BOOKS : 1 Theory of Elasticity by S.P.Timoshenko & J.N. Goodier
2 Aircraft structures for Engg. Students by T H G Megson

AER-434 B KINEMATICS AND DYNAMICS OF MACHINES							
B. TECH. SEMESTER – VIII AERONAUTICAL ENGG.							
L	T	P	Credits		Class Work	:	25 Marks
3	1	--	4		Examination	:	75Marks
					Total	:	100 Marks
					Duration of Examination	of	3 Hours

UNIT- I

BASIC CONCEPTS: Kinematics and dynamics of machines, mechanisms, pairs, inversion of slider crank chains, degrees of freedom, Kutzbach’s equation, Grubler criterion and numerical problems

VELOCITY AND ACCELERATION : Basic concepts of machines, link, mechanisms, kinematic chain, relative motion of parts of mechanisms, displacement, velocity, acceleration, diagrams of all basic mechanisms including quick return motion mechanism, coriolis component,

UNIT- II

FRICTION : Efficiency of inclined plane, friction in V threads, screw jack, pivots and collar plate and cone clutches, power lost in friction, friction circle and friction axis of a link.

STATIC FORCE ANALYSIS: Equations of equilibrium, couple, equilibrium of force and four force systems, free body diagrams, forces on slider crank mechanism, quick return mechanism and four bar mechanism, slider crank mechanism with friction at turning pairs and numerical problems.

UNIT- III

5 INERTIA FORCES IN MECHANISMS: Determination of forces and couples for a link, inertia of reciprocating parts, dynamically equivalent system, analytical and graphical methods, inertia force analysis of basic engine mechanism (crank connecting rod and piston etc.). Torque required to overcome inertia and gravitational force of a four bar linkage.

GYROSCOPE: Definition, axis of spin, axis of precession, gyroscopic couple, effect on the movement of ships and vehicles, ship and plane stabilization, stability of automobiles and locomotive taking a turn

UNIT- IV

BALANCING: Classification, need for balancing, balancing for simple and multiple masses, static and dynamic balancing-primary and secondary balancing for reciprocating masses, inside and outside cylinder locomotive balancing, swaying couple and variation of tractive effort, partial balancing of locomotive, balancing of coupled locomotive and its advantages, multicylinder in line engines, balancing of V engines, balancing machines

TEXT BOOKS:

1. Theory of Mechanisms and Machines: Amitabha Ghosh and Ashok Kumar Mallik, Third Edition Affiliated East-West Press.
2. Theory of Machines and Mechanisms: Joseph Edward Shigley and John Joseph Uicker, Jr. Second Edition, MGH, New York.

REFERENCE BOOKS:

1. Mechanism and Machine Theory: J.S. Rao and R.V. Dukkipati Second Edition New age International.
2. Theory of Machines: Thomas Beven.
3. Theory and Machines: S.S. Rattan, Tata McGraw Hill.
4. Kinematics of Machines-Dr. Sadhu singh, Pearson Education

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2. The use of scientific calculator will be allowed in the examination. However, programmable calculator and cellular phone will not be allowed.

AER-434 B AVIONICS						
B. TECH. SEMESTER – VIII AERONAUTICAL ENGG.						
L	T	P	Credits		Class Work	: 25 Marks
3	1	--	4		Examination	: 75Marks
					Total	: 100 Marks
					Duration of Examination	: 3 Hours

UNIT-I

AVIONICS TECHNOLOGY: Processors, Memory Devices, Digital Data Buses –MIL-STD-1553B, ARINC 429, ARINC 629, Fiber Optic Buses.LRU architecture for avionics packaging, software, environmental effects, difference in avionics architecture of commercial and military aircraft.

UNIT-II

SENSORS: Air Data Sensing – Use of pitot static probe, static probe to derive air data indications; Role of Air Data Computer (ADC) Magnetic Sensing – Magnetic Heading Reference System (MHRS) Inertial Sensing – Position Gyros, Rate Gyros, Accelerometers Radar Sensing - Radar Altimeter (RADALT), Doppler Radar, Weather Radar

UNIT-III

DISPLAY: Comparison of earlier flight deck (Electromechanical type instruments) to modern flight deck (glass fight deck), Cathode Ray Tube (CRT), Active Matrix Liquid Crystal Display (AMLCD), Head Down Display (HDD), Head Up Display (HUD),Helmet Mounted Display (HMD), Integrated Standby Instrument System (ISIS)
COMMUNICATION: HF, U/VHF, Satellite Communication , Air Traffic Control (ATC) Transponder, Traffic Collision & Avoidance System (TCAS), Identification Of Friend & Foe (IFF)

UNIT-IV

NAVIGATION: Automatic Direction Finding, Very High Frequency Omni-Range (VOR), Distance Measuring Equipment (DME), Tactical Air Navigation (TACAN), VORTAC (VOR+TACAN), Satellite Navigation System-Global Positioning System (GPS), Differential GPS , Instrument Landing System (ILS), Transponder Landing System (TLS), Microwave Landing System (MLS), Astronavigation.
AUTOMATIC FLIGHT CONTROL SYSTEM: Longitudinal, Lateral & Direction Autopilot

BOOK:

1. Civil Avionics Systems- Ian Moir, Allan Seabridge, AIAA Education Series.

ME 438B FLEXIBLE MANUFACTURING SYSTEM						
B. Tech. Semester – VIII (Mechanical Engineering)						
L	T	P	Credits		Class Work	: 25 Marks
4	-	--	4		Examination	: 75 Marks
					Total	: 100 Marks
					Duration of Examination	: 3 Hours

UNIT I

AUTOMATION AND MANUFACTURING FLEXIBILITY: Automation and types, reasons for automation, Basic elements of an Automated System: Sensors, Actuators, Analog-to-Digital and Digital-to-Analog Converters, Input/ Output Devices for Discrete Data, Definition of Manufacturing Flexibility, Need of Manufacturing flexibility, Types of Manufacturing Flexibilities, Classification of Manufacturing systems on Flexibility types, Resources and Processes to increase flexibility of manufacturing systems

GROUP TECHNOLOGY (GT): GT and its benefits, Parts classification and coding systems, the composite part concept, GT based Machine cell design through Cluster Analysis and Hollier's Algorithm; Numerical problems

UNIT II

NUMERICAL CONTROL (NC): Fundamentals of NC Technology and advantages in Manufacturing, NC Machines and types, Computer Numerical Control, Distributed Numerical Control, NC Part Programming, Coding for Manual Part Programming, Part Programming with APT, APT examples

FLEXIBLE MANUFACTURING SYSTEMS (FMS): Components of an FMS, FMS work stations. Material handling and storage system: Functions of the handling system, FMS layout configurations, Computer control system: Computer function, FMS data file, system reports. Planning the FMS, FMS applications and benefits

UNIT III

ROBOTIC TECHNOLOGY: Common robot configurations, Joints and links, work volume, types of robot control, accuracy and repeatability, interlocks, advantages and disadvantages. Brief review of Robot programming and languages: Motion programming, simulation and offline programming, work cell control. Applications of Robot: Material handling, processing operations, assembly and inspection

MATERIALS HANDLING SYSTEMS: Automated flow lines, methods of work part transport, Transfer Mechanisms, buffer storage, automation for machining operations, part feeding devices, Brief review of Automated assembly systems and types,

UNIT IV

COMPUTER INTEGRATED MANUFACTURING SYSTEMS (CIMS): Elements of CIM, Brief Reviews of Computer aided process Planning, Computer Integrated Production Management

Systems, MRP, Capacity Planning, MRPII, Shop floor Control systems, Computer Process Monitoring, Computer aided quality control, Adaptive Control of Manufacturing

TEXT BOOKS:

1. Automation, Production Systems and Computer Integrated Manufacturing: Groover M.P, Prentice Hall of India.
2. CAD/CAM: Groover M.P, Zimmers E.W, Prentice Hall of India.

REFERENCE BOOKS:

1. Approach to Computer Integrated Design and Manufacturing: Nana Singh, John Wiley and Sons, 1998.
2. Production Management Systems: A CIM Perspective: Browne J, Harhen J, Shivnan J, Addison Wesley, 2nd Ed. 1996.

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ME 442B ROBOTICS ENGINEERING						
B. Tech. Semester – VIII (Mechanical Engineering)						
L	T	P	Credits		Class Work	: 25 Marks
4	-	--	4		Examination	: 75 Marks
					Total	: 100 Marks
					Duration of Examination	: 3 Hours

UNIT I

ROBOTIC MANIPULATION: Automation and Robots; Robot Classification – Drive Technologies, Work-Envelope Geometries, Motion Control Methods, Applications; Robot Specifications – No. of Axes, Capacity and Speed, Reach and Stroke, Tool Orientation, Repeatability, Precision, Accuracy, Operating Environment, An Example, Rhino X-3.

UNIT II

DIRECT KINEMATICS: The Arm Equation Homogenous Co-ordinates – Frames, Translations and Rotations, Composite Homogenous Transformations; Screw Transformations; Link Co-ordinates; The Arm Equation; A Five-Axis Articulated Robot; A Four-Axis SCARA Robot; A Six-Axis Articulated Robot; Problems.

INVERSE KINEMATICS: Solving the Arm Equation: The Inverse Kinematics Problem; General Properties of Solutions; Tool Configuration; Inverse Kinematics of a Five-Axis Articulated Robot, Four-Axis Scara Robot, Six-Axis Articulated Robot and Three-Axis Planer Articulated Robot; A Robotic Work Cell; Problems.

UNIT III

WORK SPACE ANALYSIS AND TRAJECTORY PLANNING : Work Space Analysis; Work Envelope of a Five-Axis Articulated Robot; Work Envelope of a Four Axis Scara Robot; Work Space Fixtures; The Pick and Place Operation; Continuous Path Motion; Interpolated Motion; Straight Line Motion; Problems.

DIFFERENTIAL MOTION AND STATICS : The Tool Configuration Jacobian Matrix; Joint – Space Singularities; Generalised Inverses; Resolved – Motion Rate Control; $n > 6$; Rate Control of Redundant Robots : $n > 6$; Rate Control using (1) – Inverses; The Manipulator Jacobian; Induced Joint Torques and Forces; Problems.

UNIT IV

MANIPULATOR DYNAMICS : Lagrange’s Equation; Kinetic & Potential Energy; Generalised Force; Lagrange – Euler Dynamic Model; Dynamic Models of a Two-Axis Planer Articulated Robot and A Three-Axis SCARA Robot; Direct & Inverse Dynamics; Recursive Newton - Euler Formulation; Dynamic Model of a One-Axis Robot; Problems.

ROBOT CONTROL : The Control Problems; State Equations; Constant Solutions; Linear Feedback Systems; Single-Axis PID Control; PD-Gravity Control; Computed –Torque Control; Variable-structure Control; Impedance Control; Problems.

Text Books:

1. Fundamental of Robotics (Analysis & Control) by Robert J.Schilling, Published by PHI, Pvt. Ltd., New Delhi.
2. Introduction to Robotics (Mechanics & Control) by John J. Craig, Published by Addition Wesley (Intl. Student Edition).
3. Analytical Robotics & Mechatronics by Wolfram Stadler, Published by Mc-Graw Hill, Inc., New Delhi.
4. Industrial Robotics - Technology, Programming & Applications by Mikell P. Grover, Weiss, Nagel and Ordef , Published by Mc-Graw Hill International Edition.
5. A Robot Engg. Test Book - Mohsen Shahinpoor, Harper & Low, Publishing New York.
6. Robotic Engineering – An Integrated Approach : Richard D.Klafter, Thomas A. Chmielewski and Michael Negin PHI 1989.
7. Foundations of Robotics Analysis and Control - Tsuneo Yashikawa MIT Press 1990, Indian Reprint 1998.
8. Robots and Control - R.K.Mittal and I.J.Nagrath - Tata McGraw Hill 2003

Note:

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2. The use of scientific calculator will be allowed in the examination. However, programmable calculator and cellular phone will not be allowed.

AER-444 B AIR TRANSPORTATION AND AIRCRAFT MAINTENANCE						
B. TECH. SEMESTER – VIII AERONAUTICAL ENGG.						
L	T	P	Credits		Class Work	: 25 Marks
3	1	--	4		Examination	: 75Marks
					Total	: 100 Marks
					Duration of Examination	: 3 Hours

UNIT-I

AIR TRAFFIC CONTROL: Principles of Air Navigation and Air Traffic Control, Overview of CNS & ATM, Separation standards, Radar and Non-radar separation, wake turbulence longitudinal separation minima, Precision approaches for landing, Radar systems for ATC

AIRLINES: Introduction to airline industry and economics, determination of operating costs, Airline route selection and scheduling, planning of flight operations, special topics in airline operations, Emergence of LCC.

UNIT-II

AIRPORTS: Aircraft characteristics affecting airport design, Airport layouts and configurations, Geometric design of the airfield, Wind Rose Diagram, Geometric design of the airfield,

CURRENT ISSUES AND TRENDS IN AIR TRANSPORTATION: Modeling & Simulation of ATC systems, Estimation of airway Capacity & Delay, Human Factors and Controller Workload, Performance Based Navigation, Free Flight, Conflict Detection and resolution, Environmental effects of Aviation, Modeling air transport systems.

UNIT-III

MAINTENANCE SCHEDULES: Maintenance of aircraft, its components, systems and sub-systems. Types of maintenance schedules, Mandatory schedules, Inspection of aircraft and components: Types of Inspections, Various Aircraft Manuals, Service Letters, Service Bulleting, Advisory Circulars, Repair, Modifications, Alteration, Reconditioning, History Record Sheet

UNIT-IV

MAINTENANCE OF STRUCTURE AND VARIOUS SYSTEMS: Maintenance of aircraft structure, propeller, power-plant, undercarriage, hydraulic system, fuel system, air-conditioning system

AIRCRAFT ASSEMBLY AND RIGGING: Aircraft Assembly, Rigging, Alignment of fixed surfaces and flight controls and systems in details, balancing, Inspection and Maintenance, Flight control system of Helicopter.

Suggested Readings:

1. Aircraft Maintenance and Repair :Kroes et.al GLENCOE ,1993
2. Aircraft Basic Science :Kroes et.al.
- 3 Fundamentals of Air Traffic Control, 4th Edition, Michael S. Nolan, Thomson /Cole, USA, 2004.
- 4 An Introduction to Airline Economics, 6th Edition, William E. O'Connor, Greenwood Group, 2001.
- 5 Planning and Design of Airports, 4th Edition, Robert Horonjeff & Francis X. McKelvey, Mcgraw Hill Professional Publishing, 1993.
- 6 Airline Route Planning, John H. H. Grover, BSP Professional Books, Blackwell Scientific Publications, Oxford, UK, 1990.
- 7 Air Transportation: A Management Perspective, 6th Edition, John G. Wensveen, Ashgate Publishing, Ltd., UK, 2007.

ME 446B MODERN MANUFACTURING PROCESSES						
B. Tech. Semester – VIII (Mechanical Engineering)						
L	T	P	Credits		Class Work	: 25 Marks
4	-	--	4		Examination	: 75 Marks
					Total	: 100 Marks
					Duration of Examination	: 3 Hours

UNIT I

Limitations of conventional manufacturing processes, Need of unconventional manufacturing processes, Classification of Modern Manufacturing Processes and its future possibilities.

ULTRASONIC MACHINING- Introduction, Basic Principle of USM, Elements of Process, tool feed mechanism, cutting tool system design, effect of parameters on MRR, economic considerations, applications, limitations of the process, advantages and disadvantages.

ABRASIVE JET MACHINING- Process description, features of AJM, Parameters in AJM, metal removal rate (MRR) in AJM. Advantages, limitations and Practical applications of AJM. Water Jet Machining- Jet cutting equipments, process details,

UNIT II

CHEMICAL MACHINING, basic technique of chemical machining, Mechanism of metal removal, process variables, advantages and applications .Electrochemical machining, principle of ECM process, ECM process detail, chemical reactions in ECM, tool work gap, process variables and characteristics in ECM, advantages, disadvantages and application of ECM .Electrochemical Grinding - Material removal, surface finish, accuracy, advantages, applications.

UNIT III

THERMAL SPARK EROSION PROCESSES: Electric Discharge Machining (EDM) or spark erosion machining processes, practical aspects of spark erosion machining, mechanism of metal removal, spark erosion generators, electrode feed control, dielectric fluids, flushing, electrodes for spark erosion, selection of electrode material, tool electrode design, surface finish, machining accuracy, machine tool selection, applications. Wire cut EDM. Advantages and disadvantages of spark erosion machining.

Laser beam machining (LBM)- Introduction, lasing process, Laser machining system, Thermal effect on workpiece, calculation of MRR, description of laser drilling machine, cutting speed and accuracy of cut, advantages and limitations.

UNIT IV

PLASMA ARC MACHINING (PAM): introduction, non thermal generation of plasma types of plasma arc , the stabilized arc, mechanism of plasma torch, , mechanism of metal removal, PAM parameters, equipments for D.C. plasma torch unit, safety precautions, economics, other applications of plasma jets.

ELECTRON BEAM MACHINING (EBM) – Description of the process, need for high vacuum in EBM, process parameters in EBM. Advantages and disadvantages of EBM. Electron beam welding.

Text Books:

1. Advanced Machining Processes by V.K. Jain. Allied Publishers Pvt Ltd
2. Modern Machining Methods by Adithan, Khanna Publishers
3. Modern Machining Processes by P.C. Pandey and H.S. Shan. Tata McGraw - Hill
4. Advanced Methods of Machining by J. A. Mcgeough, Springer
5. Non-Traditional Manufacturing Process by Benedict, CRC pub.
6. Unconventional Manufacturing Process by M K Singh, New Age Publishers
7. Nonconventional manufacturing by P. K. Mishra, Narosa Publishers

Note:

1. In the semester examination, the examiner will set two questions from each unit (total 08 questions in all), covering the entire syllabus. The students will be required to attempt only 5 questions selecting at least one question from each unit.
2. The use of scientific calculator will be allowed in the examination. However, programmable calculator and cellular phone will not be allowed.

AER-448 B WIND ENERGY CONVERSION						
B. TECH. SEMESTER – VIII AERONAUTICAL ENGG.						
L	T	P	Credits		Class Work	: 25 Marks
3	1	--	4		Examination	: 75Marks
					Total	: 100 Marks
					Duration of Examination	: 3 Hours

UNIT-I

INTRODUCTION: History of wind power technology, wind resources, economic viability, experience in Europe and America , The Indian experience, factors in favor of wind energy, environmental effects.

UNIT-II

CLASSIFICATION OF WIND MACHINES: Types of wind energy collectors: horizontal axis rotors; Head on, Fixed pitch and variable pitch blade rotors, cross wind. Vertical axis rotors; Savonius type and its variants, Darrieus type, lift based devices and drag devices

SOME CASE STUDIES: Description of various types of wind energy conversion systems (WECS) in use through their design features from 1kW range onwards. Considerations of complexities getting in to the design and operation with increase in size and power output.

UNIT-III

APPLICATIONS: Stand alone system; water pumping, direct heating and electric generation applications. Wind energy farms; Grid connected mode ,hybrid mode.

WINDMILL SITING: Wind histories, wind characteristics, power in wind stream, recording wind streams, wind rose, choice of site.

UNIT-IV

PERFORMNCE OF WIND MACHINES: Power extraction from the wind stream, Ideal power coefficient, Typical performance curves for various types, maximum power coefficients, speed-torque curves, power density of a wind stream, ducted system, vortex generator.

SYSTEM DESIGN: Objectives, power requirements, wind availability, type and size of WECS required, cost of energy delivered, WECS viability, system characteristics, system requirements, system evaluation, design optimization, wind system design synthesis.

BOOK:

1. Wind Machines: Frank R Eldridge, Van Nostrand Reinhold 1980.

REFERENCES:

1. Wind Energy Systems: Conference proceedings of Fourth International Symposium on Wind Energy Systems Vol 2