SANJAY GHODAWAT UNIVERSITY KOLHAPUR

Sanjay Ghodawat University (SGU) is established in the Academic Year 2017-18, as a State Private University under Govt. of Maharashtra Act No. XL of 2017 dated 3rd May 2017, with the approval of the UGC and the state Government. "For the true measure of giving is giving without measure." Spread across 150 Acres, Sou. Sushila Danchand Ghodawat Charitable Trust's Sanjay Ghodawat University (SGU) is situated in serene atmosphere amidst idyllic hills and lush green meadows to study in harmony with Nature. The Institution aspires to run along the lines of best-in- the-world education and become a world-class institution where teaching-learning process gets a far deeper meaning. SGU always stands as the guiding star of brilliance, quality and deliverance beyond expectations. Innovativeness and Creativity are the hallmarks of a genius enterprise and SGU stands to be a stage where these qualities would be nurtured, encouraged and blossomed. The genius is incomplete without the sense of social responsibility and SGU's ultimate goal remains the development of an attitude of gratitude that freely gives back without expectations.

The Sanjay Ghodawat University stands as a beacon of light to guide the younger generation of the day on the right path to fulfilment in career and life. The USP of the University is its research based curriculum and academically oriented teaching staff. The world class ambience and infrastructure helps the students to easily accommodate themselves in an environment that is conducive to the teaching- learning process. Hands on experience, challenge based case studies, maximum participation of students in the classroom, use of modern digital technology, smart classrooms, solution oriented thinking promotion, stress on research and innovation, international tie ups, choice based credit system for flexibility in choosing areas of interest etc. are some of the features of the University.

The university will help students develop as a unique individual-to be educated as a whole person, intellectually, emotionally, socially, ethically, and spiritually. The educational program designs are worked out meticulously in line with best in class universities with special focus on:

- Flexible Choice Based Credit System
- OBE - Outcome Based Education System
- Experiential Learning
- Project Based Learning

- Case Based Learning
- Training need analysis based on Performance Appraisal System
- Active Learning tools for effective delivery
- Mentoring / Proctorship
- On line learning /Self learning platforms
- Flipped Classroom concept
- Effective Student Feedback Mechanism

VISION

Internationally recognized university of excellence in creating and disseminating knowledge through value-based quality education leading to betterment of mankind.

MISSION

- To prepare students for life-long learning and leadership in a global academic culture
- To create intellectual manpower relevant to the industry and society at large
- To collaborate with institutions of international repute for academic excellence
- To promote research and development through conducive environment
- To encourage entrepreneurship and skill development programs

CORE VALUES

- Integrity
- Transparency
- Accountability
- Equality
- Empathy
- Stewardship

QUALITY POLICY

Sanjay Ghodawat University is committed to establish high standards in value-based quality education to enhance and nurture young minds to excel in their chosen profession and develop into socially responsible citizens through resourceful collaboration, innovation and research

CHOICE BASED CREDIT SYSTEM (CBCS)

The credit based semester system provides flexibility in designing curriculum and assigning credits based on the course content and hours of teaching. The choice based credit system provides a 'cafeteria' type approach in which the students can take courses of their choice, learn at their own pace, undergo additional courses and acquire more than the required credits, and adopt an interdisciplinary approach to learning.

University Grants Commission has come up with the Choice Based Credit System (CBCS) programme in which the students have a choice to choose from the prescribed courses, which are referred as core, elective or minor or soft skill courses and they can learn at their own pace and the entire assessment is graded-based on a credit system. The basic idea is to look into the needs of the students so as to keep up-to-date with development of higher education in India and abroad. CBCS aims to redefine the curriculum keeping pace with the liberalization and globalization in education. CBCS allows students an easy mode of mobility to various educational institutions spread across the world along with the facility of transfer of credits earned by students.

Where the students can choose the prescribed courses, as the core, and elective or soft skill courses, from a range of options, rather than to simply consume what the curriculum offers. They can learn at their own pace and the assessments are graded based on a credit system. It provides an opportunity for students to have a choice of courses or subjects within a programmed resembling a buffet, against the mostly fixed set of subjects now being offered (except for the limited choice of electives in professional degrees and postgraduate programmers) with the flexibility to complete the programmed by earning the required number of credits at a pace decided by the students.

The UGC has always initiated measures to bring efficiency and excellence in the Higher Education System of India. The basic motive is to expand academic quality in all aspects, right from the curriculum to the learning-teaching process to examination and evaluation systems. However, so far multiple methods are followed by different universities across the country towards examination, evaluation and grading system. Considering this diversity, the implementation of the choice based credit system seems to be a good system in assessing the overall performance of a student in a universal way of a single grading system.

OUTCOME BASED EDUCATION (OBE) MODEL

Sanjay Ghodawat University (SGU) has implemented OBE model of education, which is a learner centered approach. SGU has witnessed a sea change in the entire academic systems with implementation of all three components of OBE – Design, Delivery and Assessment. The SGU model of autonomy focuses on experiential learning which believes in learning by doing. This is achieved through hands on experience, industrial assignments, mini projects and live problem solving and collaboration with industries.

SGU is set in to dynamics of transformation and witnessing a shift in focus from teaching to learning and entire academic system of SGU is designed to provide multiple learning opportunities for students to acquire and demonstrate the Knowledge, Skills and Attitudes (KSA) for rewarding career.

The Vision and Mission of the Management, contribution from eminent BOG members and knowledgeable members of Academic Council and Board of Studies, the motivation and drive of the Director, the relentless efforts of the fellow Deans and Head of Departments and all teaching and non teaching staff along with commitment to learning of students made it possible to successfully transform the institute and stand out to carve a niche for itself as an Institute of repute.

OBE is an approach of curriculum design and teaching that focuses on what students should be able to do (attained) at the end of course/ program. Outcome based education (OBE) is student-centered instruction model that focuses on measuring student performance through outcomes. Outcomes include knowledge, skills and attitudes (KSA). Its focus remains on evaluation of outcomes of the program by stating the knowledge, skill and behavior a graduate is expected to attain upon completion of a program and after 4 – 5 years of graduation. In the OBE model, the required knowledge and skill sets for a particular degree is predetermined and the students are evaluated for all the required parameters (Outcomes) during the course of the program.

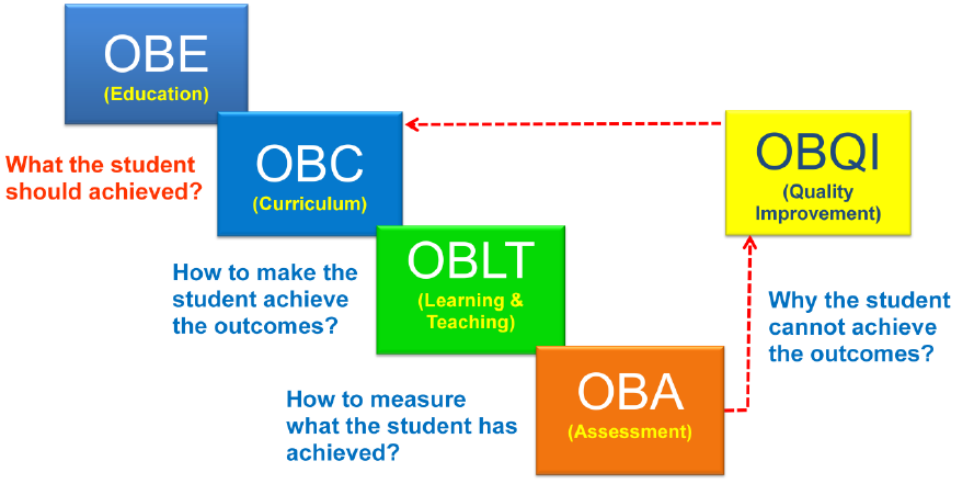
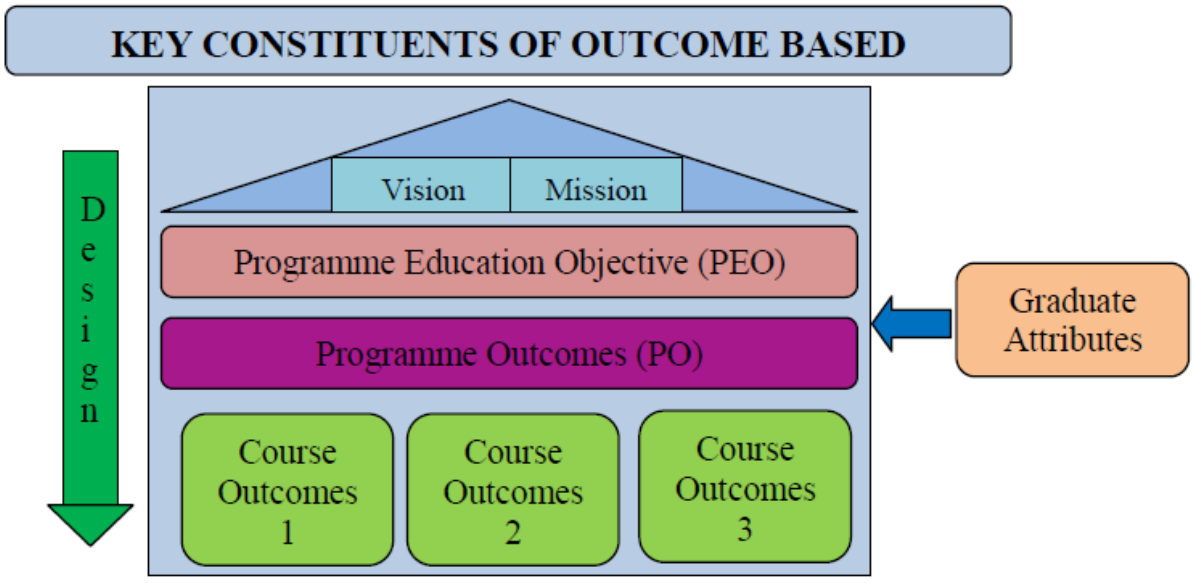


Figure 1: OBE flows and desciption



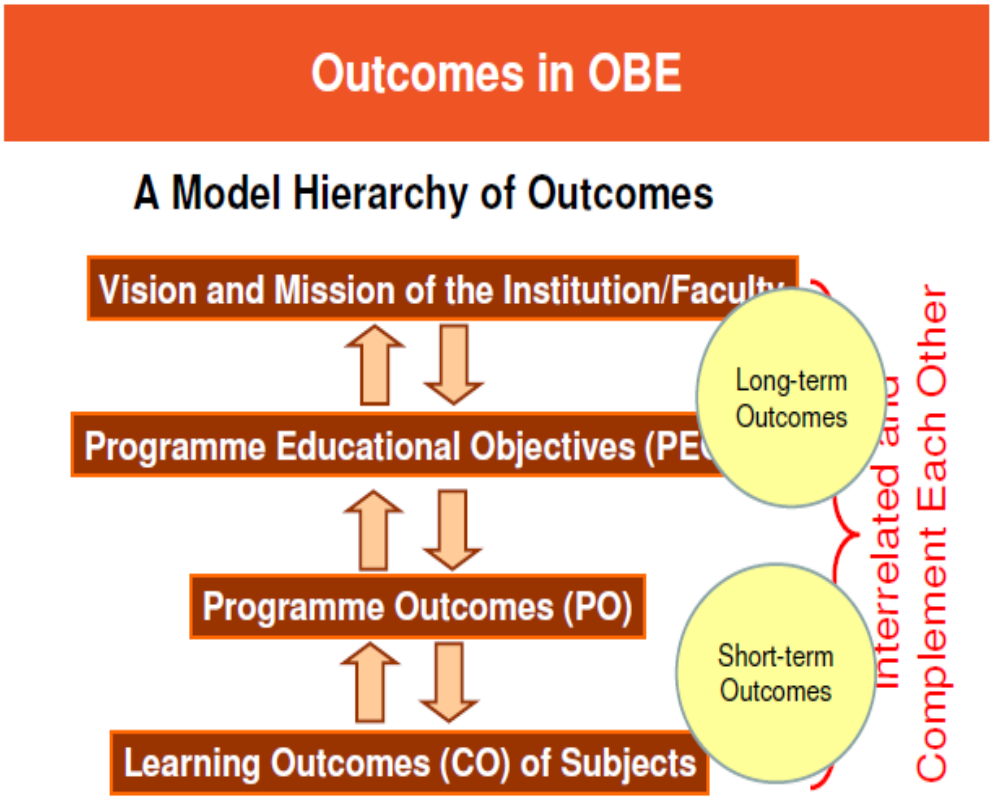
The OBE model measures the progress of the graduate in three parameters, which are

- Program Educational Objectives (PEO)
- Program Outcomes (PO)
- Course Outcomes (CO)

Program Educational Objectives (PEO) are broad statements that describe the career and professional accomplishments that the program is preparing the graduates to achieve. PEO's

are measured 4-5 years after graduation. Program outcomes are narrower statements that describe what students are expected to know and be able to do by the time of graduation. They must reflect the Graduate attributes. Course outcomes are the measurable parameters which evaluates each students performance for each course that the student undertakes in every semester.

The various assessment tools for measuring the Course Outcomes include Tests and End Semester Examinations, Tutorials, Assignments, Project work, labs, Presentations, Employer or Alumni Feedback etc. These course outcomes are mapped to Graduate attributes and Program outcomes based on relevance. This evaluation pattern helps Institutions to measure the Program Outcome. The Program Educational Objective is measure through Employer satisfaction survey (Yearly), Alumni survey (Yearly), Placement records and higher education records.



Special Features of OBE

- OBE is an educational process that focuses on what students **can do** or the **qualities** they should develop after they are taught.
- OBE involves the restructuring of curriculum, assessment and reporting practices in education to reflect the achievement of high order learning and mastery rather than accumulation of course credits.
- Both structures and curricula are designed to achieve those **capabilities** or **qualities**.
- Discourages traditional education approaches based on direct instruction of facts and standard methods.
- It requires that the students demonstrate that they have learnt the required skills and content.

Sanjay Ghodawat University Kolhapur

(Established as a State University under Government of Maharashtra Act No XL dated 3rd May 2017)

Academic and Examination Rules and Regulations

Approved in the second Academic Council Meeting held on 9th May, 2018 and to be implemented from academic year 2018-19. [Version R0]

Sanjay Ghodawat University Kolhapur

Kolhapur - Sangli Highway, A/p Atigre - 416 118,
Tal. - Hatkanangale, Dist. Kolhapur,
Maharashtra, India

(Implemented from Academic year 2018-19)

Academic and Examination Rules and Regulations

1.0 Preamble

The Sanjay Ghodawat University (SGU) stands for quality and excellence. It aims at nurturing the young talent and grooming them into responsible citizen and a value added human resource. Outcome Based Education (OBE) model is adopted to enhance the effectiveness of teaching learning process and Credit Based semester system is implemented.

The focus of the University is its research based curriculum and academically oriented teaching staff. The world class ambience and infrastructure helps the students to easily accommodate themselves in an environment that is conducive to the teaching- learning process. Hands on experience, challenge based case studies, maximum participation of students in the classroom, use of modern digital technology, smart classrooms, solution oriented thinking promotion, stress on research and innovation, international tie ups, choice based credit system for flexibility in choosing areas of interest etc. are some of the features of the University.

Vision of SGU is internationally recognized university of excellence in creating and disseminating knowledge through value-based quality education leading to betterment of mankind. To achieve the vision SGU has developed state-of-the-art infrastructure that promotes conducive ambience promoting innovation and research. Create intellectual manpower relevant to the industry and society at large. Foster mutually beneficial partnership with alumni, industry and academia. Inculcate ethics and values to develop socially responsible citizens and promote entrepreneurship.

SGU is offering various programs through schools such as School of Technology, School of Commerce and Management, School of Sciences and School of Arts.

SGU has implemented the outcome-based Education (OBE) system and Credit based Evaluation System in all the schools.

The rules and regulations mentioned in this document are applicable to all the Under Graduate (UG) and Post Graduate programs offered by the Sanjay Ghodawat University from the academic year 2018-19. The rules and regulations stated under here are subject to revisions / refinements, updates and modifications and amendments by Academic Council (AC) from time to time and applicable to all batches including those already undergoing programs in different year and are binding on all stakeholders including students, faculty, parents and University authorities.

The academic programs of the University shall be governed by rules and regulations approved by the Academic Council from time to time. Academic council is the supreme and statutory academic body that governs all academic matters of the university and the decisions of the academic council are final and binding in the matters related to academics.

2.0 Definition of Terms

1. University: University means Sanjay Ghodawat University, Kolhapur
2. Academic Year: The period of the year during which students attend university for all academic activities, usually it starts from first of July and ends on 30th of June next year.
3. **Semester:** Academic Year is divided in to 2 parts called Semester, Odd Semester which starts from July and Even Semester which starts from January.
4. **Duration of Semester**: Total duration of semester is usually 20weeks per semester including instructions, examination and evaluation. Total instructional days are 90 per semester.
5. **Course:** It is a Subject that is in a semester. The course may consist of Theory/Practical/Project/Seminar during semester. Usually taught by instructor in a class. e.g. Physics, Chemistry, Engineering Mechanics, Workshop etc.
6. **Program:** Collection of Courses is called Program. B Tech in Mechanical Engineering,
7. M Tech in Civil Engineering, Bachelor of Business Administration. Bachelor of Science etc.
8. **Department:** Department is a unit of the school which offers one or more programs.
9. **Contact Hours:** Time of students in class/laboratory with instructor. Usually in the range of 26-30 Hrs./Week. For the purpose of uniformity one contact hour is measured as 60 minutes
10. **Academic Council (AC):** Means apex academic body governing the academic programs responsible for framing policy, rules and regulations.
11. **Board of Examination (BOE):** Central body responsible for framing policy ,rules and regulations for Examination.
12. **Board of Studies (BOS):** Departmental academic body to govern the academics of programs(BOS)offered by department.

3.0 Curriculum:

3.1. Curriculum:

Every program has a prescribed structure which, in general, is known as Curriculum. It prescribes courses to be studied in each semester. The booklet containing courses structure along with detail syllabus for each course of each

program is updated periodically and made available on the website.

3.2. Semesters:

SGU implements a credit based semester system. The academic year is divided into two regular semesters. The semesters that begin in July are known as Odd semester and the semester that begin in January are known as Even semesters. Total duration of each semester is generally of 20 weeks including the period of examination, evaluation and grade declaration.

3.3. Course Credit System/Structure:

In general, a certain quantum of work measured in terms of credits is laid down as the requirement for a particular program. Calculation of number of credits for a course in any semester is as per Table 3.1

Table 3.1: Calculation of number of credits for a course

Sr. No.	Course	Credits
1	Lecture of 1 hour/week	**1**
2	Tutorial of 1 hour/week	**1**
3	Practical / Laboratory / Drawing/mini-project of two hours/ week	**1**
4	Seminar (1 hour per week)	**1**

There are mainly two types of courses- viz. Theory courses and Laboratory courses. Generally a theory course consists of Lecture hours (L) and Tutorial hours (T). Tutorial hours may not be assigned to a particular theory course if it has a separate laboratory course. Laboratory course consists of practical hours (P) for which a student works in a Laboratory/Drawing Hall/Workshop. The other courses required to be taken by a student include seminar, mini project, and project at various levels of the program.

A student shall earn credits for a particular course by fulfilling the minimum academic requirements for attendance and evaluation. No credits shall be awarded if a student satisfies the minimum attendance requirements but fails to meet minimum evaluation requirements.

The total number of credits required for completing a program shall be mentioned in the course structure. The total number of credits in a semester which a student

registers shall generally be 20-25. The maximum number of credits per semester shall not exceed 30

3.4 Audit Course:

3.4.1 A student may have to register for an audit course in a semester which could be institute requirement or department requirement.

3.4.2 An audit course may include either a) a regular course required to be done as per structure or required as pre-requisite of any higher level course or b) the programmes like practical training, industry visits, societal activities etc.

3.4.3 Audit course shall not carry any credits but shall be reflected in Grade Card as "PP"/"NP" depending upon the satisfactory performance in the semester evaluation as per the course curriculum structure.

4.0 Course Registration:

4.1 Every student must register for the courses that he/she wants to study for earning credits at the beginning of each semester on the prescribed dates announced from time to time and shall be mandatory for every student till he/she completes the program. Only after registration his/her name shall appear in the roll list of each of such courses.

4.2 Students shall be required to fill up a Course Registration Form which shall be made available to them by the Student section of Administration office after payment of required fees.

4.3 Registration, according to rules, should be carried out as per the schedule given in academic calendar. Late registration may be permitted only for valid reasons and on payment of late registration fees. In any case, registration must be completed before the prescribed last date for registration, failing which his/her studentship shall be liable to be cancelled. Students having dues outstanding towards the institute or hostel shall be permitted to register only after clearing such dues.

4.4 In-absentia registration may be allowed only in rare cases at the discretion of the Dean Academics and with prior permission.

4.5 For registration in an odd semester, the student must have earned all the credits of the pre-previous year and at least 2/3rd credits of the previous year. For example, for registration of the 5^{th} semester courses (i.e. 3^{rd} year of program), a student must have earned all the credits of the first year and 2/3rd credits of the second year. Similarly, for registration of the 7^{th} semester courses (i.e. 4^{th} year of program), a student must have earned all the credits of the second year and 2/3rd credits of the third year. However, if 2/3rd calculation turns out to be a mixed number (integer + fraction) then only the integer part of that number shall be considered for taking decision related with this clause.

4.6 A student registered in odd semester shall be eligible to register for the courses offered in the even semester of that year irrespective of his/her SGPI or the number of credits earned by him/her in that odd semester.

5.0 Lateral Entry For B.Tech Programs

Post diploma students in engineering and B.Sc. Graduates can have lateral entry at third semester of the program. Such admissions are governed by the rules of regulatory bodies like AICTE New Delhi and Directorate of Technical Education Maharashtra state and Sanjay Ghodawat University for Admission criteria and shall undergo all academic requirements as specified by the Academic council.

For such students there shall not be First Year Performance Index (FYPI). Semester Performance Index (SGPI) and Cumulative Performance Index (CGPI) shall be calculated from the third semester onwards taking into consideration the courses undergone by them at Sanjay Ghodawat University Kolhapur.
Registration of the students not covered by the cases mentioned above shall be decided by the Academic Council. Such students shall undergo the academic program as specified by the Academic Council. Such odd entry students shall not be eligible for any medals or awards instituted by the institute.

6.0 Change of Program:

This is applicable to B Tech Program only. Students shall be eligible to apply for Change of Program after completing the first two semesters. The following rules/ guidelines shall be used for considering their applications for change:

6.1 The change of program shall be permitted strictly on merit basis subject to the rules of admissions prevailing at the time of such change.

6.2 Students without fail grades and/or backlogs shall be eligible to apply for change of program and can give their choices in the order of preference.

6.3 The request for change of program by a student from program A to program B shall be considered if number of students of program B does not exceed the sanctioned capacity of program B and also the minimum strength required to run the program as decided by Academic Council.

6.4 All such transfers can be effected only once at the beginning of the second academic year of the 4-year UG program. No application for change of program during subsequent academic years shall be entertained.

7.0 Facilitation to Students:

7.1 Faculty Advisor:

On joining the institute, a student or a group of students shall be assigned to a faculty advisor who shall be mentor for a student throughout his/her tenure in the institute. A student shall be expected to consult the faculty advisor on any matter relating to his/her academic performance and the courses he/she may take in various semesters / summer term. A Faculty advisor shall be the person to whom the parents/guardians should contact for performance related issues of their ward. The role of a faculty advisor is as outlined below:

The role of the Faculty Adviser is outlined below:

a. Guide the students about the rules and regulations governing the courses of study for a particular degree.
b. Advise the students for registering courses as per curriculum given. For this purpose the Faculty Adviser has to discuss with the student his/her academic performance during the previous semester and then decide the number and nature of the courses for which s/he can register during the semester as per the curriculum.
c. Approve the registration of the students.
d. Advice students to overload/ drop one or more courses/activities based on her/his academic performance as per the prescribed rules.
e. At the end of the first semester/year, the Faculty Adviser may even advise a reduced load program for a poorly performing student.
f. Pay special attention to weak students and carefully monitor performance of students recommended for slow track option.
g. Advice students for Course Adjustment / Dropping of courses during the Semester within the stipulated time frame given in the Academic calendar.
h. Advice students seeking semester drop either during the ongoing semester or before the commencement of the semester. FA has to ensure strict compliance of rules and regulations laid down for this purpose. Recommend the cases to the appropriate authorities for consideration.
i. Make revised plan of study for weak/bright students based on their semester wise performance.
j. Suggest modalities for course/credit requirements for the students recommended for exchange program.
k. Guidance and liaison with parents of students for their performance.
l. To ensure that students are not permitted to re-register for courses, which they have already passed.
m. Inform students that any academic activity (course / Lab. / seminar / project / noncredit requirement etc.) undergone without proper registration will not be counted towards the requirements of his/her degree.
n. Strictly warn students that if she/he fails to register during any semester without prior approval, his/her studentship is liable to be cancelled.

- Keep the students updated about the Academic Administration of the University.

7.2. Helping Weaker Students:

A student with backlog/s should continuously seek help from his/her faculty advisor, Head of the Department and the Dean of respective schools. Additionally, he/she must also be in constant touch with his/her parents/local guardians for keeping them informed about academic performance. The university also shall communicate to the parents/guardians of such student at least once during each semester regarding his/her performance in in-in various tests and examination and also about his/her attendance. It shall be expected that the parents/guardians too keep constant touch with the concerned faculty advisor or Head of the Department, and if necessary - the Dean of the respective school.

8.0 Discipline and Conduct:

8.1 Every student shall be required to observe discipline and decorous behavior both inside and outside the campus and not to indulge in any activity, which shall tend to bring down the prestige of the university.

8.2 Any act of indiscipline of a student reported to the Dean, Student Development, shall be discussed in a Disciplinary Action Committee of the institute. The Committee shall enquire into the charges and recommend suitable punishment if the charges are substantiated.

8.3 If a student while studying in the university is found indulging in anti-national activities contrary to the provisions of acts and laws enforced by Government he/she shall be liable to be expelled from the institute without any notice.

8.4 If a student is involved in any kind of ragging, the student shall be liable for strict action as per provisions in the Maharashtra anti-ragging act.

8.5 If any statement/information supplied by the student in connection with his/her admission is found to be false/ incorrect at any time, his/ her admission shall be cancelled and he/she shall be expelled from the university and fees paid shall be forfeited.

8.6 If a student is found guilty of malpractice in examinations then he/she shall be punished as per the recommendations of the Grievance Redressed Committee (CRC) constituted by Board of Examinations.

8.7 Every admitted student shall be issued photo identification (ID) card which must be retained by the student while he/she is registered at Sanjay Ghodawat University Kolhapur. The student must have valid ID card with him/her while in the University Campus.

8.8 Any student who alters or intentionally mutilates an ID card or who uses the ID card of another student or allows his/her ID card to be used by another, student shall be subjected to disciplinary action.

8.9 The valid ID card must be presented for identification purpose as and when demanded by authorities. Any student refusing to provide an ID card shall be subjected to disciplinary action.

8.10 Students should switch off the Mobiles during the Instructional hours and in the academic areas of university Building, Library, Reading room etc. Strict action will be taken if students do not adhere to this.

8.11 During the conduct of any Tests and Examination students must not bring their mobiles. A student in possession of the mobile whether in use or switched off condition will face disciplinary action and will be debarred from appearing for the Test / Examination.

9.0 Academic Calendar

The academic activities of the institute are regulated by Academic Calendar and is made available to the students/ faculty members and all other concerned in electronic form or hard copy. It shall be mandatory for students / faculty to strictly adhere to the academic calendar for completion of academic activities

10.0 Attendance:

10.1 Regular 100% attendance is expected from all students for every registered course in lectures, tutorial, laboratory, projects, mini-projects and other courses mentioned in program curriculum. Hence, attendance is compulsory and shall be monitored during the semester rigorously. Students shall be informed at the end of every month if they are failing short of attendance requirements.

10.2 A Maximum of 25% absence for the attendance may be permitted only on valid grounds such as illness, death in family of blood relations (Father, Mother, Sister, and Brother) and any other emergency reason which is beyond the control of the student and shall be approved by the authorities in respective departments.

10.3 If a student fails to put up 75% attendance individually in each course, the student will be put under X grade category and student will be debarred form attending the End Semester Examination (ESE) and Re-Exam for that semester in that course. However, student has an option to re-register for the course whenever it is offered next time or he can appear for 100% examination for which he will be awarded two grade penalties. Student's FET, CAT1 and CAT2 marks are treated as null and void.

10.4 The maximum number of days of absence for students participating in Co-curricular activities /Sports/ Cultural events during a semester shall not exceed 10. Any waiver in this context shall be on the approval of the Academic council only after the recommendation by Dean Academics of the university

The HOD and Dean of the respective school shall report and recommend to Academic council the cases of students not having 75% attendance as per the records of course instructor. After rigorously analyzing these cases AC may take a decision to debar such

student from End-Semester Examination (ESE) for that course. Such a student shall re-register for that course as and when it is offered next. ISE and MSE evaluations of such a student for this course during regular semester shall be treated as null & void.

10.5 A student remaining absent during ESE of a course either on medical ground (Accident and/or hospitalization of a student) or any other emergency circumstances (death of immediate close relative i.e. father, mother, brother and sister) or due to representing University at university/state level in sports/co-curricular activities shall be treated as per the rules of Sec 12.6.2 and 11.1.2

The critical cases of absenteeism which are not covered by any of the above clauses shall be reported by concerned Head of Department to Academic dean and all such cases the decision of Academic council is final.

11.0 Modes of Assessment:

11.1Assessment of Theory Courses:

11.1.1 A student shall be evaluated for his/her academic performance in a theory course through Faculty Evaluation Theory (FET), Continuous Assessment Tests (CAT1 and CAT2) and End Semester Examination (ESE).

11.1.2 The relative weightage for the theory courses having ESE shall be generally as shown in the Table 11.1.2

Table 11.1.2: Weightage for the theory courses in %

FET	CAT1	CAT2	ESE
20	15	15	50

The details of the weightage of each course shall be listed in the structures of each program.

11.1.3 FET shall be based on student's performance in assignments, quizzes, seminars, Course projects and field assignments, term papers, etc. The mode of FET shall be decided and announced by the Course Instructor at the beginning of the course.

11.1.4 CAT1 shall generally be of one hour duration for each course and shall be held as per the schedule declared in the Academic calendar for that Semester. The test will be based on first two units of the course.

11.1.5 CAT2 shall generally be of one hour duration for each course and shall be held as per the schedule declared in the Academic calendar for that semester based on unit 3 and unit 4 of the syllabus.

11.1.6 ESE is of three hours comprehensive examination having the weightage of 60% for unit 5 and 6 and 40% to unit 1 to unit 4. It is of 100 marks

11.1.7 All examinations and evaluations shall be compulsory. Credits for a course shall be awarded only if a student satisfies evaluation criteria and acquires the necessary minimum grade.

11.1.8 There shall be no re-examination for CAT1 and CAT2 of the courses having all the three components of evaluation viz. FET, CAT1 CAT2 and ESE. However, a student remaining absent for CAT1 and CAT2 for representing the institute in state level or university level sports/co-curricular activities (on prior recommendation and approval from) or on valid grounds such as illness, death in family or other emergency reason which is beyond control of a student (on approval by the head of department and dean of respective school shall be considered for Make- up examinations.

11.1.9 A student remaining absent for ESE of a course either due to medical reason (Accident and/or hospitalization of a student) or other emergency circumstances (death of immediate close relative i.e. father, mother, brother and sister) or due to representing college at university/state level in sports/co-curricular activities shall be awarded with grade "I". Such a student shall be allowed to appear for make-up examination scheduled along with re-examinations of other courses. The student shall apply to COE with proper documentary evidence to appear for make-up examination. After make-up examination, a student shall be entitled to an appropriate grade as per Table I of Sec. 10.1.2 based on his/her performance during the regular semester and in make-up examination.

11.2 Assessment of Laboratory Courses:

11.2.1 The assessment of laboratory course shall be continuous and based on turn-by-turn supervision of the student's work and the quality of his/her work as prescribed through laboratory journals and his/her performance in viva-voce examinations uniformly distributed throughout the semester. Where ESE for the laboratory course is specified ESE shall be based on performing an experiment followed by an oral examination. The relative weightage for FEP and ESE for assessment of laboratory courses shall be 50% each for FEP and ESE and a minimum performance of 40% in both ISE and ESE separately shall be required to get the passing grade.

11.2.2 ESE for laboratory course shall normally be held before the ESE for theory courses and shall be conducted by a panel of examiners appointed by COE from the panel of

experts approved by BOS. This activity shall be coordinated by Department Examination Coordinator (DEC) in consultation with HOD of the respective department.

11.2.3 Student failed in ESE of a laboratory course in a regular semester shall be eligible to appear for 100% examination conducted alongwith ESEs of laboratory courses of the subsequent semester. Such examination shall be fairly comprehensive (generally of 3 hours similar to POE i.e. Practical-Oral-Examinations) to properly judge his/her practical skill and theoretical knowledge for that laboratory course. He/She shall suffer one grade penalty.

12.0 The Grading System:

Absolute Grading System (AGS) is adopted based on absolute numerical marks obtained by the student during all stages of evaluation for a course.

12.1. Award of Grade (Regular Semester):

12.1.1For every course registered by a student in a semester, he/she shall be assigned a grade based on his/her combined performance in all components of evaluation scheme of a course as per the structure. The grade indicates an assessment of the student's performance and shall be associated with equivalent number called a grade point.

12.1.2The academic performance of a student shall be graded on a ten point scale. The Absolute Grading System is followed. Letter grades, the guidelines for conversion of marks to letter grades and their equivalent grade points are as given in Table

Table 12.1.2: Grade Table for Regular Semester

Marks Obtained	Grade Letter GL	Grade Point GP	Performance Description
90-100	**O**	**10**	Outstanding
80-89	**A+**	**09**	Excellent
70-79	**A**	**08**	Very Good
60-69	**B+**	**07**	Good
50-59	**B**	**06**	Above Average

45-49	**C**	**05**	Average
40-44	**P**	**04**	Pass
00-39	**F**	**00**	Fail
-	**Ab**	**00**	Absent
-	**X**	**00**	Detained (Failed)
-	**Satisfactory**	-	Pass in Non Credit Courses
-	**Un Satisfactory**	-	Failed in Non Credit Courses

12.1.3 A student shall pass the course if he/she gets any grade in the range "O" to "P".

12.1.4 “FF" grade shall be awarded to a student in a course if he/she gets less 40% jointly in the FET, CAT1, and CAT2 & ESE for a theory course and in PET & ESE for a laboratory course. A course shall then be eligible to apply for re-examination. A student failed in laboratory course shall be eligible to apply only for 100% examination conducted with the laboratory examinations of the subsequent semester. In both cases, a student has to suffer one grade penalty.

13 Assignment of X Grade

Grade "X" in a regular course shall be given to a student if he/she falls in any of the following categories.

13.1.1 A student does not maintain the minimum 75% attendance in any of the theory or laboratory courses.

13.1.2 A student has not completed most of the Evaluations like FET, CAT1 and CAT2 due to non-medical reasons (for example when a student has missed all or most of the components of internal evaluation conducted by the instructor in that semester).

13.1.3 The performance of a student is less than 40% in FET, CAT1 and CAT2 Combined.

13.1.4 A student is guilty of any academic malpractice during semester (Such cases shall be dealt by Grievance Redressed and Discipline Committee).

In above four cases grade "X" shall be declared one week before ESE and intimated to the Academic Office and COE immediately thereafter. Such a student shall not be permitted to take the ESE of that course.

13.1.5 Grade "X" may be given to a student if

13.1..5.1 A student eligible for ESE remains absent for ESE of a course with no written intimation to Exam Cell within four days after the respective ESE is over.

13.1.5.2 A student is guilty of any academic malpractice during examination. (Such cases shall be dealt by Grievance Redressal Committee).

In 13.1.5.2 grade "X" in that course shall be declared after Grievance Redressed Committee confirms the academic malpractice.

In above two cases when a student gets "X " grade in a course, then this shall be treated as "FF" for the purpose of calculation of Semester Performance Index (SGPI) and First Year Performance Index (FYPI) or Cumulative Performance Index (CGPI).

Following rules apply to the student who has obtained grade "X" in a regular semester:

13.1.6.1 A student obtaining grade "X" in a course in a regular semester or during examination shall be not be allowed to appear for End semester examination and also Re ESE conducted before the beginning of the next semester. His/her FET, CAT1 and CAT2 evaluations for all courses shall be treated as null and void. He/She needs to re-register for courses of that semester in the next academic year whenever they are offered and undergo all evaluations along with fresh regular students for which he will get one grade penalty.

13.1.6.2 Grade "I" shall be declared in a theory/laboratory course if a student has satisfactory performance FET, CAT1, CAT2 and has fulfilled the 75% attendance requirement, but has not appeared for ESE due to genuine reasons. Such students shall be eligible for the make-up examination of ESE only on medical grounds/valid reasons and on production of authentic medical certificate or other supporting document/s (as required by the University) to the COE within ten days after the respective examination is over. The application form with requisite amount of fees must be submitted to the Exam Cell before the last date of filling such application forms for make-up examinations. These examinations shall be based on 100% syllabus and shall be scheduled before the commencement of the subsequent semester for theory courses and along with ESEs of laboratory courses of the subsequent semester. A student with "I" grade when appears for the make-up examination shall be eligible to obtain a regular performance grade ("O" to "F") as per Table 11.1.2 depending on his/her overall performance in FET, CAT1 ,CAT2 and make-up examination. If a student fails to appear for make-up examination too, a grade "XX" shall be awarded to him/her. Thus "I" is only a temporary grade and shall be replaced by a valid grade only after make-up examination.

13.2 There shall be a few audit courses as per the policies of the institute or as decided by DPC of respective program. The grade "PP" (Passed)/ "NP" (Not Passed) shall be awarded for such courses depending upon the performance of a student evaluated by the faculty in-charge. No grade points shall be associated with these grades and performance in these courses shall be not taken into account in the calculation of the performance indices (SGPI, CGPI). However, the award of the degree shall be subject to obtaining a "PP" grade in all such courses.

13.3 Award of Grades for Re-Examination:

13.3.1 A student who has obtained grade "F" in regular semester shall be eligible to appear for re-examination conducted before the commencement of the next regular semester. In such cases FET, CAT1 and CAT2 marks are carried forward and a student has to suffer one grade penalty

13.3.2A student shall apply for re-examination before the last date of such application and shall appear for re-examination.

13.3.3 50% weightage similar to ESE shall be given to re-examination and there is one grade penalty.

13.3.4 A student who has obtained "F" grade in ESE of a regular semester and has not availed re-examination option or a student who has obtained "F" grade in both ESE and re-examination shall be eligible to choose one of the two options below to clear his/her backlog:

- Re-registration for the next regular semester course whenever that course is offered.
- Appearing for ESE of the course when conducted...
  A student detained in a regular semester due to either a) by obtaining "X" grade or b) by involvement in academic malpractice or c) by breaking the institute code of conduct and discipline can re-register for the course when offered next

Following rules apply for these cases:

13.4.1 In first case i.e. Re- registration the earlier performance of a student in all the evaluations of that course shall be treated as null and void. The student has to undergo all the evaluations after re-registration.

13.4.2 Grades for Third and Subsequent attempts:

If A student opts for ESE or Re ESE who previously had obtained grade "F" in a course in two attempts, his/her FET, CAT1 and CAT2 performance of the regular semester shall be considered for evaluation and he/she has to suffer two grade penalty for the third attempt and for 4th and subsequent attempts shall be awarded a grade "P" or "F" or "X" based on his/her performance.. However, if a student takes more than three chances (regular

examination being the first chance, re-examination being the second chance, to clear a course, then the maximum passing grade that he/she can get shall be only "P". Thus a student has to suffer a grade penalty by accepting a lower grade than that obtained in the regular examination, re-examination, or examination for a re-registered course.

14. CALCULATION OF PERFORMANCE INDICES:

14.1. Semester Grade Point Average (SGPA)

The performance of a student in a one specific semester is indicated by SGPA. SGPA is a weighted average of the grade points obtained in all courses registered by the students during the semester. SGPA can be calculated by following equation.

$$SGPA = S_i = \frac{\sum_{i=1}^{n} C_i P_i}{\sum_{i=1}^{n} C_i}$$

Where, i = 1,2,3…….n are number of courses during semesters. C = No of credits associated with that course and P = Grade point earned in that course. SGPA will be rounded off to two decimal places.

14.2 Cumulative Grade Point Average (CGPA)

The total cumulative performance of a student at the end of specific semester is indicated by CGPA. An up-to-date assessment of the overall performance of a student for the courses from the first semester onwards till completion of the program shall be obtained by calculating Cumulative Grade Point Average (CGPA).

CGPA is a weighted average of the SGPA obtained in all semesters by the students during the semesters. CGPA can be calculated by following equation.

$$CGPA = \frac{\sum_{j=1}^{n} C_j S_j}{\sum_{j=1}^{n} C_j}$$

Where, j = 1,2,3…….n are number of semester during program. C = Total No of credits in the semester for which CGPA is to be calculated.

CGPA will be rounded off to two decimal places.

Conversion of CGPA to percentage marks for CGPA ≥ 4.5 can be obtained using equations. Percentage marks = (CGPA x 10) – 7.5.

14.3For the students acquiring "I" grade (which is only a temporary grade) in any of the courses, SGPA, CGPA shall be calculated only after make-up examination.

14.4. First Year Performance Index (FYPI): (Applicable For B. Tech Programs Only)

14.2.1 For a student registered in Sanjay Ghodawat University Kolhapur right from the First semester, First-Year-Performance-Index (FYPI) shall be calculated as weighted average of the grade points obtained in all the courses registered by him/her in semesters I and II only.

$$\text{FYPI} = \frac{\sum_i C_i g_i}{\sum_i C_i}$$

Where summation is for all the courses registered by a student in first two semesters. FYPI shall be calculated when SPI for the second semester is calculated. FYPI shall be rounded off to two decimal places.

14.2.2 FYPI shall reflect all the courses undergone by a student in the first year including the courses in which he/she has failed. FYPI may get modified in the subsequent semesters whenever a student clears his/her first year backlog courses.

14.2.3If a student has been awarded "I" grade in the regular semester course of the first year then, FYPI shall be calculated after the make-up examination on the basis of the grade obtained by that student in a make-up examination.

14.2.4 If a student has obtained grade "F" or "X" at any time in any of the courses registered by him, then zero grade points corresponding to these grades shall be taken into consideration for calculation of FYPI.

15 Maximum Duration for Completing the Program

Maximum duration for completing any program UG/PG offered by Sanjay Ghodawat University is respective program duration plus two additional years.

Maximum duration for getting the B. Tech degree for students admitted in the first semester of UG program is, program duration plus two additional years (i.e. 12 Semesters and 6 academic years) For lateral entry student academic admitted in the third semester shall be (10 Semester and 5 Years).

The maximum duration of the program includes the period of withdrawal, absence and different kind of leaves permission to student but excludes the period of rustication of the student from the university however genuine case an confidential of valid reason may be referred to academic council for extending this limit by additional criteria

16 NFTE (Not Fit For Technical Education) (Applicable to B Tech program only)

It is mandatory for the student to earn all credits of first year specified for semester I & II or eligible for ATKT as per the rules to seek admission to semester III of second year in three years from the date of admission to avoid NFTE. If a student fails to become eligible for admission to Semester III in three year form the date of his admission, he shall be declared as "Not Fit for Technical Education" leading to discontinuation of his/her registration with the university. Such cases should be put up in the academic council.

17. Academic Progress Rules (ATKT Rules):

17.1 A student shall be allowed to register for the courses of the next year's odd semester only if he/she has earned all the credits of the previous year and has earned at least 75% credits of the current year. If 75% calculation turns out to be a mixed number (integer + fraction) then only the integer part of that number shall be considered for deciding the eligibility for ATKT.

At the end of 1st year a student shall be allowed to keep terms (ATKT) to 2nd year of study provided he/she attends course work prescribed for 1st year with prescribed attendance and successfully earned at least 75% of the total credits specified for 1st year program.

For Example: Total credits for B. Tech first year 2017-18, are 45 (Total of Semester I and II). A Student should earn mininum75% of the 45 Credits i.e. 33.15 (Rounded to 33 Credits). A student can go to next higher class with a maximum backlog of 12 credits of semester I & II of the first year.

Student, who fails to earn those credits, cannot register for next semester, either it can re-registrar for the course and credits or can use the next opportunity to earn the credits when exams are conducted. .

(b) At the end of 2nd year a candidate shall be allowed to keep terms to 3rd year of study provided he/she attends course work prescribed for 2nd year with prescribed attendance, and successfully cleared 1st year program and at least 75% of total credits prescribed for 2nd year program.

(c) At the end of 3rd year a candidate shall be allowed to keep terms to final year of study provided he/she attendants course work prescribed for 3rd year with prescribed attendance, and should have completed 2nd year program and 75% of total credits prescribed for 3rd year program.

All such candidates fulfilling the above criteria shall be declared as FAILED, ATKT.

A student shall be allowed to take admission for odd semester of next academic year only if he/ she have earned all the credits of the previous year and 75% happens to be a decimal, it is rounded to only integer part.

18 Semester Grade Report:

18.1 Semester grade report reflects the performance of a student in that semester (SGPI) and also his/her cumulative performance for the first year (FYPI) and also the cumulative performance since the third semester of his/her study (CGPA).

18.2 The semester grade card issued at the end of each semester/ summer term to each student shall contain the following.

- The credits for each course registered for that semester.
- Any audit course/s undertaken by a student in a Semester.
- The letter grade obtained in each course.
- The total number of credits earned by a student for the first year separately.
- The total number of credits earned by a student since the 3rd semester onwards.
- SGPI, FYPI, CGPI.
- A list of backlog courses, if any.
- Remarks regarding eligibility of registration for the next semester.

18.3Semester grade card shall not indicate class or division or rank however a conversion from grade point index to percentage based on CGPI shall be indicated on the final grade card of the program.

19 Award of Degree:

Following rules prevail for the award of degree.

- A student has registered and passed all the prescribed courses under the general institutional and departmental requirements.
- A student has obtained CGPI $\geq$ 4.75.
- A student has paid all the institute dues and satisfied all the requirements prescribed.

- A student has no case of indiscipline pending against him/her. Academic Council shall recommend the award of degree to a student who is declared to be eligible and qualified for above norms.

20.0 Grace Marks

- Maximum total grace marks will be 1% of the total theory credit courses x 100 subjected
- To maximum 6 marks in that semester.
- Grace marks will be given to candidate for change in grades for theory credit courses, i.e. from fail to pass grade only and will be reflected in final ESE marks.
- The grace marks are applicable only for maximum 1/3rd courses (rounded to higher Integer part i.e. if there are 4 theory courses then 4/3 = 1.33 = 2 courses).
- Maximum grace marks will be distributed in maximum courses
- Benefit of grace marks is not applicable for any medal/award.
- Applicable to theory and (Theory + Practical Courses). If is not applicable for Practical courses.
- Scheme for grace marks only can be used when the student will pass in all courses of That semester.

21.0 CGPA Improvement Policy for Award of Degree:

An opportunity shall be given to a student who has earned all the credits required by the respective program with CGPA greater than or equal to 4.00 but less than 4.75 to improve his/her grade by allowing him/her to appear for ESE examinations of maximum two theory courses of seventh semester. Such examinations shall be scheduled along with re-examinations/make-up examinations. However, CGPA shall be limited to 4.75 even though the performance of a student as calculated through modified CGPA becomes greater than 4.75.

Conclusions:

The academic policies regarding conduct of programs in Sanjay Ghodawat University Kolhapur are published in this document. The Academic Council shall reserve the right to modify these policies as and when required from the point of view of achieving academic excellence. In special and abnormal cases (i.e. the cases not covered through above rules) the decision of the (Chairman, Academic Council shall be final and shall be binding on all concerned.

Chairman
Academic Council

Sem. III									
Course Code	Course Title	L	T	P	C	Evaluation Scheme			
						Component	Exam	WT(%)	Min.Pass %
AET201	Differential Calculus and Transforms	3	1	-	4	Theory	FET	20	40
							CAT I	15	
							CAT II	15	
							ESE	50	40
AET203	Elements of Aeronautical Engineering	3	-	-	3	Theory	FET	20	40
							CAT I	15	
							CAT II	15	
							ESE	50	40
AET205	Aero Thermodynamics	3	-	-	3	Theory	FET	20	40
							CAT I	15	
							CAT II	15	
							ESE	50	40
AET207	Fluid Mechanics	3	-	-	3	Theory	FET	20	40
							CAT I	15	
							CAT II	15	
							ESE	50	40
AET209	Manufacturing Processes	3	-	-	3	Theory	FET	20	40
							CAT I	15	
							CAT II	15	
							ESE	50	40
AET211	Elements of Aeronautical Engineering -Lab	-	-	2	1	Practical	FET	50	40
							ESE	50	40
AET213	Aero Thermodynamics-Lab	-	-	2	1	Practical	FET	50	40
							ESE	50	40
AET215	Fluid Mechanics - Lab	-	-	2	1	Practical	FET	50	40
							ESE	50	40
AET217	CAD Lab - I	-	-	2	1	Practical	FET	100	40
AET219	Work Shop I	-	-	2	1	Practical	FET	100	40
AET221	Computer Programming Lab	-	-	2	1	Practical	FET	100	40
AET223	Professional Development Skills-I	-	-	2	NC	Theory	FET	100	40
AET225	Environmental Sciences	1	-	2	NC	Theory	FET	100	40
	Total	16	01	14	22	Total Hrs: 31, Total Credits: 22			

Sem. IV									
Course Code	Course Title	L	T	P	C	Evaluation Scheme			
						Component	Exam	WT(%)	Min.Pass %
AET202	Applied Numerical Methods	3	1	-	4	Theory	FET	20	40
							CAT I	15	
							CAT II	15	
							ESE	50	40
AET204	Aerodynamics- I	3	-	-	3	Theory	FET	20	40
							CAT I	15	
							CAT II	15	
							ESE	50	40
AET206	Propulsion	3	-	-	3	Theory	FET	20	40
							CAT I	15	
							CAT II	15	
							ESE	50	40
AET208	Mechanics of Materials	3	1	-	4	Theory	FET	20	40
							CAT I	15	
							CAT II	15	
							ESE	50	40
AET210	Avionic Engineering	3	-	-	3	Theory	FET	20	40
							CAT I	15	
							CAT II	15	
							ESE	50	40
AET212	Aerodynamics- I-Lab	-	-	2	1	Practical	FET	50	40
							ESE	50	40
AET214	Propulsion –Lab	-	-	2	1	Practical	FET	50	40
							ESE	50	40
AET216	Avionic Engineering Lab	-	-	2	1	Practical	FET	50	40
							ESE	50	40
AET218	CAD Lab - II	-	-	2	1	Practical	FET	100	40
AET220	Work shop II	-	-	2	1	Practical	FET	100	40
AET222	Professional Development Skills-II	-	-	2	NC	Theory	FET	100	40
Total		15	02	12	22	Total Hrs: 29, Total Credits: 22			

Course Code	AET 227			Title	**Differential Calculus and Transforms**			
Teaching Scheme	L	T	P	C	Evaluation Scheme	FET	CAT I	CAT II	ESE.
	3	1	-	4		20	15	15	50
						Minimum pass marks - 20			Minimum pass marks - 20

Course Outcomes: The students will be able to,

CO1	**Solve**[3] LDE with constant coefficients.
CO2	**Solve**[3] partial differential equations.
CO3	**Represent**[4] periodic function as a Fourier series.
CO4	**Find**[2] Laplace transforms and Inverse Laplace Transforms.
CO5	**Find**[2] gradient of scalar, curl & divergence of vector fields.

Unit No.	**Content**	**Hrs**
Unit 1:	Linear Differential Equations (LDE): Linear Differential Equations with constant coefficients, Complementary function and Particular integral (without method of variation of Parameters), Homogeneous Linear differential equations.	8
Unit 2:	Partial Differential Equations: Four standard forms of PDE of first order- $f(p,q)=0$, $f(p,q,z)=0$, $f_1(x,p)=f_2(y,q)$ and Lagrange's equation $Pp+Qq=R$.	6
Unit 3:	Fourier Series: Definition, Euler's Formulae, Dirichlet's Conditions, Functions having points of discontinuity, Change of interval, Expansion of odd and even periodic functions, Half range series.	6
Unit 4:	Laplace Transform: Definition, Transforms of elementary functions, Properties of Laplace transform, Transforms of derivatives and Integral. Transforms of periodic function.	8
Unit 5:	Inverse Laplace: Inverse Laplace transforms by using partial fractions and Convolution theorem. Inverse laplace transform by using derivative and	6

	integration, Solution of Linear differential equation with constants coefficients by Laplace transforms method.	
Unit 6:	Vector Differential Calculus: Differentiation of vectors, Gradient of scalar point function, Directional derivative, Divergence of vector point function, Curl of a vector point function. Irrotational and solenoidal vector field.	6

Text Books:

1. Dr. B. S. Grewal, Higher Engineering Mathematics, 80th -Edition (2010), Khanna Publishers, Delhi.
2. P. N. Wartikar & J. N. Wartikar, A text book of Applied Mathematics, Vol.-I,II,III, Edition-2010, Pune Vidyarthi Griha Prakashan, Pune.

Reference Books:

1. Erwin Kreyszig, Advanced Engineering Mathematics, 10th Edition, Wiley India Pvt. Ltd.
2. H. K. Das, Advanced Engineering Mathematics, 25th Revised Edition, S. Chand Publication.
3. Kanti B. Datta, Mathematical methods of Science and Engineering adided with MATLAB, 1st Edition, Cengage Learning
4. V. Sundaram, Engineering Mathematics, Vikas Publication, 6th edition.
5. Merle C. Potter, Advance Engineering Mathematics, Oxford University Press, 2005.

Course Code	AET203				Title	Elements of Aeronautical Engineering			
Teaching Scheme	L	T	P	C	Evaluation Scheme	FET	CAT I	CAT II	ESE
	3	-	-	3		20	15	15	50
						Minimum pass marks - 20			Minimum pass marks - 20

Course Outcomes: The students will be able to,

CO1	**Explain**[2] various types of aircraft and spacecraft components based on its configurations.
CO2	**Explain**[2] principles of flight dynamics and aerodynamics.
CO3	**Write**[2] working principles of jet and rocket propulsion
CO4	**Describe**[2] various aircraft structural members.
CO5	**Discuss**[2] significance of various materials used in an aircraft

Unit No.	Content	Hrs.
Unit 1:	**Introduction to Aircraft Anatomy & Configurations** Brief Review of Historical Developments in Aeronautical & Aerospace Engineering, Basic Parts & Their Functions of Single Engine & Multi Engine Aircraft, Helicopter, Rocket & Missiles, & Satellite, Classification of Flying Vehicles, Current Market Opportunities in Aeronautical Engineering.	6
Unit 2:	**Aerodynamics of Fixed Wing Aircraft** Forces acting of the Aircraft, Introduction to Aerofoils, Classification of Aerofoils, Centre of Pressure & Aerodynamic Centre, Pressure Distribution over Aerofoils, Aerofoil Lift characteristics, Coefficient of Lift &Drag, Aspect Ratio, Taper Ratio, Lift – Drag Ratio	6
Unit 3:	**Aircraft & Rocket Propulsion** Introduction to Propeller & Jet Propulsion, Basic Components & Their Functions of Gas Turbine Engine, Variants of the Gas Turbine Engines – Turbojet, Turbofan, Turbo shaft, Turboprop, Ramjet & Scramjet Engines, Thrust Equation of Jet Propulsion, Principles of Rocket Propulsion, Classification of Rocket Motors, Thrust Equation of Rocket Propulsion.	8
Unit 4:	**Aircraft Structures** Introduction to Aircraft Structural Members of Wing, Fuselage & Empennage, & their functions (Ribs, Spars, Longerons, Keel, Stringers & Skin), Semi-monocoque & Monocoque Construction of Aircraft, Structural Detail of the Landing Gear, Air & Ground Loads acting on the Aircraft.	6
Unit 5:	**Aircraft Materials** Material Selection Criteria for Aircraft Applications, Significance of Strength to Weight Ratio, Aluminium Alloys in Aerospace Applications(2024-T3, 6061-T6, 5052-H32), Maraging Steel, Nickel & Titanium Alloys, High Temperature Creep & Corrosion Resistant Materials, Fatigue Resistant Materials, Introduction to Composite Materials & Super Alloys.	8
Unit 6:	**Flight Controls & Aircraft Performance** Primary & Secondary Flight Controls & Their Functions – Elevators, Rudder, Aileron, Flaps, Slats., Types of Wing & Empennage	6

	Configurations & their Effect on Stability of the Aircraft, Steady & Level Flight Equation of Motion, Steady Rate of Climb & Glide Equations, Thrust & Power Required & Available Curves.
Text Books:	1. Anderson, J.D., "Introduction to Flight", McGraw-Hill, 7th Edition, 2011 2. Anderson, J.D. Jr., "Fundamentals of Aerodynamics", McGraw-Hill, 5th Edition, 2013. Kermode, A.C., "Mechanics of Flight", Himalayan Books, New Delhi, 2004.
Reference Books:	Kermode, A.C., "Flight without Formulae", Pearson Education Ltd, 5th Edition, 2007

Course Code	AET205			Title	Aerothermodynamics			
Teaching Scheme	L	T	P	C	Evaluation Scheme	FET	CAT I	CAT II	ESE.
	3	-	-	3		20	15	15	50
						Minimum pass marks - 20			Minimum pass marks - 20

Course Outcomes: The students will be able to,

CO1	**Explain**[2] basic concepts of thermodynamics
CO2	**Discuss**[2] thermodynamics laws
CO3	**Solve**[3] numerical problems using thermodynamics laws
CO4	**Analyze**[3] products of combustion
CO5	**Solve**[3] numerical problems on various vapor power and gas power cycles

Unit No.	Content	Hrs.
Unit 1:	**Definitions & Concepts** Fundamentals units. Derived units (SI units) systems, properties, energy, thermodynamic equilibrium work, state postulate, Zeroth law of thermodynamics, temperature scale; pure substance, ideal gas law, van der wall equation	6
Unit 2:	**1st Law of Thermodynamics** Application of 1st law of thermodynamics for non flow process, for flow process-steady state, steady flow processes, transient flow processes-charging & discharging of tank.	6
Unit 3:	**Fundamentals of Combustion** Fuels – Types, fuel usage, Basic consideration of fuel choice, Properties of mixture, Stoichometric, Heating Values, Ignition Theory – gaseous mixtures, heterogeneous mixtures, Spontaneous Ignition, adiabatic flame temperature - factors effecting.	6
Unit 4:	**2nd Law of Thermodynamics & Its Application** Limitations of the 1st law of thermodynamics, heats engine, heat pump/refrigeration. 2nd law of thermodynamic-Kelvin Planck & Clausius statement & their equivalence. Reversible & irreversible process, Carnot cycle & Carnot principles, availability	8
Unit 5:	**Entropy** The inequality of clausius, entropy-A property of a system, entropy change in reversible process, entropy change of control mass during on irreversible process, entropy generation, entropy change of solid or liquid and an ideal gas, entropy as an rate equation.	7

Unit 6:	**Power Cycle & Refrigeration Cycle** **Power Cycle:** Rankin's cycle- ideal reheat & regenerative. Gas power cycle – Otto cycle, diesel cycle, dual cycle &Brayton cycle. **Refrigeration cycle:** Refrigeration cycle, vapor compression refrigeration &Air refrigeration Systems, Vapour absorption system	7

Text Books:

1. Fundamentals of thermodynamics, sixth edition, R.E Sonntag, C Borgnakke ,wiley, 2003.
2. A Textbook of Refrigeration and Air Conditioning, 2nd Edition, R. K Rajput, S. K. Kataria and Sons,2012
3. Gas Turbine Combustion: Alternative Fuels and Emissions, Third Edition, Arthur H. Lefebvre, Dilip R. Ballal,CRC Press, 2010.

Reference Books:

1. Basic and applied thermodynamics, eighth edition, P K Nag, Tata McGraw – Hill Company limited, 2006
2. Thermodynamics an engineering approach, 5th edition, Yunus A Cengel and Michael A Boles, -McGraw Hill College, Boston, MA, 2006
3. Fundamentals of combustion processes, Sara McAllister, Jyh-Yuan Chen, A. Carlos Fernandez-Pello, Springer Science & Business Media. ,2011

Course Code	AET207			Title	**Fluid Mechanics**				
Teaching Scheme	L	T	P	C	Evaluation Scheme	FET	CAT I	CAT II	ESE.
	3	-	-	3		20	15	15	50
						Minimum pass marks - 20			Minimum pass marks - 20

Course Outcomes: The students will be able to,

CO1	**Explain**[2] basic concepts of fluid mechanics and fluid properties
CO2	**Discuss**[3] fundamental laws and their applications
CO3	**Explain**[3] significance of dimensionless quantities associated with viscous flow
CO4	**Apply**[4] dimensional analysis to fluid flow problems
CO5	**Explain**[3] working Principle of Turbines and Pumps

Unit No.	**Content**	**Hrs.**
Unit 1:	**Basic Concepts and Properties** 1. Fluid - definition, distinction between solid and fluid - Units and dimensions - Properties of fluids density, specific weight, specific volume, specific gravity, temperature, viscosity, compressibility vapour pressure, capillary and surface tension 2. Fluid statics: concept of fluid statics, pressure, absolute and gauge pressures - pressure measurements by manometers and pressure gauges.	7
Unit 2:	**Fluid Kinematics and Fluid Dynamics** 1. Fluid Kinematics - types of flow - velocity field and acceleration - continuity equation (one and three dimensional differential forms), stream function, velocity potential function 2. Fluid dynamics - equations of motion -Euler's equation along a streamline - Bernoulli's equation - applications - Venturi meter, Orifice meter, Pitot tube	7
Unit 3:	**Viscous Flow and Pipe Flow** Viscous flow - Navier-Stoke's equation (Statement only) - Shear stress, pressure gradient relationship- laminar flow between parallel plates - Laminar flow through circular tubes (Hagen poiseulle's) - flow through pipes -Major Losses- Darcy -weisback's equation -friction factor- minor losses - flow through pipes in series and in parallel.	8
Unit 4:	**Boundary Layer Theory and Dimensional Analysis** 1. Boundary Layer Theory: Boundary layer thickness, its characteristics, laminar and turbulent boundary layers, separation, boundary layer control 2. Dimensional Analysis, Similitude: Dimensionally homogeneous equations, Buckingham's Pi-theorem, Calculation of dimensionless parameters. Similitude, complete similarity	6
Unit 5:	**Forces On Immersed Bodies And Compressible Flow** Forces on Immersed Bodies: Lift and Drag, Drag on a flat plate and on aerofoil. Types of drags	6
		6

Unit 6: **Hydraulic Turbines and Pumps**

1. Fluid machines: definition and classification - Euler's equation for turbo machines- Construction of velocity vector diagram's - head and specific work - Hydro turbines: definition and classifications - Pelton turbine - Francis turbine - Propeller turbine -Kaplan turbine - working principles - velocity triangles - work done - specific speed - efficiencies - performance curve for turbines.
2. Pumps: definition and classifications - Centrifugal pump: Classifications, working principles, velocity triangles, specific speed, efficiency and performance curves

Text Books: **Textbooks:**

1. Streeter, V.L, and Wylie, E.B., "Fluid Mechanics", McGraw-Hill, 1983.
2. Kumar, K.L., "Engineering Fluid Mechanics", Eurasia Publishing House (P) Ltd., New Delhi (7th edition), 1995.
3. Vasandani, V.P., "Hydraulic Machines -Theory and Design", Khanna Publishers, 1992.

Reference Books:

1. Bansal, R.K., "Fluid Mechanics and Hydraulics Machines", (5th edition), Laxmi publications(P) Ltd., New Delhi, 1995.
2. White, F.M., "Fluid Mechanics", Tata McGraw-Hill, 5th Edition, New Delhi, 2003.
3. Ramamirtham, S., "Fluid Mechanics and Hydraulics and Fluid Machines", Dhanpat Rai and Sons, Delhi, 1991.
4. Som, S.K., and Biswas, G., "Introduction to fluid mechanics and fluid machines", Tata McGraw Hill, 2nd edition, 2004

Course Code	AET209				Title	**Manufacturing Processes**			
Teaching Scheme	L	T	P	C	Evaluation Scheme	FET	CAT I	CAT II	ESE.
	3	-	-	3		20	15	15	50
						Minimum pass marks - 20			Minimum pass marks - 20

Course Outcomes: The students will be able to,

CO1	**Explain**[2] various metal cutting processes
CO2	**Explain**[2] various metal forming
CO3	**Discuss**[2] metal shaping processes
CO4	**Design**[2] die and punch
CO5	**Discuss**[2] various Non-Conventional Machining Processes and their application

Unit No.	**Content**	**Hrs.**
Unit 1:	**Metal Cutting Processes-I** a. Centre lathe, lathe operations, taper turning, methods of taper turning, work holding and cutting tool, thread cutting, machining time and power estimation b. Shaping Machine - Types-crank shaper, hydraulic shaper, Crank and slotted link quick return mechanism, Table feed mechanism, Various operations. c. Planning Machine- Types-standard double housing planer, principle parts, table drive and feed mechanism, Various operations.	7
Unit 2:	**Metal Cutting Processes-II** a. Drilling machine, its types, twist drill, drilling time and power estimates, counter boring, spot facing, boring, reaming, tapping, and broaching, broach tool, broaching types and operations, Sawing Machine - Types, Operations b. Milling machine and its types, milling operations, milling cutters, milling time and power estimates, Gear cutting using indexing mechanism, indexing types - simple, compound and differential indexing	7
Unit 3:	**Metal Forming Processes** a. Rolling – Introduction , Hot and cold Rolling, Rolling Mill Classification, Defects in Rolling, b. Forging- Introduction, Hand Forging Operations, Forging Machines (board Hammer, Air and Steam, Hydraulic Hammer) Open and Closed Die Forging, Defects in Forging c. Extrusion- Introduction, Direct , Indirect , Tube , Impact and Hydraulic Extrusion, Defects in Extrusion d. Drawing – Introduction and Types of Wire, rod and pipe drawing, Defects in Drawing.	7
Unit 4:	**Metal Shaping Processes** a. Introduction to casting processes : Patterns, Cores, core prints, sand casting procedure, Specialized casting processes such as shell mould casting, die casting, centrifugal casting, investment casting and permanent mould casting b. Plastic shaping : Molding – Compression molding, Transfer molding,	7

	Blow molding, Injection molding – Process and equipment. Extrusion of Plastic – Type of extruder, extrusion of film, pipe, cable and sheet Thermoforming – Principle, pressure forming and vacuum forming	
Unit 5:	**Sheet Metal Working:** Types of sheet metal operations, Types of dies and punches, material for dies and punches, Die design for Progressive and Drawing Die, clearance analysis, center of pressure, blank size determination (Numerical), strip layout, sheet utilization ratio (Numerical), method of reducing forces	6
Unit 6:	**Non-Conventional Machining Processes:** Classification, selection of process, Electro Discharge Machining, Electro Chemical Machining, Ultra Sonic Machining, Electron Beam Machining, Laser Beam Machining, Abrasive Jet Machining	6

Text Books:

1. P.C. Sharma -A Textbook of Production Technology (Manufacturing Processes)
2. P. N. Rao- Manufacturing Technology- Foundry, Forming and Welding, Tata McGraw-Hill

Reference Books:

1. J. T. Black – Degormos Materials and process in manufacturing – John Willey and sons.
2. M.P Grover – Fundamentals of modern manufacturing: Materials and systems
3. A.S Athalye – Processing of plastic– Colour Publication (Pvt.) Ltd. U.K
4. Dr. R. S. Parmar, Welding Processes And Technology, Khanna Publishers, New Delhi.

Course Code	AET211			Title	**Elements of Aeronautical Engineering - Lab**		
Teaching Scheme	L	T	P	C	Evaluation Scheme	FET	ESE.
	-	-	2	1		50	50
						Minimum pass marks - 20	Minimum pass marks - 20

Course Outcomes: The students will be able to,

CO1	**Identify**[2] components of the aircraft components
CO2	**Discuss**[2] working principle of Aircraft & Rocket Propulsion
CO3	**Perform**[3] experiment on Aircraft Structures
CO4	**Perform**[3] test on Aircraft Materials and
CO5	**Critique**[3] working of aircraft control surface from pilot point of view

List of Experiments

1. Demonstration of working principle of Fixed Wing Aircraft
2. Calibration of subsonic Wind tunnel
3. Conduct experiment on ramjet model working
4. Demonstration of Turbojet Engine
5. Conduct experiment on Aircraft Structures equipment
6. Perform test on cantilever beam
7. Conduct experiment on hardness test for Aircraft Materials
8. Conduct experiment on Flight Controls & Aircraft Performance
9. Demonstration of Primary controls in Aircraft

Course Code	AET213			Title	**Aero Thermodynamics Lab**		
Teaching Scheme	L	T	P	C	Evaluation Scheme	FET	ESE
	-	-	2	1		50	50
						Minimum pass marks - 20	Minimum pass marks - 20

Course Outcomes: The students will be able to,

CO1	**Apply**[3] fundamental concepts of thermodynamics to engineering applications
CO2	**Conduct**[3] experiments to determine thermodynamic properties of fuel
CO3	**Determine**[3] calorific value and viscosity of given fuel
CO4	**Analyze**[4] the results obtained
CO5	**Analyze**[4] IC engine performance parameters with different variables

List of Experiments

1. Test on grease penetrometer of dropping point apparatus
2. Determine carbon residue of a given oil
3. Determine cloud and pour point of a given oil
4. Use Red wood viscometer and Aniline Point apparatus
5. Determination of flash point and fire point of lubricant oil.
6. Find C. V of a fuel using Bomb calorimeter
7. Determine CoP of vapor compression refrigeration cycles
8. Determine Efficiency and BHP of SI and CI engines
9. Performance test of compressors and blowers.
10. Determine Smoke Point of an oil

Course Code	AET215			Title	**Fluid Mechanics - Lab**	
Teaching Scheme	L	T	P	C	Evaluation Scheme	FET	ESE.
	-	-	2	1		50	50
						Minimum pass marks - 20	Minimum pass marks - 20

Course Outcomes: The students will be able to,

CO1	**Verify**[3] the law of fluid mechanics
CO2	**Visualize**[3] flow over surfaces
CO3	**Evaluate**[4] performance of fluid machines with different parameters
CO4	**Measure**[3] the major and minor losses in pipe flows
CO5	**Determine**[3] lift and drag on model using wind tunnel

List of Experiments

1. Flow visualization over an airfoil by plotting of streamlines (Halshaw's apparatus).
2. Verify Reynolds no. experimentally
3. Verify Bernoulli's equation experimentally
4. Determine the coefficient of discharge of Venturimeter/Orifice-meter
5. Determination of minor losses in pips-fittings
6. Determination of coefficient of friction in pipes of different materials.
7. Perform test on Turbine
8. Perform test on Centrifugal Pump
9. Measurement of lift and drag on a model using the wind tunnel.

Course Code	AET217			Title	**CAD – Lab I**	
Teaching Scheme	L	T	P	C	Evaluation Scheme	FET
	-	-	2	1		100
						Minimum pass marks - 40

Course Outcomes: The students will be able to,

CO1	**Draw**[2] advanced part drawing using limit, fit and tolerances
CO2	**Demonstrate**[2] application of design table
CO3	**Assemble**[3] components developed
CO4	**Develop**[3] 3D models
CO5	**Prepare**[2] bill of materials

List of Exercises

1. Exercises on advanced part drawing using limit, fit and tolerances
2. Application of design table
3. Exercises on assembly of components developed
4. Preparation of bill of materials
5. Exercises on 3D modelling

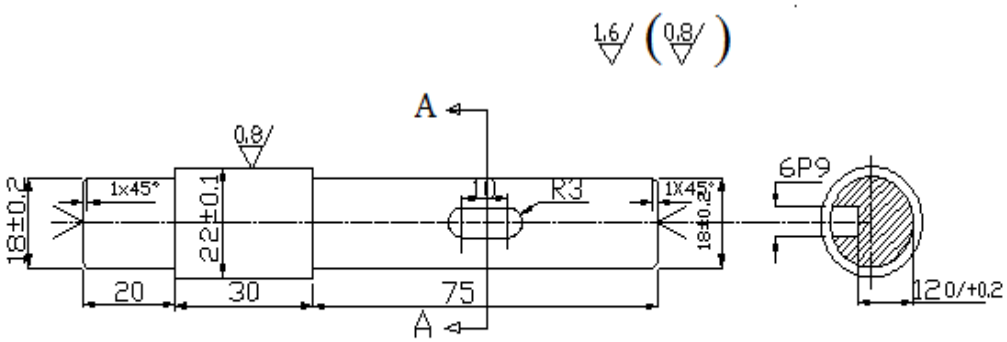
Course Code	AET219			Title	**Workshop I**	
Teaching Scheme	L	T	P	C	Evaluation Scheme	FET
	--	--	2	1		100
						Minimum pass marks - 40

Course Outcomes: The students will be able to,

CO1	**Select**[2] appropriate machine tool for a given operation
CO2	**Select**[2] appropriate cutting tool for a given operation
CO3	**Read**[3] component drawing with clarity
CO4	**Prepare**[4] model according to the dimensions provided using suitable machine tool and use all measuring instruments
CO5	**Calculate**[3] machining time of the model completed

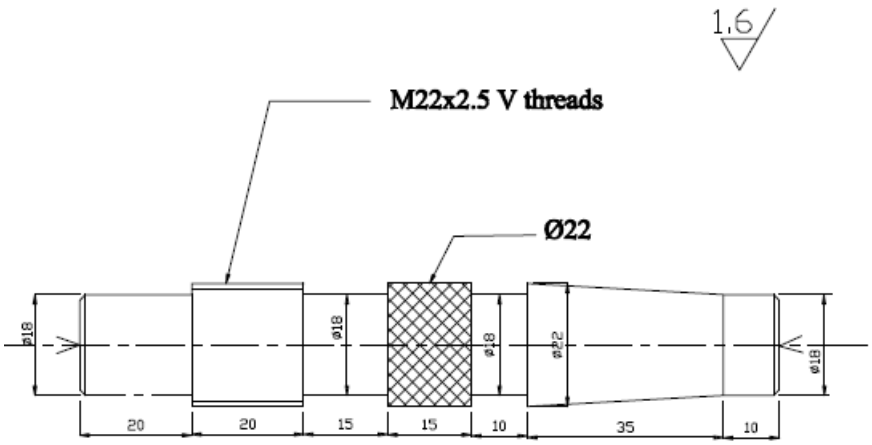
Exercise 1- Facing, turning , milling & grinding

Material- MS Bar ø25x130mm
Tolerance on unspecified dimensions= ±0.1
All dimensions are in mm.



P9= $^{-0.016}_{-0.051}$

Exercise 2- Facing, Turning, threading, knurling and taper turning



Material- MS Bar ø25x130mm
Tolerance on unspecified dimensions= ±0.1
All dimensions are in mm.

Course Code	AET221			Title	**Computer Programming Lab**	
Teaching Scheme	L	T	P	C	Evaluation Scheme	FET
	--	--	2	1		100
						Minimum pass marks - 40

Course Outcomes: The students will be able to,

CO1	**Develop**[3] algorithms for solving problems using Object Oriented Language.
CO2	**Apply**[3] their knowledge and programming kills to solve various computing problems in the field of Aeronautical Engineering.

List of Experiments

1. Assignment on programs of Array, Array with pointer
2. Assignment on programs of Structure, Class and Objects-i
3. Assignment on programs of Structure, Class and Objects-ii
4. Assignments on simple programs using MATLAB software (Minimum two)
5. Assignment on programs of Conditional program flow (if), Iteration / Looping

Text Books:
1. E. Balguruswami, "Object Oriented Programming", Tata McGrawHill Publishing Company Ltd.
2. YashwantP.Kanetkar, "LetUsC++",BPB Publication, NewDelhi,11th Edition, 2011 .
3. Jibitesh Mishra and MuktikantaSah, "Object-Oriented Programming in C++",Scitech Publications India Ltd.,2nd Edition,2010.

Reference Books:
1. Alstevans, "C++Programming", Wiley India Pvt. Ltd., New Delhi,7th Edition,2007
2. Nicolai M. Josuttis, "Object-Oriented Programmingin C++",WileDreamtech India Pvt.Ltd.,NewDelhi,1stEdition,2003.
3. SouravSahay,"Object Oriented Programming with C++",Oxford University Press, Incorporated,2006.
4. Nicolas A.Solterand Scott J.Kleper ,"Professional C++",Wiley India Pvt. Ltd., New Delhi.

Course Code	AET223			Title	Professional Development Skill –I
Teaching Scheme	L	T	P	C	Evaluation Scheme
	-	-	2	-	100
					Minimum pass marks - 40

Course Outcomes: The students will be able to,

CO1	**Apply**[3] self analysis techniques
CO2	**Plan**[4] and execute SMART goals
CO3	**Demonstrate**[3] team building skills
CO4	**Prepare**[3] time table and action plan to achieve set goals.
CO5	**Exhibit**[3] presentation and public speaking skills

Unit No.	Content	Hrs.
Unit- I	**Soft Skills**: What are soft skills? Importance of soft skills, selling your soft skills, identifying and improving your soft skills **Self Analysis**: Importance of knowing yourself, SWOT Analysis, Importance of Self Confidence, Self Esteem	04
Unit- II	**Goal Setting**: SMART Goals, Short Term goals, Moderate term goals, Long Term, Life Time Goals	04
Unit- III	**Team Building and Teamwork:** Introduction-meaning–aspects of team building, team Vs group, Stages of team building, Characteristics of effective team, role of a team leader, role of team members	04
Unit- IV	**Time Management**: Value of time, Diagnosing Time Management, Preparing to do list, Prioritizing work	04
Unit- V	**Presentation skills and Public Speaking**: Elements of an effective presentation, Structure of a presentation, Presentation tools, Audience analysis, Language: Articulation, Good pronunciation, Voice quality, Modulation, Accent and Intonation. Extempore and Prepared speeches	04
References	1.Wallace & Masters, Personal development for Life & work, Thomson Learning. 2. Barun K. Mitra, Personality Development and Soft- Skills, Oxford University Press. 3. Fred Luthans, Organizational behavior, McGraw Hill. 4. Asa Don Brown, Interpersonal skills in the Workplace, Tate publishing and Enterprises.	

Course Code	AET225			Title	Environmental Studies	
Teaching Scheme	L	T	P	C	Evaluation Scheme	FET
	1	-	-	-		100
						Minimum pass marks - 40

Unit No.	Content
Unit 1:	a) **Introduction to environmental studies:** □ Multidisciplinary nature of environmental studies; Scope and importance; Concept of sustainability and sustainable development. **b) Ecosystem:** □ Concept of ecosystem, Structure and function of ecosystem; Energy flow in an ecosystem. □ Food chains, food webs and ecological succession. □ Structure and function of the following ecosystems: Examples
Unit 2:	**a) Natural Resources: Renewable and Non- Renewable Resources** □ Land resources and land use change; Land degradation, soil erosion anddesertification. □ Deforestation: Causes and impacts due to mining, dam building on environment and forests □ Water: Use and over-exploitation of surface and ground water, floods, droughts □ Energy resources: Renewable and non renewable energy sources, use of alternate energy sources, growing energy needs, case studies b) **Biodiversity and Conservation** □ Levels of biological diversity: genetic, species and ecosystem diversity; □ Global biodiversity hot spots. India as a mega-biodiversity nation; Endangered and endemic species of India □ Threats to biodiversity: Habitat loss, poaching of wildlife, man-wildlife conflicts, biological invasions. □ Conservation of biodiversity In-situ and Ex-situ conservation of Biodiversity □ Ecosystem and biodiversity services: Ecological, economic, social, ethical, Aesthetic and Informational value.
Unit 3:	**a) Environmental Pollution** □ Environmental pollution: types, causes, effects and controls; Air, water, Noise pollution □ Nuclear hazards and human health risks □ Solid waste management: Control measures of urban and industrialwaste. **b) Environmental policies and practices** □ Global issues: Climate change, global warming, ozone layer depletion, acid rain and impacts on human communities and agriculture. □ Environment Laws: Environment Protection Act; Air (Prevention & Control of Pollution) Act; Water (Prevention and control of Pollution) Act; Wildlife Protection Ac

Unit 4: **Human Communities and the Environment**

- Human population growth: Impacts on environment, human health and welfare
- Disaster management: floods, earthquake, cyclones and landslides.
- Environmental movements: Chipko, Silent valley, Bishnois of Rajasthan.
- Environmental communication and public awareness, case studies (e.g., CNG vehicles in Delhi).

References

1. Carson, R. 2002. Silent Spring. Houghton Mifflin Harcourt.
2. Gadgil, M., &Guha, R. 1993. This Fissured Land: An Ecological History of India. Univ.
of California Press.
3. Gleeson, B. and Low, N. (eds.) 1999. Global Ethics and Environment, London,
Routledge.
4. Gleick, P. H. 1993. Water in Crisis. Pacific Institute for Studies in Dev., Environment &
Security. Stockholm Env. Institute, Oxford Univ. Press.
5. Groom, Martha J., Gary K. Meffe, and Carl Ronald Carroll. Principles of Conservation
Biology. Sunderland: Sinauer Associates, 2006.
6. Grumbine, R. Edward, and Pandit, M.K. 2013. Threats from India's Himalaya dams.
Science, 339: 36-37.
7. McCully, P. 1996. Rivers no more: the environmental effects of dams (pp. 29-64). Zed
Books.
8. McNeill, John R. 2000. Something New Under the Sun: An Environmental History of the
Twentieth Century.
9. Deeksha Dave, S.S. Katewa, Textbook of Environmental Studies.
10. B.K. Sharma, Environmental Chemistry.
11. BharuchaErach, The Biodiversity of India, Mapin Publishing pvt. Ltd., Ahmedabad
380013, India, Email:mapin@icenet.net (R)
12. De A.K., Environmental Chemistry, Wiley Wastern Ltd.
13. Trivedi R.K. Handbook of Environmental Laws, Rules, Guidelines, Compliances and
Standards, vol. I anfd II, Environmental Media (R**)**

Course Code	AET225			Title	**Environmental Studies Project**
Teaching Scheme	L	T	P	C	Evaluation Scheme	PET
	-	-	2	-		100
						Minimum pass marks - 20

Field Work

- Visit to an area to document environmental assets: river/ forest/ lora/fauna, etc.
- Visit to a local polluted Site-Urban/Rural/Industrial/Agricultural.
- Study of common plants, insects, birds and basic principles of identification.
- Study of simple ecosystems-pond, river, etc.

Course Code	AET202			Title	Applied Numerical Methods			
Teaching Scheme	L	T	P	C	Evaluation Scheme	FET	CAT I	CAT II	ESE.
	3	1	-	4		20	15	15	50
						Minimum pass marks - 20			Minimum pass marks - 20

Course Outcomes: The students will be able to,

CO1	**Solve**[3] Algebraic and Transcendental Equations and Simultaneous linear equations.
CO2	**Express**[2] numerical data as polynomial
CO3	**Apply**[3] the probability distributions.
CO4	**Evaluate**[5] derivative and integration
CO5	**Solve**[3] Ordinary Differential Equation

Unit	Content	Hrs
Unit 1:	**Algebraic and Transcendental Equations:** Introduction, Roots of equation by Bisection Method, False position method, Secant method, Newton- Raphson method, multiple roots by Newton method.	8
Unit 2:	**Simultaneous Linear Equations:** Gauss elimination method, Gauss-Jordan method, Factorization method, Gauss- Seidel iterative method, Jacobi iterative method.	6
Unit 3:	**Interpolation:** Introduction, Properties and problems on Finite differences, Interpolation on equal intervals -Newton forward and backward difference formulae, Stirling Interpolation formula (tabular value), Interpolation on unequal intervals- Newton divided difference formula, Lagrange Interpolation.	6
Unit 4:	**Numerical differentiation and Integration:** Newton forward and backward difference formulae for equally spaced data, Derivative using stirling formula, Newton's divided difference formula for unequally spaced data, Derivative using Lagrange Interpolation. Numerical Integration by Trapezoidal rule and Simpson 1/3rd and 3/8th rules for integration.	7
Unit 5:	**Statistics:** Random variable, Probability mass function and probability density function, Binomial distribution, Poisson distribution and Normal distribution.	7
Unit 6:	**Numerical Solution of Ordinary Differential Equations of 1st order and 1st degree:** Taylor series method, Picard Method, Euler Method, Euler modified method , fourth order Runge-Kutta method	6

Textbooks

1) Manish Goyal, Computer Based Numerical and Statistical Techniques, Laxmi Publications (P) Ltd, Third edition.

2) Dr. B. S. Grewal, Numerical Methods in Engineering & Science (with Programs in C, C++ &MATLAB), Published August 2014 by Khanna Publisher

References:

1) Dr. B. S. Grewal, Higher Engineering Mathematics, 80th -Edition (2010), Khanna Publishers, Delhi.
2) Erwin Kreyszig, Advanced Engineering Mathematics, 10th Edition, Wiley India Pvt. Ltd.
3) Numerical Methods by E Balguruswamy, Tata McgrawHill PublicationCompany Ltd., 8th Edition, 2002.
4) Numerical Methods by G. Haribaskaran, Laxmi Publications Pvt.Ltd,New Delhi, 1st Edition,2006.
5) Numerical Analysis Theory and Applications by R.L.Burden and J.D.Faires,Cengage Learning India Pvt.Ltd.,New Delhi,1st Edition,2005.

Course Code	AET204			Title	**Aerodynamics I**			
Teaching Scheme	L	T	P	C	Evaluation Scheme	FET	CAT I	CAT II	ESE
	3	-	-	3		20	15	15	50
						Minimum pass marks - 20			Minimum pass marks - 20

Course Outcomes: The students will be able to,

CO1	**Explain**[3] basic concepts of aerodynamics
CO2	**Explain**[2] inviscid flow and boundary layer flow
CO3	**Discuss**[3] various conformal transformation laws
CO4	**Analyze**[4] incompressible flow over the finite wing
CO5	**Explain**[3] aerodynamic characteristics of Propeller and Wings

Unit	**Content**	**Hrs**
Unit 1:	**Introduction** 1. Fundamental of Aerodynamic variable 2. Aerodynamic Forces and Moments calculation 3. Aerodynamic Center 4. Center of Pressure 5. Continuity Equation 6. Momentum Equation Application of the Momentum Equation: Drag of a 2D Body	8
Unit 2:	**Inviscid, Incompressible Flow** 1. Condition of Velocity for Incompressible Flow 2. Governing Equation for Irrotational Incompressible Flow: Laplace's Equation 3. Elementary Flow I. Uniform Flow II. Sourse Flow III. Sink Flow IV. Vortex Flow 4. Combination of Elementary Flow I. Rankine half oval II. Rankine full oval III. Doublet IV. Flow over a non rotating circular cylinder V. Flow over a rotating Circular cylinder KuttaJoukowski Theorem and the generation of lift	6
Unit 3:	**CONFORMAL TRANSFORMATION** 1. Complex potential function 2. Blasius theorem 3. Principles of conformal transformation 4. Kutta – Juokowaski transformation of a circle into I. Flat plate	6

II. Airfoils
III. Ellipses.

Unit 4: **Incompressible flow over Airfoil** 8

1. The Vortex Sheet
2. The Kutta Condition
3. Kelvin Circulation Theorem and the starting Vortex
4. Classical Thin Airfoil theory
   I. Symmetrical Airfoil (Theory and Derivation also)
   II. Un-Symmetrical Airfoil (Theory and basic equation without Derivation)

Unit 5: **Incompressible flow over finite wing** 6

1. Downwash and Induced Drag
2. The vortex filament
3. Biot-Savart Law
4. Helmholtz Theorem
5. Prandtl's Classical Lifting Line theory
6. Elliptical Lift Distribution
7. General Lift Distribution (Theory and basic equation without Derivation)

Effect of aspect ratio

Unit 6: **Propellers Theory** 6

1. Froude Momentum Theory of Propulsion
2. Airscrew Coefficient
   I. Thrust Coefficient
   II. Torque Coefficient
   III. Efficiency
   IV. Power factor
   V. Activity Factor
3. Airscrew pitch
   I. Geometric Pitch
   II. Experimental Mean Pitch
   III. Effect of geometric pitch on airscrew performance
4. Blade element theory
   I. The vortex system of an airscrew
   II. The performance of blade element

Text Books:

1. Fundamental of Aerodynamics By J. D. Anderson
2. Aerodynamics for Engineering Students by Hughton and Carpenter

Course Code	AET206			Title	**Propulsion**			
Teaching Scheme	L	T	P	C	Evaluation Scheme	FET	CAT I	CAT II	ESE.
	3	-	-	3		20	15	15	50
						Minimum pass marks - 20			Minimum pass marks - 20

Course Outcomes: The students will be able to,

CO1	**Explain**[2] power plants and differences in various propulsion systems
CO2	**Analyze**[4] performance parameters of jet engine inlet
CO3	**Explain**[3] effects of various factors and operating variables on combustion chamber performance
CO4	**Analyze**[4] performance parameters of jet engine compressor and nozzle
CO5	**Explain**[2] advance propulsion systems in development

Unit	**Content**	**Hrs**
Unit 1:	**Fundamentals of Gas Turbine Engines:** Illustration of working of gas turbine engine - Thrust equation - Factors affecting thrust. Effect of pressure, velocity and temperature changes of air entering compressor. Methods of thrust augmentation. Characteristics of turboprop, turbofan and turbojet - Performance characteristics.	6
Unit 2:	**Subsonic and Supersonic Inlets for Jet Engines:** Internal flow and Stall in subsonic inlets - Boundary layer separation - Major features of external flow near a subsonic inlet - Relation between minimum area ratio and external deceleration ratio - Diffuser performance - Supersonic inlets - Starting problem on supersonic inlets - Shock swallowing by area variation - External deceleration - Modes of inlet operation.	8
Unit 3:	**Combustion Chambers:** Classification of combustion chambers - Important factors affecting combustion chamber design - Combustion process - Combustion chamber performance - Effect of operating variables on performance - Flame tube cooling - Flame stabilization - Use of flame holders.	6
Unit 4:	**Nozzles:** Theory of flow in isentropic nozzles - Convergent nozzles and nozzle choking - Nozzle throat conditions - Nozzle efficiency - Losses in nozzles - Over expanded and under expanded nozzles - Ejector and variable area nozzles - Interaction of nozzle flow with adjacent surfaces - Thrust reversal.	6
Unit 5:	**Compressors:** Principle of operation of centrifugal compressor - Work done and pressure rise - Velocity diagrams - Diffuser vane design considerations - Concept of prewhirl - Rotation stall - Elementary theory of axial flow compressor - Velocity triangles - degree of reaction - Three dimensional - Air angle distributions for free vortex and constant reaction designs - Compressor blade design - Centrifugal and Axial compressor performance characteristics.	8
Unit 6:	**Other Propulsion Systems:** Introduction to other propulsion systems Ram jet , Scram jet , Rocket	6

	propulsion, Pulse detonation engine, liquid air cycle engine (LACE), turbo ramjet, Turbo Rocket configurations
Text Books:	Hill, P.G. & Peterson, C.R. "Mechanics & Thermodynamics of Propulsion" Addison - Wesley Longman INC, 1999. Ward cheney, “Numerical Mathematics and Computing”, Cengage Learning India Pvt.Ltd.,New Delhi,7th Edition
Reference Books:	1. Ahmed F. El-Sayed, “Aircraft Propulsion and Gas Turbine Engines”,CRC Press- Taylor and Francis Group, 2006. 2. Cohen, H. Rogers, G.F.C. and Saravanamuttoo, H.I.H. "Gas Turbine Theory", Longman, 1919. 3. Oates, G.C., "Aero thermodynamics of Aircraft Engine Components", AIAA Education Series, New York, 1915.

Course Code	AET208			Title	**Mechanics of Materials**			
Teaching Scheme	L	T	P	C	Evaluation Scheme	FET	CAT I	CAT II	ESE.
	3	1	-	4		20	15	15	50
						Minimum pass marks - 20			Minimum pass marks - 20

Course Outcomes: The students will be able to,

CO1	**Explain**[2] basic concepts of mechanics of materials
CO2	**Solve**[3] numerical problems with axial and shear loading
CO3	**Analyze**[4] stresses in beam structures
CO4	**Analyze**[4] deflections of beam structures with different load settings
CO5	**Analyze**[4] buckling of columns with different end conditions

Unit	**Content**	**Hrs**
Unit 1:	**Simple Stress and Strain** Introduction, Stress, Strain, Mechanical properties of materials, Linear elasticity, Hooke's Law and Poisson's ratio, Stress-Strain behavior of Mild steel. Extension/Shortening of a bar, bars with cross sections varying in steps, bars with continuously varying cross sections (circular and rectangular), Principle of super position.	6
Unit 2:	**Shear Force &Bending Moment in Beams** Introduction, Types of beams, loads and reactions,shear forces and bending moments, sign conventions, relationship between shearforce and bending moments. Numerical on Shear force and bending moment diagrams for different beams subjected to various loading condition.	6
Unit 3:	**Bending and Shear Stresses in Beams**: Introduction, Theory of simple bending, assumptions insimple bending. Bending stress equation. Shearing stresses in beams for various cross sections.(Composite / notched beams not included).	8
Unit 4:	**Compound Stresses: Introduction** Plane stress, stresses on inclined plane, principal stresses and maximum shear stresses, and orientation of these planes Mohr's circle for plane stress.Stress in Composite Section, Volumetric strain, expression for volumetric strain, elastic constants, simple shear stress, shear strain, temperature stresses (including compound bars).	8
Unit 5:	**Deflection of Beams**: Introduction, Differential equation for deflection. Double integration method for simply supported and cantilever beam subjected to point load only. Deflection by Macaulay's method.	6
Unit 6:	**Torsion of Circular Shafts and Elastic Stability of Columns**: Introduction, Pure torsion, assumptions, derivation of torsional equations, torsional rigidity/stiffness of shafts. Power transmitted by solid and hollow circular shafts. **Columns:** Euler's theory for axially loaded elastic long columns. Derivation of Euler's load for Hinged ends conditions, limitations of Euler's theory. Derivation of Rankine's Equation.	6

Text Books:

1. R. C. Hibbeler, “Mechanics of Materials”, Prentice Hall. Pearson Edu., 2005.
2. James M. Gere, “Mechanics of Materials”, Thomson, Fifth edition, 2004.
3. Ferdinand Beer & Russell Johnston, “Mechanics of Materials”, 5th Ed, TATA McGraw Hill- 2003.
4. S. S. Rattan , “Strength of Materials”, Tata McGraw Hill, 2009
5. S.S.Bhavikatti , “Strength of Materials”, Vikas publications House -1 Pvt. Ltd., 2nd Ed., 2006.
6. K.V. Rao, G.C. Raju, “Mechanics of Materials”, First Edition 2007
7. Egor.P. Popov, "Engineering Mechanics of Solids", Pearson Edu. India, 2nd, Edition 1998

Course Code	AET210				Title	**Avionic Engineering**			
Teaching Scheme	L	T	P	C	Evaluation Scheme	FET	CAT I	CAT II	ESE.
	3	-	-	3		20	15	15	50
						Minimum pass marks - 20			Minimum pass marks - 20

Course Outcomes: The students will be able to,

CO1	**Explain**[2] design considerations for avionic systems
CO2	**Explain**[2] various display systems used in an aircraft
CO3	**Discuss**[2] aircraft instruments that make the avionic system
CO4	**Explain**[2] communication, navigation, and surveillance systems
CO5	**Apply**[3] various Data Buses used in aircraft applications

Unit	**Content**	**Hrs**
Unit 1:	**Design Considerations** Importance and role of avionics, avionic environment, Regulatory and advisory agencies -Displays and man-machine interaction: Head -glass cockpit- Cathode Ray Tube (CRT), Active Matrix Liquid Crystal Display (AMLCD).	5
Unit 2:	**Display Systems** Head Down Display (HDD), Head Up Display (HUD), Helmet Mounted Display (HMD), OLEDS, Night Vision Goggles, LASERS, Integrated Standby Instrument System (ISIS), data fusion, intelligent displays management, Displays technology, control and data entry, instrument placements	6
Unit 3:	**Aircraft Instruments** Inertial reference systems, attitude derivation. RMI, HSI, ADI Magnetic Heading Reference System (MHRS.); Outside world sensor systems: Radar systems - Radar Sensing - Radar Altimeter (RADALT), Doppler Radar, Weather Radar, RADOME, Infrared systems, AWACS, Aircraft Lighting, Runway Lighting Systems	5
Unit 4:	**Navigation Systems** Principles of navigation, Automatic Direction Finding, Very High Frequency Omni-Range (VOR), Distance Measuring Equipment (DME), landing aids (ILS & MLS), Inertial Navigation, GPS-global positioning system, terrain reference navigation, RNAV, FMS, GPWS, TCAS, GNSS	6
Unit 5:	**Surveillance & Communications Systems** HF, VHF, UHF, Microwaves Signals and Noise, Modulation and demodulation, Antennas, propagation, data links, Telemetry, Transponders, Typical Systems in Aircrafts, Basic Radar Systems and types, ATC Electronic Warfare Basics	7
Unit 6:	**Data Buses** Evolution of avionics architecture, integrated modular avionics, tornado	7

serial, ARINC 429, 629, MIL-STD-1553B, STAGNAG 3910, JWIAG, hi speed data bus, PI Bus, TM Bus, COTS Data buses, Fibre Channel options, IEEE 1394 firewire, TTE, commercial off-the shelf (COTS) TTE Bus, modern data buses, Gigabit Ethernet

Text Books:

1. Cary R. Spitzer, The Avionics Handbook, 2nd Edition, CRC Press LLC, 2006
2. Ian Moir, Allan G. Seabridge, Military Avionics Systems, John Wiley & Sons, Ltd,2009

Reference Books:

1. Ian Moir, Allan G. Seabridge, Aircraft Systems: Mechanical, Electrical, Avionics Subsystems Integration, 3rdEdition, ohn Wiley & Sons, Ltd 2008
2. Cary R. Spitzer., Digital Avionics Systems Principles and Practices, 2nd ed, McGraw-Hill, Inc,1993.
3. Brain Kendal, “Manual of Avionics”, The English Book House, 3rd Edition, New Delhi, 1993.
4. Collinson RPG, Introduction to Avionics, Second Edition, Kluwer Academic Publishers, Chapman & Hall, 2003.
5. Don Middleton., Avionic Systems (Longman Aviation Technology Series), Longman, 1989

Course Code	AET212			Title	**Aerodynamics I - Lab**	
Teaching Scheme	L	T	P	C	Evaluation Scheme	FET	ESE.
	-	-	2	1		50	50
						Minimum pass marks - 20	Minimum pass marks - 20

Course Outcomes: The students will be able to,

CO1	**Operate**[2] wind tunnel for different analysis
CO2	**Analyze**[4] different forces acting on different bodies
CO3	**Analyze**[4] pressure distribution over different surfaces
CO4	**Conduct**[3] experiments to draw different boundary layer profiles for different models in wind tunnel
CO5	**Analyze**[4] flow patterns over surface of different models

List of Experiments

1. Perform experiment to calculate the different velocities and compare them with the manometer deflection.
2. Analysis of forces (Lift & Drag) over symmetrical aerofoil
3. Analysis of forces (Lift & Drag) over cambered aerofoil
4. Analysis of forces (Lift & Drag) over flat plate.
5. Perform experiment to calculate pressure distribution on a symmetrical aerofoil
6. Perform experiment to calculate pressure distribution on an unsymmetrical aerofoil.
7. Perform experiment to calculate pressure distribution on flat plate.
8. Perform experiment to calculate pressure distribution on a circular cylinder.
9. To visualize the flow patterns over the surface of different model
   I. Smoke Visualization
   II. Water tunnel

Course Code	AET214			Title	**Propulsion – Lab**	
Teaching Scheme	L	T	P	C	Evaluation Scheme	FET	ESE.
	-	-	2	1		50	50
						Minimum pass marks - 20	Minimum pass marks - 20

Course Outcomes: The students will be able to,

CO1	**Demonstrate**[2] working of an aircraft engine operated using electric motor
CO2	**Conduct**[3] experiment to determine heat transfer coefficient using free and forced convection equipment
CO3	**Evaluate**[4] propeller performance
CO4	**Conduct**[3] experiment on combustion of aviation fuel
CO5	**Test**[3] the prepared solid propellant

List of Experiments

1. Determine pressure distribution using Subsonic free / wall jet apparatus
2. Determine pressure distribution using Nozzle / Diffuser
3. Evaluate Propeller performance
4. Demonstration of Aircraft engines models/cut section
5. Determine convective heat transfer coefficient using Free/forced convective test setup
6. preparation of Solid propellant
7. Conduct test on magneto and ignition system
8. Determine combustion characteristics
9. Determine pressure/velocity distribution using Supersonic free jet apparatus

Course Code	AET216			Title	**Avionic Engineering Lab**		
Teaching Scheme	L	T	P	C	Evaluation Scheme	FET	ESE.
	-	-	2	1		50	50
						Minimum pass marks - 20	Minimum pass marks - 20

Course Outcomes: The students will be able to,

CO1	**Perform**[2] tests on digital systems
CO2	**Develop**[4] aircraft systems operations using logic gate
CO3	**Write**[3] program for applications of microprocessors.
CO4	**Test**[3] landing gear using avionic systems
CO5	**Write**[3] program for avionic data buses

List of Experiments

Digital Systems

1. Verification of Boolean theorems
2. Verification of Half adder/Full adder
3. Verification of Multiplexer / De-multiplexer Circuits.

Microprocessors

1. Addition and Subtraction of 8-bit and 16-bit numbers.
2. Sorting of Data in Ascending & Descending order.

Digital Experiments on Aircraft Systems

1. Aircraft engine starting system by logic gates
2. Aircraft landing gear position indignation and warning system

Avionics Data Buses

1. Study of Different Avionics Data Buses.
2. MIL-Std - 1553 Data Buses Configuration with Message transfer.
3. MIL-Std - 1553 Remote Terminal Configuration

Course Code	AET220			Title	**Workshop II**	
Teaching Scheme	L	T	P	C	Evaluation Scheme	FET
	-	-	2	1		100
						Minimum pass marks - 40

Course Outcomes: The students will be able to,

CO1	**Select**[2] appropriate hand tool for a given operation
CO2	**Select**[2] appropriate machine/work bench for a given operation
CO3	**Develop**[3] sheet metal drawing
CO4	**Prepare**[4] parts according to the dimensions
CO5	**Assemble**[3] all parts prepared to get a final product

List of Experiments

1. Preparation of Welding Joints Lap Joint, Butt Joint and T joint
2. Preparing Riveting Joints
1. Making Adhesive Joints (metal and non metals)
2. Making models of student choice with all joining processes

Course Code	AET218			Title	**CAD – Lab II**	
Teaching Scheme	L	T	P	C	Evaluation Scheme	FET
	-	-	2	1		100
						Minimum pass marks - 40

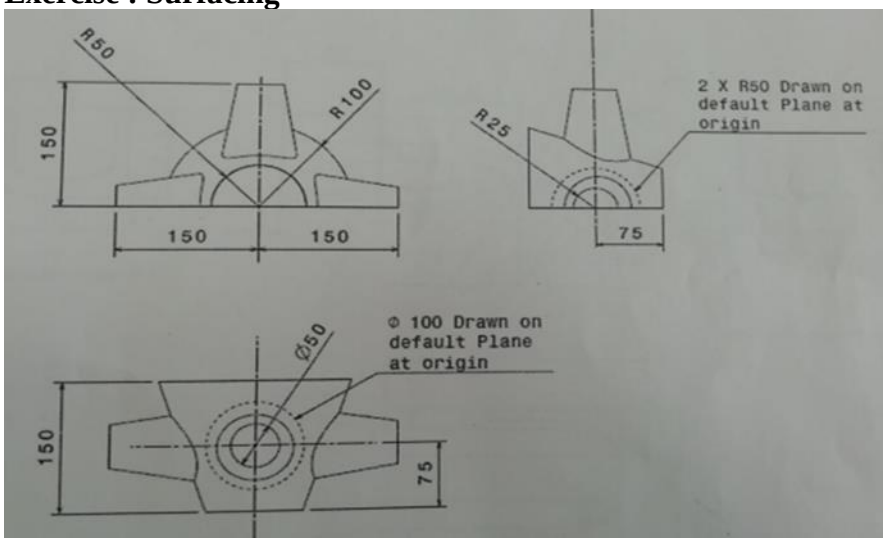
Course Outcomes: The students will be able to,

CO1	**Draw**^{2} surfacing exercises
CO2	**Design**^{2} wing of an Aircraft
CO3	**Creat**^{3} fuselage of an aircraft
CO4	**Draw**^{2} control components of an aircraft
CO5	**Design**^{3} elevator of an aircraft

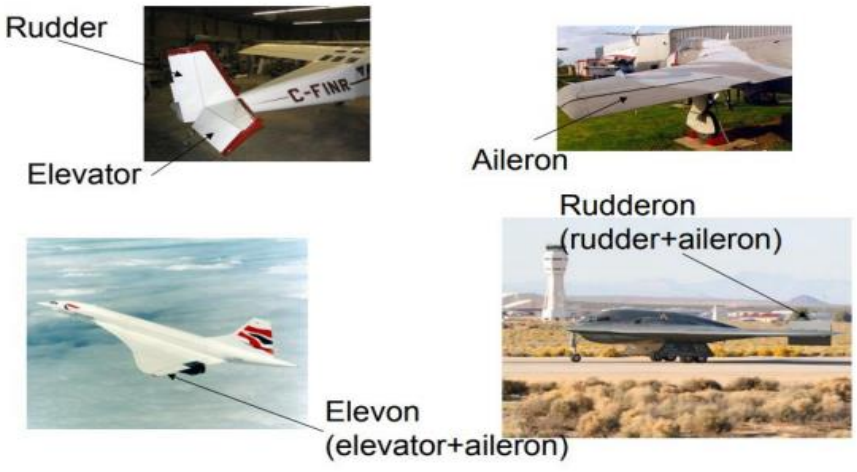
List of Exercises

1. Exercises on surfacing
2. Exercises on wing design
3. Exercises on fuselage design
4. Exercises on control design
5. Exercises on Elevator design

Exercise : Surfacing



Exercise : Modern control surfaces



Course Code	AET222			Title	**Professional Development Skill-II**	
Teaching Scheme	L	T	P	C	Evaluation Scheme	PET
	-	-	2	-		100
						Minimum pass marks - 40

Course Outcomes: The students will be able to,

CO1	**Demonstrate**[3] leadership skills
CO2	**Evaluate**[6] process and practical ways of decision making
CO3	**Judge**[6] causes of stress and find remedies to reduce stress
CO4	**Apply**[3] business etiquettes and ethics
CO5	**Exhibit**[3] group discussion and Interview skills

Unit	Content	Hrs
Unit- I	Leadership: Skills for a good Leader, Assessment of Leadership Skills Creativity: Lateral thinking, vertical thinking, Out of box thinking	04
Unit- II	Decision Making: Importance and necessity of Decision Making, Process and practical way of Decision Making, Weighing Positives & Negatives.	04
Unit- III	Stress Management: Causes of Stress and its impact, how to manage & distress, Circle of control, Stress Busters. Emotional Intelligence: What is Emotional Intelligence, dealing with feelings, emotional quotient, why Emotional Intelligence matters, Emotion Scales. Managing Emotions.	04
Unit- IV	Adapting to corporate life: Corporate Grooming and dressing, Business Etiquette Business Ethics, Dinning Etiquette, Ethics policy	04
Unit- V	Group Discussion: Group discussions as part of selection process. Structure of a group discussion, Dynamics of group behavior, techniques for effective Participation, Teamwork and use of body language. Interview: Process, techniques, Pre-In-After the interview preparation.	04
References	1. Wallace & Masters, Personal development for Life & work, Thomson Learning. 2. Barun K. Mitra , Personality Development and Soft- Skills , Oxford University Press. 3. Fred Luthans, Organizational behavior, McGraw Hill. 4. Asa Don Brown, Interpersonal skills in the Workplace, Tate publishing and Enterprises.	