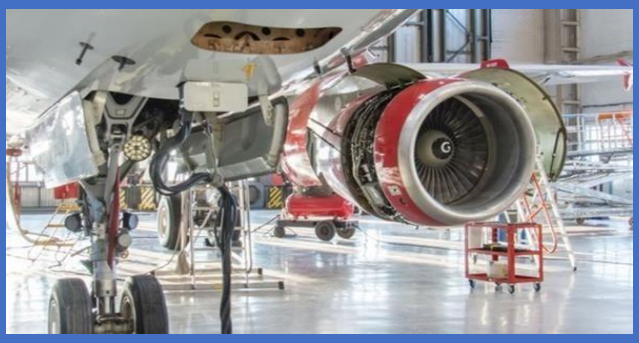
NEP III & IV Semester
Scheme & Syllabus
(2021-22)
Department of
Aeronautical Engineering

SCHEME AND SYLLABUS



Department of Aeronautical Engineering

GLOBAL ACADEMY OF TECHNOLOGY
(Autonomous institution affiliated to VTU, Belagavi.
Accredited by NAAC with 'A' grade,
NBA Accredited CS, E&C, E&E, MECH and IS branches)
Ideal Homes Township,
Raja Rajeshwari Nagar, Bengaluru-560098.

H.P. Rajasekhar Dheas
Dean Academic
Global Academy of Technology,
Rajarajeshwarinagar, Bengaluru-98

Head of the Department
Dept. of Aeronautical Engineering
Global Academy of Technology
R.R. Nagar, Bengaluru - 560 098.

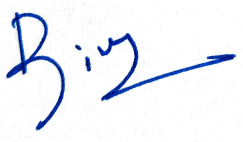
PREAMBLE

There has been a lot of discussion on the current mode of engineering education in our country and its impact on employability of fresh engineering graduates. Employability rating of fresh graduates is far from being satisfactory and industries are running short of trained and skilled manpower.

The demands of the society are dynamic, complex and keep changing at a rapid pace. Technological advancement is providing several innovations and breakthroughs exponentially in IT related domains like Artificial intelligence, Internet of Things, Machine learning, Automation and Robotics. These interventions are changing further the expectations of the society on products and services. In view of this, it becomes imperative to equip students to learn the art of linking science and engineering to the needs of the industry and society. The students must relate their learning to provide solutions to complex and real-life problems faced by the society. Engineering education needs to focus on how to apply knowledge to complex, unstructured problems in a global platform. The herculean task ahead of the engineering institutions is to produce graduates who are employable. Employability does not mean that a student should be placed in an industry before he/she leaves the portals of an institution. Employability means equipping engineering graduates with necessary technical skills, communication skills, leadership qualities, soft skills, professional ethics, and a social responsibility.

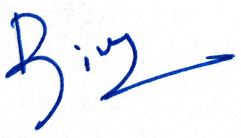
The onus of providing graduates with the attributes mentioned above lies with the institutions. Institutes should create conducive atmosphere where students learn to stimulate their creativity and develop their talents. The graduates must be trained to work in teams and must be exposed to interdisciplinary areas to establish better links with present generation industries. The domain boundaries have collapsed and most of the engineering streams are getting integrated and blended. It is therefore crucial that the graduates must be made to understand the nuances of the engineering education and the importance of creative thinking, innovation and being sensitive to societal changes.

Global Academy of Technology (GAT) has understood the importance of broad-based education and has created a conductive environment for the students to blossom into complete individuals. A true broad-based education prepares students for life, without losing their areas of specialization and competence. Our aim is to become a premier institution imparting quality education in engineering and management to meet the changing needs of the industry and society. The entire team at GAT is committed to realize the dream of making GAT an institution of eminence and creating an indelible impression in the area of engineering education.



The present focus of the institute is to improve the laboratory infrastructure by bringing new industry relevant technology to enable higher level of learning in students, foster integrated learning by providing multiple industry relevant interfaces, enable students to take up industry relevant projects and encourage faculty to take up research by providing ability to add customer logic.

With changing times and emergence of disruptive technologies, GAT stands strong in adapting and encompassing these into the mainstream in shaping students' career, thus contributing directly to society and nation building.



Contents

1. Global Academy of Technology – An Overview

(Autonomous Institution under Visvesvaraya Technological University, Belagavi)

1.1 Vision of the Institute:

Become a premier institution imparting quality education in engineering and management to meet the changing needs of society.

1 .2 Mission of the Institute:

- **Create environment conducive for continuous learning through quality teaching and learning processes supported by modern infrastructure.**
- **Promote Research and Innovation through collaboration with industries.**
- **Inculcate ethical values and environmental consciousness through holistic education programs.**

1.3 Objectives:

- **With a very firm resolve, Global Academy of Technology is continuously investing untiring efforts to enable students to:**
- **Develop careers in Government and Private engineering organizations and other**
- **professionally related domains.**
- **Pursue higher studies and research to develop innovative solutions and technologies in engineering and other multi-disciplinary areas.**
- **Improve professional and personal traits oriented towards professional ethics and environmental compulsions.**
- **Inculcate professional leadership and successful entrepreneurship qualities.**
- **Help society in raising the quality of life.**

1.4 Quality Policies:

- **Providing Excellent Education Through High Quality, Experienced and Committed Faculty.**
- **Evolving creative processes for optimal Knowledge and Skill Transfer.**
- **Building up state-of-the-art infrastructure at par with international standards.**
- **Creating an environment for holistic personality development and develop research temperament.**

1.5 Hallmarks of Global Academy of Technology:

- **Proactive management determined to build the institute as a Centre of Excellence in engineering education.**
- **Qualified and dedicated faculty in all the departments.**
- **State of the art Infrastructure and up to date laboratory and Library facilities.**
- **Lush green campus with an environment of tranquility and harmony.**
- **Student centric teaching-learning processes banking on Outcome Based Education;**
- **students' friendly learning atmosphere.**

- **Emphasis on Project based learning throughout the course.**
- **Strong Industry-Institute interface with more than twenty Memorandum of Understanding**
- **(MOUs) signed with leading industries and institutions of repute.**
- **Indian Institute of Information Technology (IIIT), Allahabad, has signed a MOU for providing internships to students of GAT, research assistance to faculty, and conducting Faculty Development Programs in key areas of IT - Big Data, Cloud Computing, Artificial Intelligence, and Machine Learning.**
- **Mahatma Gandhi University, Kottayam, has signed a MOU to facilitate research in Nano Technology and provide research assistance to faculty of GAT.**
- **Industrial consultancy undertaken in many departments.**
- **Excellent Placement with more than 80% of the eligible students placed in leading IT**
- **companies, core industries and Start-up companies.**
- **Holistic and integrated training modules covering communication skills, leadership skills, soft skills and technical skills through professional trainers.**
- **On campus and off campus internship facilities.**
- **Robust parent connects and Student counselling system.**
- **In-house technical skill training programs/add on courses to enhance the employability of the students.**
- **Strong and growing alumni connect in place**
- **Exclusive Research and Development, Industry–Institute Interaction Cell and Teaching and Learning Centre in place.**
- **Rainwater harvesting facility in the campus.**

The following academic processes are implemented on a regular basis to sustain a meaningful and proactive teaching-learning environment:

- **Emphasis on continuous revision of the curriculum, based on feedback from the students and input from industry, alumni, and other stakeholders.**
- **Conduction of regular training programme for faculty, technical & supporting staff.**
- **Conduction of Academic Audit of each department on an annual basis.**
- **Under open electives students have the options to study subjects offered by other departments to augment their interdisciplinary knowledge.**
- **Students have to do value added courses, mandatory courses, certificate courses, and become members of professional bodies, etc.**
- **Advanced and enrichment courses are offered as Electives during the final year UG and PG Degree Programmes.**
- **Self-Learning is encouraged in students through MOOCs, NPTEL/SWAYAM, Coursera, Edex etc. Credit shall be awarded to students for completion of such courses.**

2.0 Department of Aeronautical Engineering

2.1 Vision of the Department:

To emerge as an excellent center for imparting quality education and research to produce competent Aeronautical Engineers to meet the global challenges.

2.2 Mission of the Department:

M1: Empower the students with the fundamental knowledge and skill for a successful career in the field of Aeronautical Engineering, and facilitating them to continue their education through higher studies and Research & Development activities.

M2: Providing state of the art laboratories and infrastructure for academics and research in the areas of Aerodynamics, Structures, Propulsion and control systems.

M3: Enhancing industry-institute interaction leading to interdisciplinary research with social concern to become leaders in industries and/or become entrepreneurs with good ethics.

2.3 About the Department:

The Department of Aeronautical Engineering was established in the year 2020, affiliated to VTU, Belagavi, Karnataka, approved by AICTE. The department offers 4-year undergraduate programme, B.E. in Aeronautical Engineering. The department has a team of highly qualified, dedicated and motivated young and experienced faculties. The Department of Aeronautical Engineering has laboratories catering to students, scholars and faculty members for their academic and research activities. The curriculum is designed to impart engineering knowledge in topics such as Aerodynamics, Aircraft structures, Propulsion, Flight dynamics & Controls and UAVs. Further provision exists to acquire additional engineering knowledge through electives. The department prepares the graduates to undertake design, analysis, experimental and research activities as their careers in aeronautical engineering. The institution is located very closer to many leading aeronautical industries (ISRO, NAL, HAL, ADA, ADE etc.) and IT industries which will benefit the students in terms of collaboration.

The department activities are being monitored by the Department Advisory Board (DAB) and Program advisory committee (PAC) whose members are eminent personalities from industries, government organizations and R&D Sectors. The new initiative of establishing Research Centre in Aeronautical Engineering, GAT would provide researchers a good opportunity for enhancing their Research knowledge and Problem-solving skills.

3 Salient Featuresof Autonomy

Autonomous institutions occupy pivotal positions and are the key interfaces between the industry and academia. Autonomous institutions can create the key channels required for scientific and industrial research and innovation, inclusive teaching and training, and initiatives to develop the eco system for creating more employment.

Autonomy means freedom and authority in academic matters. Autonomy bestows the teacher with the right to decide what to teach, how to teach, how much to teach and whom to teach.

Autonomy gives the privilege to:

- **Run courses relevant to requirements of industries and society at large.**
- **Design Teaching-Learning methodologies, Assessment Tools and Methods, and Admission policies.**
- **Create an eco- system for holistic development of the individuals.**
- **Build strong academia and industry interface.**
- **Build the reputation of the institution through quality education.**
- **Industry relevant value-added courses during vacations.**
- **Internships in Industry/ R&D establishments in summer holidays.**
- **Building leadership qualities including spirit of tolerance and teamwork.**
- **There will be a lot of scope for industry- oriented skill development built-in into the system.**
- **Deliver engineering graduates who can effectively shoulder the responsibility of building a strong and vibrant INDIA.**

GAT has Board of Governance, Academic Council, Boards of Studies, Boards of Examination, Finance Committee, and Institute Steering Committee. Stakeholders in these bodies comprise of Academicians, Researchers, Industry Experts, Faculty and Alumni. Governing Body of the autonomous college lays down policies and procedures for Governance of the college carried out through the Principal of the college. Academic Council is the apex academic body of the college responsible for approval of schemes of study, syllabi, examinations and evaluation methods, declaration of results, recommendation of candidates to the University for Award of degrees etc. The college constitutes different Boards of Studies for different branches of engineering. The BOS's are responsible for framing of schemes of study and detailed curricula, academic rules etc. Other bodies like Finance Committee, Recruitment Committee help in administration of the college.

3.1 Outcome Based Education (OBE):

Outcome based education (OBE) is student-centered instruction model that focuses on measuring student performance through outcomes. Outcomes include knowledge, skills and attitude. 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 to 5 years of graduation.

The induction of India in the Washington Accord in 2014 with the permanent signatory status of The National Board of Accreditation (NBA) is considered a big leap forward for the higher-education system in India. It means that an Engineering graduate from India can be employed

in any one of the other countries who have signed the accord. For Indian Engineering Institutions to get accredited by NBA according to the pacts of the accord, it is compulsory that engineering institutions follow the Outcome Based Education (OBE) model. So, for an Engineering Institution to be accredited by NBA it should compulsorily follow the OBE model.

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

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

Outcome Based Education assesses students' performance, knowledge and skills through quiz, solving puzzles, giving an online presentation, modelling something, taking up a multiple - choice assessment. Assessments are criterion-focused which the students achieve during the learning period. Students are expected to go with the flow, think out of the box in order to implement outcome based education.

Students studying in an accredited program of an institution in India can be confident of getting an education which is of assured quality comparable to global standards. They can compete with their global counterparts for securing jobs in Multi-National Companies and other enterprises across the world. Students can also have global mobility- can work anywhere -in any corner of the globe. In addition, students will have access to the state-of-the-art facility, infrastructure, and access to highly qualified teaching faculty in an accredited program. Students would have acquired "graduate attributes" at the end of the course and will be industry ready. A student can also get into post- graduation and research.

3.2 Advantages of Outcome Based Education:

- Student-centered - It is an approach by which the learner's mastery over a particular skill is demonstrated and measured.
- Clarity in focus - A learning outcome must be made obvious to the learner even at the outset of learning. This outcomes-based model works on bringing out the specific outcomes from the learners.
- The curriculum is designed with a clear definition, outlining the expected outcomes. This will pave a way to achieve the expanded opportunities in the student's performance.
- Exceeding expectations - All students can deliver the highest level of performance. The only kick start needed is to make them believe and encourage, the only way to attain high expectation.
- Expanded opportunities - It means giving countless chances and ways to show the students that they have met with their objective. Not all learners learn the same thing, the same way, and at the same time. However, extended opportunities can help achieve high standards. They help students to learn what is mostly needed for the time and hour.

3.3 Program Outcomes (POs) as prescribed by National Board of Accreditation (NBA):

PO1- Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

PO2- Problem analysis: Identify, formulate, research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

PO3- Design/development of solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

PO4- Conduct investigations of complex problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

PO5- Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.

PO6- The engineer and society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal, and cultural issues, and the consequent responsibilities relevant to the professional engineering practice.

PO7- Environment and sustainability: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

PO8- Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

PO9- Individual and teamwork: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

PO10- Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

PO11- Project management and finance: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

PO12- Life-long learning: Recognize the need for and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

3.4 Program Specific Outcomes

PSO1: Apply the fundamental knowledge of Aerodynamics, Propulsion, Structures and Flight controls to solve core contemporary problems.

PSO2: Develop and use modern engineering tools to design and analyze the simple and complex problems in Aeronautical Engineering.

3.5 Some Definitions:

"Course" is a unit of teaching, which encompasses various topics, that typically lasts one semester, is led by one or more faculty and has a fixed registered student. Course means a subject either theory or practical identified by its title and code number.

"Program" – cohesive arrangements of courses, co- curricular extra-curricular activities to accomplish predetermined objectives leading to award of a Degree.

"Degree"- Academic award conferred upon a student on successful completion of a program designed to achieve the defined attributes.

3.6 Choice Based Credit System (CBCS):

Major Benefits: Major benefits accruing by adopting the Credit System are listed below:

- **Quantification and uniformity in the listing of courses for all programmes at a college, like core (hard/soft), electives and project work.**
- **Ease of allocation of courses under different heads by using their credits to meet national/international practices in technical education.**
- **Convenience to specify the minimum/ maximum limits of course load and its average per semester in the form of credits to be earned by a student.**
- **Flexibility in programme duration for students by enabling them to pace their course load within minimum/maximum limits based on their preparation and capabilities.**
- **Wider choice of courses available from any department of the same College or even from other similar Colleges, either for credit or for audit.**
- **Improved facility for students to optimize their learning by availing of transfer of credits earned by them from one College to another.**

As the Credit System has many advantages over the conventional system of organizing academic programs, GAT has introduced an appropriate Choice Based Credit System (CBCS) for the various programs. This will be of great benefit to the students in their preparations to meet the challenging opportunities ahead. In the Credit System, the course work of students is unitized, and each unit is assigned one credit after a student completes the teaching-learning process as prescribed for that unit and is successful in its assessment. However, there are different definitions followed in academic circles for the size of a unit and in turn, for a credit.

3.7 Credit Definition:

As it is desirable to have uniformity in the definition of credit across all Autonomous Colleges under the University, the following widely accepted definition for credit shall be followed at GAT. This can provide the good flexibility to the students and also strengthens CBCS under the University. Here, one unit of course work and its corresponding one credit (while referring to a Main Semester) shall be equal to:

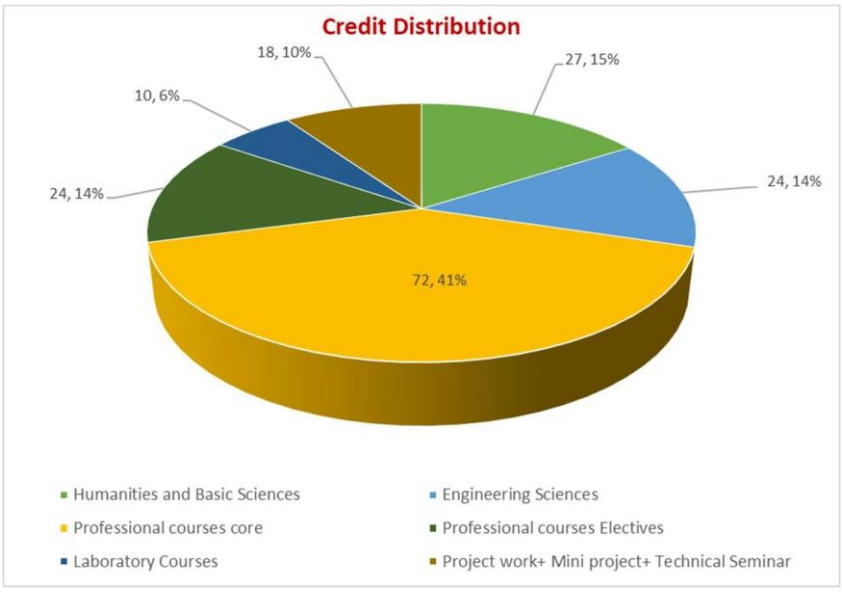
I. **Theory course conducted for 1 hour/week/ semester;**
II. **Laboratory course or Tutorial conducted for 2 hours/week/semester. The following additional factors may also be noted in this connection:**
III. **The above figures shall be multiplied by a factor of 2 in the case of the Supplementary Semester,**
IV. **Other student activities which are not demanding intellectually, or which do not lend to effective assessment, like practical training, study tours, attending guest lectures shall not carry any credit.**

Audit Courses: In Addition, a student can register for courses for audit only with a view to supplement his/her knowledge and/or skills. Here also, the student's grades will have to be reflected in the Grade Card. These courses shall not be considered in determining the student's academic performance in the semester. In view of this, it may not be necessary for the college to issue any separate transcript covering the audit courses to the registrants at these courses.

For more details on the academic regulations, students are advised to refer Academic Rules and regulations document available on the college website www.gat.ac.in.

3.5 Credit Distribution among Curricular components:

Sl. No.	Curricular Component	Credits allocated	Percentage of allocation
1	Humanities and Basic Sciences		
2	Engineering Sciences		
3	Professional courses core		
4	Professional courses Electives		
5	Laboratory Courses		
6	Project work+ Mini project+ Technical Seminar		
	Total		


Credit Distribution
18, 10%
27, 15%
10, 6%
24, 14%
24, 14%
72, 41%
Humanities and Basic Sciences
Engineering Sciences
Professional courses core
Professional courses Electives
Laboratory Courses
Project work+ Mini project+ Technical Seminar

Department of Aeronautical Engineering

III – IV Semester

SCHEME AND SYLLABUS

Scheme of UG Autonomous Program – 2021batch
(3rd to 8th Semester)

III SEMESTER

Sl. No.	Course Code	Course Title	Course Type	Teaching Dept.	Teaching Hours/Week			Examination			CREDITS
					L	T	P	CIE	SEE	Total	
1	21MAT31C	Complex Variables and Probability	BS	MAT	2	2	0	50	50	100	3
2	21ANE32	Fluid Mechanics	IPC	Respective Department	3	0	2	50	50	100	4
3	21ANE33	Solid Mechanics	IPC		3	0	2	50	50	100	4
4	21ANE34	Aero Thermodynamics	PC		2	2	0	50	50	100	3
5	21ANE35	Basics of Aeronautical Engineering	PC		3	0	0	50	50	100	3
6	21KSK36	Samskrutika Kannada	HSM	Any Department	1	0	0	50	50	100	1
	21KBK36	Balake Kannada									
	OR										
	21CIP36	Constitution of India and Professional Ethics									
7	21ANE37X	Ability Enhancement Course–I Digital Manufacturing in Aerospace Industries	PC	Respective Department	1	0	0	50	50	100	1
							Total	**350**	**350**	**700**	**19**
9	21MATDIP31	Additional Mathematics (For Lateral Entry Students)	BS	MAT	2	2	0	100	--	100	0

IV SEMESTER

Sl. No.	Course Code	Course Title	Course Type	Teaching Dept.	Teaching Hours/Week			Examination			CREDITS
					L	T	P	CIE	SEE	Total	
1	21MAT41X	Transforms Calculus and Numerical Techniques	BS	MAT	2	2	0	50	50	100	3
2	21ANE42	Aerodynamics – I	IPC	Respective Department	3	0	2	50	50	100	4
3	21ANE43	Computer Aided Aircraft Drawing	IPC		3	0	2	50	50	100	4
4	21ANE44	Aero Propulsion – I	PC		2	2	0	50	50	100	3
5	21ANE45	Aircraft structures - I	PC		2	2	0	50	50	100	3
7	21KSK46	Samskrutika Kannada	HSM	Any Department	1	0	0	50	50	100	1
	21KBK46	Balake Kannada									
	OR										
	21CIP46	Constitution of India and Professional Ethics									
8	21ANE47X	Ability Enhancement Course - II	PC	Respective Department	1	0	0	50	50	100	1
9	21INT48	Inter/Intra Institutional Internship	INT	Respective Department	0	0	3	100	-	100	2
							Total	**450**	**350**	**800**	**21**

Ability Enhancement Course – I

Course Code	Course Title
21ANE371	Digital Manufacturing in Aerospace Industries

Ability Enhancement Course – II

Course Code	Course Title
21ANE471	Introduction to artificial intelligence and machine learning

III Semester Syllabus

SEMESTER – III

COURSE: COMPLEX VARIABLES AND PROBABILITY (COMMON FOR ME/AE)

Course Code	**21MAT31C**	**CIE Marks**	**50**
Hours/Week (L: T: P)	**2:2:0**	**SEE Marks**	**50**
No. of Credits	**3**	**Examination Hours**	**03**

Course Objectives: To enable students to apply the knowledge of mathematics in the field of engineering by making them to learn:

CLO1	Analytic functions and complex line integrals
CLO2	Probability distributions
CLO3	Joint probability distributions
CLO4	Sampling distributions and testing of hypothesis

Content	No. of Hours/ RBT levels
Module 1 Function of a complex variable, Analytic functions, Cauchy-Riemann equations, construction of analytic functions using Milne Thomson method, Properties of analytic functions.	**08 Hours L2, L3**
Module 2 Conformal mapping, Bilinear transformations. Complex line integrals, Cauchy's theorem, Cauchy's integral formula, Singularities, poles, residues, Cauchy's residue theorem.	**08 Hours L2, L3**
Module 3 Probability, Axioms of probability, Conditional probability, Bayes theorem, Discrete and continuous random variables, Moments, Moment generating functions, Binomial, Uniform, Exponential, Poisson, Normal distributions.	**08 Hours L2, L3**
Module 4 Joint distributions, Marginal and conditional distributions, Expectation and Covariance. Transformation of random variables, Central limit theorem and law of large numbers.	**08 Hours L2, L3**
Module 5 Sampling, Sampling distributions, standard error, test of hypothesis for means and proportions, student's t-distribution, chi-square distribution as a test of goodness of fit.	**08 Hours L2, L3**

COURSE OUTCOMES:

Upon completion of this course, student will be able to:

CO1	Apply Cauchy Riemann equations to study different properties of analytic functions
CO2	Evaluate complex line integrals
CO3	Solve problems associated with random variables using probability distributions
CO4	Solve problems related to testing of hypothesis

Textbooks:

1. B. S. Grewal, Higher Engineering Mathematics, Khanna Publishers 44th Edition, 2017
2. T Veerarajan, Probability, Statistics and Random Processes for Engineers, Tata McGraw Hill, 3rd Edition, 2008

Reference books:

1. B.V. Ramana, Higher Engineering Mathematics, Tata McGraw-Hill, 2006
2. N.P.Bali and Manish Goyal, A Textbook of Engineering Mathematics, Laxmi Publications 6 th Edition, 2014
3. Richard H Williams, Probability, Statistics and Random Processes for Engineers, Cengage Learning, 1st Edition, 2003.

Scheme of Examination:

Semester End Examination (SEE):

SEE Question paper is to be set for 100 marks and the marks scored will be proportionately reduced to 50. There will be two full questions (with a maximum of three sub questions) from each module carrying 20 marks each. Students are required to answer any **five full questions** choosing at least **one full question from each module.**

Continuous Internal Evaluation (CIE):

Three Tests are to be conducted for 40 marks each. Average of Marks scored in all three tests is added to test component. CIE is executed by way of quizzes / Alternate Assessment Tools (AATs), and three tests. **Some possible AATs:** seminar/assignments/ mini-projects/ concept videos/ partial reproduction of research work/ group activity/ any other.

Typical Evaluation pattern for regular courses is shown in Table 2.

Table 2: Distribution of weightage for CIE & SEE of Regular courses

Component		Marks	Total Marks
CIE	CIE Test-1	**40**	**50**
	CIE Test-2	**40**	
	CIE Test-3	**40**	
	Assignments	**10**	
SEE	Semester End Examination	**50**	**50**
Grand Total			**100**

CO/PO Mapping																
CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO31.1	3	2	1									3				
CO31.2	3	2	1									3				
CO31.3	3	2	1									3				
CO31.4	3	2	1									3				
Average	3	2	1									3				

Low-1: Medium-2: High-3

SEMESTER – III

COURSE: FLUID MECHANICS

Course Code	**21ANE32**	**CIE Marks**	**50**
Hours/Week (L: T: P)	**3:0:2**	**SEE Marks**	**50**
No. of Credits	**4**	**Examination Hours**	**03**

Course Objectives: To enable students to apply the knowledge of Fluid Mechanics in broad domain of Aeronautical Engineering by making them to learn:

CLO1	The properties of fluids and its Characteristic are studied
CLO2	To understand the importance of dimensional analysis
CLO3	The applications of the conservation laws to flow through pipes are studied
CLO4	To understand the importance of Flow Measuring devices.
CLO5	To understand the importance of Viscous effect.

Content	**No. of Hours/ RBT levels**
Module 1 **Fluids**: Introduction, Properties of fluids, Viscosity, Types of fluids, Compressibility and Bulk Modulus. **Fluid Statics**: Fluid Pressure at a Point, Pascal's law, Pressure variation in a Static fluid, Absolute, Gauge, Atmospheric and Vacuum Pressures. Simple Manometer and Differential Manometer. Total Pressure and center of Pressure on Submerged Plane Surfaces.	**10HoursL3**
Module 2 **Buoyancy:** Buoyancy, Center of Buoyancy, Meta-Centre and Meta-Centric Height, Conditions of Equilibrium of Floating and Submerged Bodies, Determination of Meta-Centric Height. **Dimensional Analysis:** Introduction, Derived Quantities, Dimensions Of Physical Quantities, Dimensional Homogeneity, Rayleigh's Method, Buckingham's Π Theorem, Types Of Similarities And Dimensionless Numbers.	**10HoursL3**
Module 3 **Fluid Kinematics:** Types of Fluid Flow, Continuity Equation in 2D and 3D Velocity and Acceleration. Velocity Potential Function and Stream Function, Flow net, Fundamentals of flow visualization stream lines, stream tube, timeline, path lines, streak lines, flow visualization techniques. Vortex Flow - Free and Forced Vortex	**10HoursL3**
Module 4 **Fluid Dynamics**: Introduction, Equation of motion, Euler's equation of Motion, Bernoulli's equation from first principles, limitations of Bernoulli's equation. **Fluid Flow Measurements:** Venturimeter, Orifice meter, pitot-tube, vertical orifice, V-Notch and Rectangular notches.	**10HoursL3**

Module 5	
Flow through pipes: Minor Energy losses through pipes. Darcy's and Chezy's equation for loss of head due to Friction in pipes. **Viscous Flow**: Reynolds's number, Critical Reynold's number, Laminar flow, Turbulent flow, Viscous flow through Circular Pipe-Hagen Poiseille's formula, Viscous flow between two parallel plates and, Boundary layer concept.	**10Hours** **L3**

Laboratory Exercises

LIST OF EXPERIMENTS

1) Determination of the Coefficient of discharge of given Orifice meter.
2) Determination of the Coefficient of discharge of given Venturimeter.
3) Calibration of Venturimeter
4) Determination of Vane Coefficient for Flat Vane and Semi-circular Vane.
5) Determination of Minor Losses in Flow through pipes.
6) Determination of Coefficient of Friction of flow in a pipe.
7) Performance Characteristics of single stage Centrifugal Pump.
8) To determine the coefficient of discharge of Notch (V and Rectangular types)

COURSE OUTCOMES:

Upon completion of this course, student will be able to:

CO1	Apply Fundamental knowledge to Predict the Properties and Characteristics of fluid.
CO2	Apply principle of dimensional analysis & similitude to simple engineering problems and describe buoyancy force.
CO3	Understand the Kinematics of fluid flow and Continuity Equation.
CO4	Analyze the Forces and energy for the fluid flow in a conduit and compare the different flow Measuring devices.
CO5	Analyse the losses and viscous effects in the flow through pipes.

Textbooks:

1. R K Bansal, "Fluid Mechanics and Hydraulic machines", Lakshmi Publications, revised 9th Edition 2015.
2. Frank M. White "Fluid Mechanics", Seventh Edition, McGraw-Hill Companies,Inc. Publications, New York 2011.

Reference books:

1. Graebel W.P, "Engineering Fluid Mechanics", Taylor & Francis, Indian Reprint, 2011
2. Kumar K. L., "Engineering Fluid Mechanics", Eurasia Publishing House(p) Ltd., New Delhi 2016

Web references/ links

Mod-01 Lec-01 Introduction and Fundamental Concepts - I

Scheme of Examination:

Semester End Examination (SEE):

SEE Question paper is to be set for 100 marks and the marks scored will be proportionately reducedto 50. There will be two full questions (with a maximum of four sub questions) from each module carrying 20 marks each. Students are required

to answer any **five full questions** choosing at least **one full question from each module.**

Continuous Internal Evaluation (CIE):

Three Tests are to be conducted for 40 marks each. CIE is executed by way of quizzes / Alternate Assessment Tools (AATs) for 10 marks

Table 1: Distribution of weightage for CIE & SEE of Regular courses

	Component	Marks	Total Marks
CIE	CIE Test-1	**40**	**50**
	CIE Test-2		
	CIE Test-3		
	Quizzes /Assignment	**10**	
SEE	Semester End Examination	**50**	**50**
Grand Total			**100**

CO/PO Mapping														
CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	-	3	-	-	-	-	-	-	-	-	-	3
CO2	3	3	-	3	-	-	-	-	-	-	-	-	-	3
CO3	3	3	-	3	-	-	-	-	-	-	-	-	-	3
CO4	3	3	-	3	-	-	-	-	-	-	-	-	-	3
CO5	3	3	-	3	-	-	-	-	-	-	-	-	-	3
Average	3	3	-	3	-	-	-	-	-	-	-	-	-	3

Low-1: Medium-2: High-3

SEMESTER – III

COURSE: SOLID MECHANICS

Course Code	**21ANE33**	**CIE Marks**	**50**
Hours/Week (L: T: P)	**3:0:2**	**SEE Marks**	**50**
No. of Credits	**4**	**Examination Hours**	**03**

Course Objectives: To enable students to apply the knowledge of Solid Mechanics in broad domain of Aeronautical Engineering by making them to learn:

CLO1	To understand the concepts of stress, strain.
CLO2	To study the concept of shearing force and bending moment due to external loads in determinate beams and their effect on stresses.
CLO3	To determine stresses and deformation under bending and shear load.
CLO4	To determine stresses and deformation in circular shafts due to torsion , also to determine deflection in beams.
CLO5	To study the stresses and deformations induced in thin and thick shells.

Content	**No. of Hours/ RBT levels**
Module 1 **Stresses and Strains:** Introduction to Stress, Types of stress, Strain, Types of Strain, Modulus of Elasticity, True Stress, True Strain, Simple problems, Stress Strain Diagram of Ductile, Brittle, Visco- Elastic, Linear & Non-linear Elastic materials, Bars with varying sections, Bars of composite sections, Simple problems, Thermal stresses, Simple problems, Elastic constants and its relation, volumetric stains, Simple problems.	**10 Hours L3**
Module 2 **Compound Stresses:** Methods of Determining stresses in oblique sections, Principal planes and stresses, Simple problems, Construction of Mohr's circle, simple problems. **Shear Force and Bending Moment Diagram:** Introduction to shear force, bending moment, Types of Beams and loads, sign convention for shear force and bending moment, Shear force and bending moment diagram for various beams. Relation between shear force and bending moment.	**10 Hours L3**
Module 3 **Bending Stresses and shear stress in Beams:** Introduction, Pure Bending and Simple Bending, Expression of Bending stress, Neutral axis and Moment of resistance, bending stress in symmetrical sections, Section modulus, Section modulus for various shapes of the beam section. Introduction to shear stress, shear stress distribution for different section	**08 Hours L3**

Module 4 **Torsion of Shafts:** Introduction to torsion, Derivation of shear stress produced in a circular shaft subjected to Torsion, Expression of Torque in terms of polar moment of Inertia, Power transmitted by shaft, simple problem.	**09 Hours L3**
Module 5 **Column and struts:** Introduction to columns and struts, Failure of a column, Expression of crippling load when (a) both ends are hinged (b) One end of the column is fixed and the other end is free (c) both ends are fixed (d) One end is fixed and the other end is hinged. Simple problems to be solved used Euler's formula and Rankine formula. **Thick and Thin cylinders:** Thin cylinders subjected to internal pressure. Stresses in a thin cylinder subjected to internal pressure, Expression of circumferential stress and hoop stress, Simple problems Thick Cylinder: Lame's theorem, Stresses in a thick cylinder, Simple problems to be solved.	**08 Hours L3**

Laboratory Exercises

LIST OF EXPERIMENTS

1) Brinell, Rockwell and Vicker's hardness test on various specimens.
2) Izod and Charpy test on various specimens using impact-testing machine.
3) Preparation of specimen for metallographic examination of different engineering materials. Study of microstructures of plain carbon steel, tool steel, gray CI, SG iron, brass, bronze & composite.
4) To study the defects of cast and welded components using non-destructive tests:
   a) Ultrasonic flaw detection.
   b) Magnetic crack detection.
   c) Dye penetration testing.
5) Tensile, Shear, Bending and Compression tests of metallic and non-metallic specimen using Universal Testing Machine.
6) Torsion test on metallic specimen using torsion testing machine.
7) To study the wear characteristics of metals and non-metal materials under different parameters.
8) Fatigue Test (demonstration only).

COURSE OUTCOMES:

Upon completion of this course, student will be able to:

CO1	Evaluate mechanical properties of engineering materials using universal testing machine.
CO2	Assess the impact strength of engineering materials using impact testing machine.
CO3	Examine the microstructure of the metals, alloys and composites using the optical microscope.
CO4	Evaluate torsional behavior of shaft material and the hardness of the ferrous and non-ferrous materials.
CO5	Identify the defects in the material and in-service components using non-destructive testing methods.

Textbooks:

1. R K Bansal, Strength of Materials , Laxmi Publication Pvt Ltd., New Delhi, 2004.
2. Ramamrutham, Strength of Materials, Vikas Publication, New Delhi, Eighth edition (2014).
3. Gere and Timoshenko, Mechanics of materials, CBS Publishers & Distributors, 2nd edition, 2006.

Reference books:

1. Egor P. Popov, Engineering Mechanics of Solids, PHI publications 2nd edition.
2. R.c Hibbeler , Mechanics of materials, Pearson publications, 9th edition.
3. B.C. Punmia, Ashok Kumar Jain & Arun Kumar Jain, Mechanics of Materials, Laxmi publications, New Delhi , 2006

Web references/ links

https://freevideolectures.com/course/96/strength-ofmaterials

Scheme of Examination:

Semester End Examination (SEE):

SEE Question paper is to be set for 100 marks and the marks scored will be proportionately reducedto 50. There will be two full questions (with a maximum of four sub questions) from each module carrying 20 marks each. Students are required to answer any **five full questions** choosing at least **onefull question from each module.**

Continuous Internal Evaluation (CIE):

Three Tests are to be conducted for 40 marks each. CIE is executed by way of quizzes / Alternate Assessment Tools (AATs) for 10 marks

Table 1: Distribution of weightage for CIE & SEE of Regular courses

	Component	Marks	Total Marks
CIE	CIE Test-1	**40**	**50**
	CIE Test-2		
	CIE Test-3		
	Quizzes /Assignment	**10**	
SEE	Semester End Examination	**50**	**50**
Grand Total			**100**

CO/PO Mapping														
CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	-	2	-	-	-	-	3	2	-	-	3	-
CO2	3	3	-	2	-	-	-	-	3	2	-	-	3	-
CO3	3	3	-	2	-	-	-	-	3	2	-	-	3	-
CO4	3	3	-	2	-	-	-	-	3	2	-	-	3	-
CO5	3	3	-	2	-	-	-	-	3	2	-	-	3	-
Average	3	3	-	2	-	-	-	-	3	2	-	-	3	-

Low-1: Medium-2: High-3

SEMESTER – III

COURSE: AERO THERMODYNAMICS

Course Code	**21ANE34**	**CIE Marks**	**50**
Hours/Week (L: T: P)	**2:2:0**	**SEE Marks**	**50**
No. of Credits	**3**	**Examination Hours**	**03**

Course Learning Objectives: To enable students to apply the knowledge of Aero Thermodynamics in broad domain of Aeronautical Engineering by making them to learn:

CLO1	Basic knowledge on the fundamental concepts of thermodynamics
CLO2	The First law of thermodynamics and its application in Various flow systems
CLO3	The second law of thermodynamics applying to systems and the concept of entropy.
CLO4	Basic knowledge on standard air cycles
CLO5	To get exposure on the basic concepts of Heat and Mass transfer.

Content	No. of Hrs /RBT Levels
Module-1 **FUNDAMENTAL CONCEPTS** Continuum and macroscopic approach; Thermodynamic Systems: open, closed and isolated; Thermodynamic properties and equilibrium; State of a system, state postulate for simple compressible substances, state diagrams, paths and processes on state diagrams; zeroth law of thermodynamics; concept of temperature.	**08Hours L1, L2**
Module-2 **FIRST LAW OF THERMODYNAMICS** Concept of energy and various forms of energy; concepts of heat and work, different modes of work; internal energy, enthalpy; specific heats; first law applied to elementary processes, closed systems and control volumes, steady flow analysis of nozzles, diffusers, throttling devices, mixing, turbines and compressors; unsteady flow analysis.	**10 Hours L2,L3**
Module-3 **SECOND LAW OF THERMODYNAMICS AND ENTROPY** Limitations of the first law of thermodynamics, concepts of heat engines and heat pumps/refrigerators, Kelvin-Planck and Clausius statements and their equivalence; reversible and irreversible processes. Carnot cycle and Carnot theorems; thermodynamic temperature scale; Clausius inequality and concept of entropy; the principle of increase of entropy, T-s diagrams; availability and irreversibility	**8 Hours L2,L3**
Module-4 **AIR STANDARD CYCLES** Otto, Diesel, Dual, Ericsson, Atkinson, Stirling and Brayton cycles - air standard efficiency - Mean effective Pressure.	**8 Hours L2,L3**
Module-5 **BASICS OF HEAT AND MASS TRANSFER** Modes of heat transfer, Basic laws governing Heat transfer, combined heat transfer mechanism. Boundary conditions of 1st, 2nd and 3rd kind. Introduction	**8 Hours L2,L3**

to mass transfer, definition and terms used in mass transfer, Fick's law of diffusion, Numerical.	

COURSE OUTCOMES:

Upon completion of this course, student will be able to:

CO1	Relate laws of thermodynamics in various engineering problems.
CO2	Differentiate thermodynamic work and heat and apply I law of thermodynamics to different process
CO3	Analyze and decide the feasibility of design variables using thermodynamics principles.
CO4	Analyze the different types of air standard cycles
CO5	Recognize and Calculate heat transfer involving several heat transfer mechanisms.

Textbooks:

1. Yunus A. Cengel and Michael A. Boles, "Thermodynamics: An Engineering Approach" 9th ed., McGraw Hill Publishing Company Limited.
2. Yunus A Cengel, Heat and Mass Transfer - A Practical Approach, 5th ed., McGraw Hill Publishing Company Limited.
3. Nag.P.K., "Engineering Thermodynamics", Tata McGraw-Hill, New Delhi, 2013.
4. Rathakrishnan E., "Fundamentals of Engineering Thermodynamics", Prentice-Hall India, 2005.

Reference books:

1. Arora C.P, "Thermodynamics", Tata McGraw-Hill, New Delhi, 2003.
2. Holman.J.P., "Thermodynamics", 3rd Edition, McGraw-Hill, 2007.
3. Merala C, Pother, Craig W, Somerton, "Thermodynamics for Engineers", Schaum Outline Series,Tata McGraw-Hill, New Delhi, 2004.
4. Ramalingam K.K. "Thermodynamics", Sci-Tech Publications, 2006
5. Venwylen and Sontag, "Classical Thermodynamics", Wiley Eastern, 1987.
6. Incropera, DeWitt, "Fundamentals of Heat and mass transfer", John Wiley and Sons, 6 th Edition, 2005.
7. Hegde, R.K., Heat and Mass Transfer - Basic Approach, Sapna book House, Bangalore

Web references/ Additional online information (related to module if any):

1. https://nptel.ac.in/courses/101/104/101104067/
2. https://nptel.ac.in/courses/101/104/101104067/
3. https://nptel.ac.in/courses/101/104/101104067/
4. https://nptel.ac.in/courses/101/104/101104067/
5. https://nptel.ac.in/courses/101/104/101104067/
6. https://nptel.ac.in/courses/112101097/

Practical knowledge references

1. https://www.youtube.com/watch?v=suuTC9uGLrI
2. https://www.youtube.com/watch?v=7bJywbP7ZIU
3. https://www.youtube.com/watch?v=7OJGZHrbD8
4. https://www.youtube.com/watch?v=7bJywbP7ZIU
5. https://www.youtube.com/watch?v=2vHLJjlinjw
6. https://www.youtube.com/watch?v=Juz9pVVsmQQ
7. https://www.youtube.com/watch?v=L1AHGHRvv9s

Scheme of Examination:

Semester End Examination (SEE):

SEE Question paper is to be set for 100 marks and the marks scored will be proportionately reduced to 50. There will be two full questions (with a maximum of four sub questions) from each module carrying 20 marks each. Students are required to answer any **five full questions** choosing at least **one full question from each module.**

Continuous Internal Evaluation (CIE):

Three Tests are to be conducted for 40 marks each. CIE is executed by way of quizzes/ Alternate Assessment Tools (AATs) for 10 marks. Typical Evaluation pattern for regular courses is shown in Table 1.

Table1: Distribution of weightage for CIE & SEE of Regular courses

	Component	Marks	Total Marks
CIE	CIE Test-1	**40**	**50**
	CIE Test-2		
	CIE Test-3		
	Quiz 1/AAT	**10**	
SEE	Semester End Examination	**50**	**50**
Grand Total			**100**

CO/PO Mapping

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	-	-	-	-	-	-	-	1	-	1	3	-
CO2	3	2	-	-	-	-	-	-	-	1	-	1	3	-
CO3	3	2	-	-	-	-	-	-	-	1	-	1	2	-
CO4	2	2	-	-	-	-	-	-	-	-	-	1	3	-
CO5	3	2	-	-	-	-	-	-	-	1	-	1	3	-
Average	3	2	-	-	-	-	-	-	-	1	-	1	3	-

SEMESTER – III

COURSE: BASICS OF AERONAUTICAL ENGINEERING

Course Code	**21ANE35**	**CIE Marks**	**50**
Hours/Week (L: T: P)	**3:0:0**	**SEE Marks**	**50**
No. of Credits	**3**	**Examination Hours**	**03**

Course Objectives: To enable students to apply the knowledge of Introduction to Aeronautical Engineering in broad domain of Aeronautical Engineering by making them to learn:

CLO1	Understand the Historical evaluation of Airplanes & different structures & construction
CLO2	Understand the basic properties and principles behind the flight
CLO3	Study the various types of power plants used in aircrafts
CLO4	Study of the aircraft Stability
CLO5	Study the different component systems and functions

Content	**No. of Hours/ RBT levels**
Module 1 **Introduction to Aircrafts** History of aviation; Atmosphere and its properties; Classification of aircrafts; Basic components of an aircraft; structural members; aircraft axis system; aircraft motions; control surfaces and high lift devices; conventional design configurations; Helicopters, their parts and functions. **Aircraft Structures and Materials:** Introduction; general types of construction; monocoque, semimonocoque and geodesic structures; typical wing and fuselage structure; metallic and non-metallic materials for aircraft application.	**08 Hours L3**
Module 2 **Aerodynamics:** Basic principles of flight – significance of speed of sound; airspeed and groundspeed; Bernoulli's theorem; forces over wing section, aerofoil nomenclature, pressure distribution over a wing section. Lift and drag components, lift curve, drag curve, types of drag, factors affecting lift and drag; centre of pressure and its significance; aerodynamic centre, aspect ratio, Mach number and supersonic flight.	**08 Hours L3**
Module 3 **Aircraft Propulsion:** Aircraft power plants, classification based on power plant and principle of operation. Turboprop, turbojet and turbofan engines; ramjets and scramjets; performance characteristics. Aircraft power plants – basic principles of piston, turboprop and jet engines; Brayton cycle and its application to gas turbine engines; use of propellers and jets for production of thrust; comparative merits and limitations of different types of propulsion engines; principle of thrust augmentation.	**08 Hours L3**

Module 4 **Aircraft Stability:** Forces on an aircraft in flight; static and dynamic stability; longitudinal, lateral and roll stability; necessary conditions for longitudinal stability; basics of aircraft control systems. Performance of aircraft – power curves, maximum and minimum speeds for horizontal flight at a given altitude; effect of changes in engine power and altitude on performance; correct and incorrect angles of bank; aerobatics.	**08 Hours** **L3**
Module 5 **Aircraft Systems:** Mechanical systems and their components; hydraulic and pneumatic systems; oxygen System; environmental Control System; fuel system. Electrical systems, flight deck and cockpit systems; navigation system, communication system. **Aircraft systems (Mechanical)** – Hydraulic and pneumatic systems and their applications; environment control system; fuel system, oxygen system. **Aircraft systems (Electrical)** – Flight control system, cockpit instrumentation and displays; communication systems; navigation systems; power generation systems – engine driven alternators, auxiliary power Module, ram air turbine; power conversion, distribution and management.	**10 Hours** **L3**

COURSE OUTCOMES:
Upon completion of this course, student will be able to:

CO1	Learn the history of aircraft & developments over the years, Acquire knowledge on Aircraft differentiate types and constructions
CO2	Understand the basic concepts of flight & Physical properties of Atmosphere
CO3	Understand the Different types of Engines and principles of Rocket
CO4	Understand the Basics of aircraft Stability
CO5	Ability to identify the types & classifications of components and control systems

Textbooks:

1. Anderson, J.D., Introduction to Flight, McGraw-Hill; 8th edition, 2015
2. Handbooks of Airframe and Power Plant Mechanics, US dept. of Transportation, Federal, Aviation Administration, the English Book Store, New Delhi, 1995.
3. Mekinley, J.L. and R.D. Bent, Aircraft Power Plants, McGraw Hill 1993.
4. Pallet, E.H.J. Aircraft Instruments & Principles, Pitman & Co 1993.
5. Stephen.A. Brandt, Introduction to aeronautics: A design perspective, 2nd edition, AIAA Education Series, 2004.

Reference books:

1. Kermode, A.C. Flight without Formulae, Pearson Education; Eleven edition, 2011
2. McKinley, J.L. and Bent R.D. Aircraft Maintenance & Repair, McGraw Hill, 1993.

Scheme of Examination:
Semester End Examination (SEE):
SEE Question paper is to be set for 100 marks and the marks scored will be proportionately reducedto 50. There will be two full questions (with a maximum of four

sub questions) from each module carrying 20 marks each. Students are required to answer any **five full questions** choosing at least **onefull question from each module.**

Continuous Internal Evaluation (CIE):

Three Tests are to be conducted for 40 marks each. CIE is executed by way of quizzes / Alternate Assessment Tools (AATs) for 10 marks

Table 1: Distribution of weightage for CIE & SEE of Regular courses

	Component	Marks	Total Marks
CIE	CIE Test-1	**40**	**50**
	CIE Test-2		
	CIE Test-3		
	Quizzes /Assignment	**10**	
SEE	Semester End Examination	**50**	**50**
Grand Total			**100**

CO/PO Mapping														
CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	1	-	-	-	-	-	-	-	-	3	1	-
CO2	3	3	1	-	-	-	-	-	-	-	-	3	1	-
CO3	3	3	1	-	-	-	-	-	-	-	-	3	1	-
CO4	3	3	1	-	-	-	-	-	-	-	-	3	1	-
CO5	3	3	1	-	-	-	-	-	-	-	-	3	1	-
Average	3	3	1	-	-	-	-	-	-	-	-	3	1	-

Low-1: Medium-2: High-3

SEMESTER – III

COURSE: Balake Kannada (for Non-Kannadiga Students)

Subject Code	21KBK36	CIE Marks	100
Hours/Week (L: T: P)	0:2:0	SEE Marks	-
Credits	0	Examination Hours	-

Course Learning Objectives:

The course will enable the students to understand Kannada and communicate (converse) in Kannada language.

Table of Contents

- Abbreviations
- Key to Transcription
- Easy learning of a Kannada Language: A few tips
- Necessity of learning a local langauge:
- Tips to learn the language with easy methods.
- Hints for correct and polite conservation
- About Kannada Language (Kannada Bhashe)
- Eight Kannada authors who have won 'Jnanpith Award'
- Information about Karnataka State

Part : I

Instructions to Teachers

1. How to Teach the BaLake Kannada Book
2. Methods to be followed in Teaching of all the chapters/ concepts

Chapter – 1 Listening and Speaking - KelisikoLLuvudu mattu Maatanaduvudu

1. Pronouns – SarvanaamagaLu
2. Adjectives – Naama VisheshaNagaLu
3. Verbs – KriyapadagaLu
4. Adverbs – KriyavisheshaNagaLu

Necessity of learning a local langauge:

The learning of local language,

- Encourages the respect for other people: it fosters an understanding of the interrelation of language and human nature.
- Expands one's view of the world, liberalizes one's experiences, and makes one more flexible and tolerant.
- Limits the barriers between people: barriers cause distrust and fear.
- Opens the door to art, music, dance, fashion, cuisine, film, philosophy, science...etc.
- Leads to an appreciation of cultural diversity.
- Helps fluent communication.

Language learning helps to develop strong cognitive skills, such as a better concept formation, mental flexibility, multitasking, listening skills and problem-solving, in addition to improve social interaction and also encourages the connection between peers.

Use of local language help to mingle with the local society and ensures security, pleasant welcoming from auto/cab drivers, shop owners, employees of local government etc., and make the living easier and more comfortable.

Tips to learn the language with easy methods.

Apart from the conventional method of learning from teachers, the learning of language can be accelerated by adopting the following methods.

1. Love the learning without boredom.
2. Talk to classmates and others in Kannada without hesitation and with no concern to grammatical mistakes during the initial stages of learning the language.
3. Use English words to continue the conversation when you find difficulty in finding suitable Kannada word/s. Vocabulary improves with the use of language.
4. While reading, read aloud (not silently or in a whisper manner, but audibly so that others are not being disturbed or others can hear what is being read). Reading aloud not only helps proper/ correct pronunciation of words with variation in pitch, pace, volume, pauses etc., but also produces a fluent and enjoyable delivery during conversation/debate/presentation.
5. Listen to Kannada news and watch Kannada movies.
6. Listen to Kannada FM radios for news, live conversations and songs.
7. Use online applications (apps) for fast learning.

Easy learning of a Kannada Language: A few tips

1. Watching Kannada movies (preferably with subtitles), can be of great help. This is an important and entertaining way to improve your language skills.
2. Do not hesitate. Speak the language at every possible opportunity.
3. Never mind if you are using less Kannada and more English words. Kanglish is anyway popular in Bangalore. However constantly try to improve your Kannada vocabulary.
4. Watch Kannada news. This is not only helpful in learning the language, but will help you to know your city better.
5. If you are a user of public transport, carefully listen to co-passengers' conversations.
6. Enjoy the local tang of the language by listening to Kannada FM stations.
7. Do not completely rely on 'Learn Kannada in 30 days' type of books. Many Bangaloreans will fail to comprehend your textbook language and you are sure to face some embarrassment, if you go strictly by books.

Hints for correct and polite conservation

1. Be vigilant about the verbs, the pronouns, the genders and tense required for day to day Conversation.
2. Pronounce the words properly.
3. Use plural form to address others.
4. Use simple sentences for conversation.

About Kannada Language (Kannada Bhashe)

- Kannada is one of the classical (Shastreeya) languages of India since November 01, 2008, and is the official language of the Karnataka state.
- This language is not just confined within the borders of Karnataka, for you will find it spoken by people in parts of the neighboring states of Andhra Pradesh, Tamil Nadu and Maharashtra. Kannada is spoken in its various dialects by Six to Seven million people across the globe. It is one among the top 40 most spoken languages of the world.
- Spoken Kannada is in use since 2500 years, and has its own script since 1900 years. Spoken Kannada varies according to the regions of Karnataka, while the written form of Kannada remains almost the same. Kannada is the third oldest language of India (after Sanskrit and Tamil).
- The written form of Kannada is phonetic and it is written as it is spoken.
- The first Kannada-English Dictionary (ShabdaKosha) was compiled in 1894 by a German priest, Rev. Ferdinand Kittel. He also wrote a book on Kannada Grammar entitled, "A Grammar of the Kannada Language: Comprising the Three Dialects of the Language".
- Several noted centuries old literary works of Kannada have been translated into Sanskrit, and other languages.
- November 1st of every year is celebrated as Kannada Rajyotsava Day throughout Karnataka state and is declared as a state holiday. This was the day that the name Karnataka was given to the Mysore state in the year 1973.

ಅಖಂಡ

SEMESTER – III

COURSE: Samskruthika Kannada

Subject Code	21KSK36	CIE Marks	100
Hours/Week (L: T: P)	0:2:0	SEE Marks	-
Credits	0	Examination Hours	-

ಸಾಂಸ್ಕೃತಿಕ ಕನ್ನಡ ಕಲಿಕೆಯ ಉದ್ದೇಶಗಳು:

- ಪದವಿ ವಿದ್ಯಾರ್ಥಿಗಳಾಗಿರುವುದರಿಂದ ಸಾಂಸ್ಕೃತಿಕ ಕನ್ನಡ ಜೊತೆಗೆ ಕ್ರಿಯಾತ್ಮಕ ಕನ್ನಡವನ್ನು, ಕನ್ನಡ ಸಾಹಿತ್ಯ, ಸಂಸ್ಕೃತಿ ಮತ್ತು ನಾಡು ನುಡಿಯ ಪರಿಚಯ ಮಾಡಿಕೊಡುವುದು.
- ವಿದ್ಯಾರ್ಥಿಗಳಲ್ಲಿ ಕನ್ನಡ ಭಾಷೆಯ ವ್ಯಾಕರಣದ ಬಗ್ಗೆ ಅರಿವು ಮೂಡಿಸುವುದು ಮತ್ತು ಕನ್ನಡ ಭಾಷಾ ರಚನೆಯಲ್ಲಿನ ನಿಯಮಗಳನ್ನು ಪರಿಚಯಿಸುವುದು.
- ಕನ್ನಡ ಭಾಷಾ ಬರಹದಲ್ಲಿ ಕಂಡುಬರುವ ದೋಷಗಳು ಹಾಗೂ ಅವುಗಳ ನಿವಾರಣೆ.
- ಸಾಮಾನ್ಯ ಅರ್ಜಿಗಳು, ಸರ್ಕಾರಿ ಮತ್ತು ಅರೆ ಸರ್ಕಾರಿ ಪತ್ರವ್ಯವಹಾರದ ಬಗ್ಗೆ ಅರಿವು ಮೂಡಿಸುವುದು.
- ಭಾಷಾಂತರ ಮತ್ತು ಪ್ರಬಂಧ ರಚನೆ ಬಗ್ಗೆ ಆಸಕ್ತಿ ಮೂಡಿಸುವುದು.
- ಕನ್ನಡ ಭಾಷಾಭ್ಯಾಸ, ಸಾಮಾನ್ಯ ಕನ್ನಡ ಹಾಗೂ ಆಡಳಿತ ಕನ್ನಡದ ಪದಗಳ ಪರಿಚಯ ಮಾಡಿಕೊಡುವುದು.

ಸಾಂಸ್ಕೃತಿಕ ಕನ್ನಡ ಪಠ್ಯಪುಸ್ತಕ

ಪರಿವಿಡಿ

ಭಾಗ – ಒಂದು ಲೇಖನಗಳು (ಕನ್ನಡ ನಾಡು, ನುಡಿ ಮತ್ತು ಸಂಸ್ಕೃತಿಗೆ ಸಂಬಂಧಿಸಿದ ಲೇಖನಗಳು)

೧. ಕರ್ನಾಟಕ ಸಂಸ್ಕೃತಿಗೆ : ಪಂಪ ನಾಗರಾಜಯ್ಯ

೨. ಕರ್ನಾಟಕದ ಏಕೀಕರಣ : ಒಂದು ಅಪೂರ್ವ ಚರಿತ್ರೆ – ಜಿ. ವೆಂಕಟಸುಬ್ಬಯ್ಯ

೩. ಆಡಳಿತ ಭಾಷೆಯಾಗಿ ಕನ್ನಡ – ವಿಶಾವಿಯ ಆಡಳಿತ ಕನ್ನಡ ಪುಸ್ತಕದಿಂದ ಆಯ್ದ ಲೇಖನ*

ಭಾಗ – ಎರಡು ಕಾವ್ಯ ಭಾಗ (ಆಧುನಿಕ ಪೂರ್ವ)

೪. ವಚನಗಳು : ಬಸವಣ್ಣ, ಅಕ್ಕಮಹಾದೇವಿ, ಅಲ್ಲಮಪ್ರಭು, ಆಯ್ದಕ್ಕಿ ಮಾರಯ್ಯ, ಜೇಡರ ದಾಸಿಮಯ್ಯ, ಆಯ್ದಕ್ಕಿ ಲಕ್ಕಮ್ಮ

೫. ಕೀರ್ತನೆಗಳು : ಅದರಿಂದೇನು ಫಲ ಇದರಿಂದೇನು ಫಲ – ಪುರಂದರದಾಸ

ತಲ್ಲಣಿಸದಿರು ಕಂಡ್ಯತಾಳು ಮನವೆ – ಕನಕದಾಸ

೬. ತತ್ವಪದಗಳು : ಸಾವಿರ ಕೊಡಗಳ ಸುಟ್ಟು – ಶಿಶುನಾಳ ಷರೀಫ

ಶಿವಯೋಗಿ – ಬಾಲಲೀಲಾ ಮಹಾಂತ ಶಿವಯೋಗಿ

೭. ಜನಪದ ಗೀತೆ : ಬೀಸುವ ಪದ, ಬಡವರಿಗೆ ಸಾವ ಕೊಡಬೇಡ

ಭಾಗ – ಮೂರು ಕಾವ್ಯ ಭಾಗ (ಆಧುನಿಕ)

೮. ಮಂಕುತಿಮ್ಮನ ಕಗ್ಗ : ಡಿ.ವಿ.ಜಿ.

೯. ಕುರುಡು ಕಾಂಚಾಣ : ದ.ರಾ. ಬೇಂದ್ರೆ

೧೦. ಹೊಸಬಾಳಿನ ಗೀತೆ : ಕುವೆಂಪು

೧೧. ಹೆಂಡತಿಯ ಕಾಗದ : ಕೆ.ಎಸ್. ನರಸಿಂಹಸ್ವಾಮಿ

೧೨. ಮಬ್ಬಿನಿಂದ ಮಬ್ಬಿಗೆ : ಜಿ.ಎಸ್. ಶಿವರುದ್ರಪ್ಪ

೧೩. ಆ ಮರ ಈ ಮರ : ಚಂದ್ರಶೇಖರ ಕಂಬಾರ

೧೪. ಚೋಮನ ಮಕ್ಕಳ ಹಾಡು : ಸಿದ್ಧಲಿಂಗಯ್ಯ

ಭಾಗ – ನಾಲ್ಕು ತಾಂತ್ರಿಕ ವ್ಯಕ್ತಿ ಪರಿಚಯ, ಕಥೆ ಮತ್ತು ಪ್ರವಾಸ ಕಥನ

೧೫. ಡಾ. ಸರ್ ಎಂ. ವಿಶ್ವೇಶ್ವರಯ್ಯ – ವ್ಯಕ್ತಿ ಮತ್ತು ಐತಿಹ್ಯ : ಎ ಎನ್ ಮೂರ್ತಿರಾವ್

೧೬. ಯುಗಾದಿ : ವಸುಧೇಂದ್ರ

೧೭. ಮೆಗಾನೆ ಎಂಬ ಗಿರಿಜನ ಪರ್ವತ : ಹಿ.ಚಿ.ಬೋರಲಿಂಗಯ್ಯ

ಭಾಗ – ಐದು ವಿಜ್ಞಾನ ಮತ್ತು ತಂತ್ರಜ್ಞಾನ

೧೮. ಕರಕುಶಲ ಕಲೆಗಳು ಮತ್ತು ಪರಂಪರೆಯ ವಿಜ್ಞಾನ : ಕರೀಗೌಡ ಬೀಚನಹಳ್ಳಿ

೧೯. 'ಕ' ಮತ್ತು 'ಬ' ಬರುವ ತಂತ್ರಾಂಶಗಳು ಮತ್ತು ಕನ್ನಡದ ಟೈಪಿಂಗ್'

೨೦. ಕನ್ನಡ – ಕಂಪ್ಯೂಟರ್ ಶಬ್ದಕೋಶ'

೨೧. ತಾಂತ್ರಿಕ ಪದಕೋಶ : ತಾಂತ್ರಿಕ ಹಾಗೂ ಪಾರಿಭಾಷಿಕ ಕನ್ನಡ ಪದಗಳು'

'(ವಿತಾವಿ ಯ ಆಡಳಿತ ಕನ್ನಡ ಪುಸ್ತಕದಿಂದ ಆಯ್ದ ಲೇಖನಗಳು – ಡಾ. ಎಲ್. ತಿಮ್ಮೇಶ ಮತ್ತು ಪ್ರೋ.ವಿ.ಕೇಶವಮೂರ್ತಿ)

SEMESTER – III

COURSE: Constitution of India and Professional Ethics (CIP)

Course Code	**21CIP36**	**CIE Marks**	**50**
Hours/Week (L: T: P)	**0 : 2 : 0**	**SEE Marks**	**50**
Total Hours of Pedagogy	**02 Hours/Week**	**Total Marks**	**100**
No. of Credits	**01**	**Examination Hours**	**01 Hours**

Course Objectives:

CLO1	To know about the basic structure of Indian Constitution.
CLO2	To know the Fundamental Rights (FR's), DPSP's and Fundamental Duties (FD's) of our constitution.
CLO3	To know about our Union Government, political structure & codes, procedures.
CLO4	To know the State Executive & Elections system of India.
CLO5	To learn the Amendments and Emergency Provisions, other important provisions given by the constitution

Content	**No. of Hours**
Module 1 **Introduction to Indian Constitution:** The Necessity of the Constitution, The Societies before and after the Constitution adoption. Introduction to the Indian constitution, The Making of the Constitution, The Role of the Constituent Assembly. The Preamble of Indian Constitution & Key concepts of the Preamble. Salient features of India Constitution.	**03 Hours**
Module 2 **FR's, FD's and DPSP's:** Fundamental Rights and its Restriction and limitations in different Complex Situations. Directive Principles of State Policy (DPSP) and its present relevance in our society with examples. Fundamental Duties and its Scope and significance in Nation building	**03 Hours**
Module 3 **Union Executive :** Parliamentary System, Union Executive – President, Prime Minister, Union Cabinet, Parliament - LS and RS, Parliamentary Committees, Important Parliamentary Terminologies. Supreme Court of India, Judicial Reviews and Judicial Activism.	**03 Hours**
Module 4 **State Executive & Elections, Amendments and Emergency Provisions:** State Executive, Election Commission, Elections & Electoral Process. Amendment to Constitution (How and Why) and Important Constitutional Amendments till today. Emergency Provisions	**03 Hours**

Module 5	
Professional Ethics: Ethics & Values. Types of Ethics. Scope & Aims of Professional & Engineering Ethics. Positive and Negative Faces of Engineering Ethics. Clash of Ethics, Conflicts of Interest. The impediments to Responsibility. Trust & Reliability in Engineering, IPRs (Intellectual Property Rights), Risks, Safety and liability in Engineering.	**03 Hours**

COURSE OUTCOMES: Upon completion of this course, student will be able to

CO1	Analyse the basic structure of Indian Constitution
CO2	Remember their Fundamental Rights, DPSP's and Fundamental Duties (FD's) of our constitution.
CO3	know about our Union Government, political structure & codes, procedures.
CO4	Understand our State Executive & Elections system of India.
CO	Remember the Amendments and Emergency Provisions, other important provisions given by the constitution.

Textbooks:

1. "Constitution of India" (for Competitive Exams) - Published by Naidhruva Edutech Learning Solutions, Bengaluru. – 2022
2. Engineering Ethics", M.Govindarajan, S.Natarajan, V.S.Senthilkumar, Prentice –Hall, 2004

Reference Books:

1. "Samvidhana Odu" - for Students & Youths by Justice HN Nagamohan Dhas, Sahayana, kerekon.
2. "Constitution of India, Professional Ethics and Human Rights" by Shubham Singles, Charles E. Haries, and et al: published by Cengage Learning India, Latest Edition – 2019.
3. "Introduction to the Constitution of India", (Students Edition.) by Durga Das Basu (DD Basu): Prentice –Hall, 2008.
4. "The Constitution of India" by Merunandan K B: published by Merugu Publication, Second Edition, Bengaluru

Assessment Details (both CIE and SEE)

The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%. The minimum passing mark for the CIE is 40% of the maximum marks (20 marks). A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/ course if the student secures not less than 35% (18 Marks out of 50)in the semester-end examination(SEE), and a minimum of 40% (40 marks out of 100) in the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together.

Continuous Internal Evaluation:

Three Unit Tests each of 20 Marks (duration 01 hour)

1. First test at the end of 5th week of the semester
2. Second test at the end of the 10th week of the semester
3. Third test at the end of the 15th week of the semester

Two assignments each of 10 Marks

4. First assignment at the end of 4th week of the semester
5. Second assignment at the end of 9th week of the semester

Group discussion/Seminar/quiz any one of three suitably planned to attain the COs and POs for 20 Marks (duration 01 hours)

6. At the end of the 13th week of the semester

The sum of three tests, two assignments, and quiz/seminar/group discussion will be out of 100 marks and will be scaled down to 50 marks

Total CIE : IA 20*3=60, Assignment 10+10=20, Quiz 20 = 100 /2 = 50

(to have less stressed CIE, the portion of the syllabus should not be common /repeated for any of the methods of the CIE. Each method of CIE should have a different syllabus portion of the course).

CIE methods /question paper is designed to attain the different levels of Bloom's taxonomy as per the outcome defined for the course.

Semester End Examination:

SEE will be conducted by University as per the scheduled timetable, with common question papers for the subject

(duration 02 hours)

1. The question paper will have 50 questions. Each question is set for 01 mark.
2. Semester End Exam (SEE) Pattern will be in MCQ Model (Multiple Choice Questions) for 50 marks (60 minutes duration).

Table 2: Distribution of weightage for CIE

	Component	Marks	Total Marks
CIE	CIE Test-1	**40**	**100**
	CIE Test-2	**40**	
	Quiz 1/AAT	**10**	
	Quiz 2/AAT	**10**	
Grand Total			**100**

SEMESTER – III

COURSE: ABILITY ENHANCEMENT COURSE – I

DIGITAL MANUFACTURING IN AEROSPACE INDUSTRIES

Course Code	**21ANE371**	**CIE Marks**	**50**
Hours/Week (L: T: P)	**1:0:0**	**SEE Marks**	**50**
No. of Credits	**1**	**Examination Hours**	**03**

Course Objectives:

CLO1	To impart the importance of additive manufacturing and its applications.
CLO2	To acquire knowledge about the various techniques involved in additive manufacturing.
CLO3	To be aware of the additive manufacturing techniques in Aerospace industries

Content	**No. of Hours/ RBT levels**
Module 1 **INTRODUCTION:** Additive manufacturing principle, Advantages of additive manufacturing, General limitation of additive manufacturing.	**02 Hours L3**
Module 2 **Development of Additive Manufacturing Technology:** Lasers, Printing Technologies, Programmable Logic Controllers, Materials, Computer Numerically Controlled Machining.	**02 Hours L3**
Module 3 **Solid Based Additive Manufacturing Systems:** Fused deposition Modeling (FDM): Principle, details of processes.	**02 Hours L3**
Module 4 **Liquid Based Additive Manufacturing Systems:** Stereolithographic Apparatus (SLA): Principle.	**02 Hours L3**
Module 5 **Powder Based Additive Manufacturing Systems:** SLS process description, Powder fusion mechanisms.	**02 Hours L3**

Course Learning Outcome:

On successful completion of the course, students should be able to:

CO1	Understand the principles, merits and demerits of additive manufacturing
CO2	Understand the convergence of different technologies and integrated into additive manufacturing
CO3	Understand the diverse range of additive manufacturing techniques
CO4	Understand the application of additive manufacturing in Aerospace industries
CO5	Select suitable process and materials used in additive manufacturing

Textbooks:

1. Gibson l D. W. Rosen l B. Stucker, Additive Manufacturing Technologies Rapid Prototyping to Direct Digital Manufacturing, Springer, 2010.
2. Chua C.K., Leong K.F., and Lim C.S., "Rapid Prototyping; Principles and Applications", Third Edition, World Scientific Publishers, 2010.

References:

1. Andreas Gebhardt, Understanding Additive Manufacturing Rapid Prototyping · Rapid Tooling, Rapid Manufacturing, Hanser Publishers, 2011.
2. Frank W. Liou, Rapid Prototyping and Engineering Applications "A Toolbox for Prototype Development, CRC Press, 2008.
3. Peter D. Hilton, Paul F. Jacobs, Rapid Tooling Technologies and Industrial Applications, Marcel Dekker, Inc., 2000.
4. Kamrani, Ali K, Nasr, Emad Abouel, Rapid Prototyping: Theory and Practice, Springer, 2006.

Scheme of Examination:

Semester End Examination (SEE):

SEE Question paper is to be set for 100 marks and the marks scored will be proportionately reducedto 50. There will be two full questions (with a maximum of four sub questions) from each module carrying 20 marks each. Students are required to answer any **five full questions** choosing at least **onefull question from each module.**

Continuous Internal Evaluation (CIE):

Three Tests are to be conducted for 40 marks each. CIE is executed by way of quizzes / Alternate Assessment Tools (AATs) for 10 marks

Table 1: Distribution of weightage for CIE & SEE of Regular courses

	Component	Marks	Total Marks
CIE	CIE Test-1	**40**	**50**
	CIE Test-2		
	CIE Test-3		
	Quizzes /Assignment	**10**	
SEE	Semester End Examination	**50**	**50**
Grand Total			**100**

CO/PO Mapping														
CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	-	-	-	-	-	-	-	-	2	3	3	3	-	1
CO2	-	-	-	-	-	-	-	-	2	3	3	3	-	1
CO3	-	-	-	-	-	-	-	-	2	3	3	3	-	1
CO4	-	-	-	-	-	-	-	-	2	3	3	3	-	1
CO5	-	-	-	-	-	-	-	-	2	3	3	3	-	1
Average	-	-	-	-	-	-	-	-	2	3	3	3	-	1

Low-1: Medium-2: High-3

SEMESTER – III

COURSE: ADDITIONAL MATHEMATICS (FOR LATERAL ENTRY STUDENTS)

Course Code	**21MATDIP31**	**CIE Marks**	**50**
Hours/Week (L: T: P)	**2:2:0**	**SEE Marks**	**50**
No. of Credits	**00**	**Examination Hours**	**03**

Course Objectives: To enable students to apply the knowledge of Mathematics in various fields of engineering by making them to learn:

CLO1	Derivatives, Polar curves and Radius of curvature
CLO2	Partial Derivatives and Jacobians
CLO3	Multiple integrals, beta & gamma functions
CLO4	Ordinary and Partial differential equations

Content	**No. of Hours/ RBT levels**
Module 1 Successive differentiation - simple problems. Polar Curves - angle between radius vector and tangent, angle between two curves, Pedal equation. Taylor's and Maclaurin's series for function of one variable.	**8 Hours L2, L3**
Module 2 Evaluation of Indeterminate forms. Partial derivatives, Differentiation of implicit and composite functions. Jacobians. Taylor's series for functions of two variables.	**8 Hours L2, L3**
Module 3 Multiple Integrals-Double integrals- direct evaluation, change of order of integration, change of variables. Triple integrals-direct evaluation. Beta and Gamma functions, relation between beta and gamma function.	**8 Hours L2, L3**
Module 4 Solution of first order and first degree differential equations – Variable Separable, Exact and Bernoulli's differential equations. Second order linear differential equation with constant Coefficients-Inverse differential operators. Cauchy's and Legendre's Linear differential equations.	**8 Hours L2, L3**
Module 5 Formation of partial differential equations by elimination of arbitrary constants and functions. Solution of non-homogeneous PDE by direct integration, homogeneous PDEs involving derivative with respect to one independent variable only.	**8 Hours L2, L3**

COURSE OUTCOMES:

Upon completion of this course, student will be able to:

CO1	Apply the knowledge of differential calculus to solve problems related to curvature, maxima & minima of a function and Jacobians
CO2	Evaluate double and triple integrals
CO3	Evaluate definite integrals using beta and gamma functions
CO4	Solve linear differential equations of first and second order with constant/variable coefficients
CO5	Solve partial differential equations.

Textbooks:

1. B. S. Grewal, Higher Engineering Mathematics, Khanna Publishers 44th Edition, 2017
2. B.V. Ramana, Higher Engineering Mathematics, Tata McGraw-Hill, 2006

Reference books:

1. E. Kreyszig , Advanced Engineering Mathematics, John Wiley & Sons 10th Edition, 2016
2. N.P.Bali and Manish Goyal, A Textbook of Engineering Mathematics, Laxmi Publications 6th Edition, 2014.

Semester End Examination (SEE):

There will be no SEE examination for this course.

Continuous Internal Evaluation (CIE):

Three Tests are to be conducted for 40 marks each. Average of Marks scored in all three tests is added to test component. CIE is executed by way of quizzes / Alternate Assessment Tools (AATs), and three tests. **Some possible AATs:** seminar/assignments/ mini-projects/ concept videos/ partial reproduction of research work/ group activity/ any other.

Typical Evaluation pattern for regular courses is shown in Table 2.

Table 2: Distribution of weightage for CIE & SEE of Regular courses

Component		Marks	Total Marks
CIE	CIE Test-1	**40**	**50**
	CIE Test-2	**40**	
	CIE Test-3	**40**	
	Assignments	**10**	
Grand Total (Final CIE x 2)			**100**

CO/PO Mapping

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	2	1									2				
CO2	3	2	1									2				
CO3	3	2	1									2				
CO4	3	2	1									2				
CO5	3	2	1									2				
Average	3	2	1									2				

Low-1: Medium-2: High-3

IV Semester Syllabus

SEMESTER IV

COURSE: TRANSFORMS CALCULUS AND NUMERICAL TECHNIQUES

Course Code	**21MAT41C**	**CIE Marks**	**50**
Hours/Week (L: T: P)	**2:2:0**	**SEE Marks**	**50**
No. of Credits	**3**	**Examination Hours**	**03**

Course Objectives: To enable students to apply the knowledge of Mathematics in various fields of engineering by making them to learn:

CLO1	Laplace Transforms
CLO2	Fourier series and Fourier Transforms
CLO3	Numerical Methods

Content	No. of Hours/ RBT levels
Module 1 place transforms of elementary functions, Unit-step and Dirac delta functions. Inverse Laplace Transforms, Solution of second order linear differential equations using Laplace transforms.	**08 Hours L2, L3**
Module 2 urier series of periodic functions, half range Fourier sine and cosine series. Infinite Fourier transforms, Fourier sine and cosine transforms. Inverse Fourier transforms.	**08 Hours L2, L3**
Module 3 lution of algebraic and transcendental equations: Regula-Falsi and Newton-Raphson method. Finite differences: Newton's forward and backward difference formulae. Newton's divided difference formula and Lagrange's interpolation formula. Numerical integration: Simpson's 1/3rd, 3/8th, Weddle's rule.	**08 Hours L2, L3**
Module 4 merical solution of ordinary differential equations of first order and first degree using Modified Euler method, Runge-Kutta method of fourth order, Milne's and Adam-Bashforth predictor and corrector methods. Numerical solution of second order ordinary differential equations: Runge-Kutta method and Milne's method.	**08 Hours L2, L3**
Module 5 One dimensional wave and heat equation. Solution of heat and wave equation by method of separation of variables. Two-dimensional heat flow, Solution of Laplace's equation, Laplace's equation in polar coordinates. Two dimensional wave equation. Numerical solution of heat and wave equations.	**08 Hours L2, L3**

COURSE OUTCOMES:
Upon completion of this course, student will be able to:

CO1	Determine Laplace and inverse Laplace transforms of given functions and solve linear differential equations
CO2	Determine Fourier series and Fourier Transform of given function.
CO3	Apply numerical techniques to solve algebraic and transcendental equations.
CO4	Apply numerical techniques for interpolation and to evaluate definite integrals.
CO5	Solve ordinary differential equations of first and second order using single step and multistep numerical methods
CO6	Solve problems related to heat and wave equations

Textbooks:

1. B. S. Grewal, Higher Engineering Mathematics, Khanna Publishers 44th Edition, 2017
2. B.V. Ramana, Higher Engineering Mathematics, Tata McGraw-Hill, 2006

Reference books:

1. E. Kreyszig, Advanced Engineering Mathematics, John Wiley & Sons 10th Edition, 2016
2. N.P.Bali and Manish Goyal, A Textbook of Engineering Mathematics, Laxmi Publications 6th Edition, 2014

Scheme of Examination:

Semester End Examination (SEE):

SEE Question paper is to be set for 100 marks and the marks scored will be proportionately reduced to 50. There will be two full questions (with a maximum of three sub questions) from each module carrying 20 marks each. Students are required to answer any **five full questions** choosing at least **one full question from each module.**

Continuous Internal Evaluation (CIE):

Three Tests are to be conducted for 40 marks each. Average of Marks scored in all three tests is added to test component. CIE is executed by way of quizzes / Alternate Assessment Tools (AATs), and three tests. **Some possible AATs:** seminar/assignments/ mini-projects/ concept videos/ partial reproduction of research work/ group activity/ any other.

Typical Evaluation pattern for regular courses is shown in Table 2.

Table 2: Distribution of weightage for CIE & SEE of Regular courses

Component		Marks	Total Marks
CIE	CIE Test-1	**40**	**50**
	CIE Test-2	**40**	
	CIE Test-3	**40**	
	Assignments	**10**	
SEE	Semester End Examination	**50**	**50**
Grand Total			**100**

CO/PO Mapping														
CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	1									3		
CO2	3	2	1									3		
CO3	3	2	1									3		
CO4	3	2	1									3		
CO5	3	2	1									3		
CO6	3	2	1									3		
Average	3	2	1									3		

Low-1: Medium-2: High-3

SEMESTER IV

COURSE: AERODYNAMICS – I

Course Code	**21ANE42**	**CIE Marks**	**50**
Hours/Week (L: T: P)	**3:0:2**	**SEE Marks**	**50**
No. of Credits	**4**	**Examination Hours**	**03**

Pre requisite: Fluid Mechanics

Course Objectives: To enable students to apply the knowledge of aero dynamics in broaddomain of aeronautical engineering by making them to learn:

CO1	The governing equations of fluid flow for incompressible inviscid flow
CO2	Understand the concept of superposition of elementary flows for inviscid, incompressible flow
CO3	Methods for describing airflow around airfoils and wings and calculating lift, drag and moments
CO4	Viscous Flow: boundary layer, velocity profile, thickness and friction coefficient.

Content	No. of Hours/ RBT levels
Module 1 **REVIEW OF BASIC DEFINITIONS & EQUATIONS** Importance of Aerodynamics, Fundamental aerodynamics, variables and dimensional analysis leading to Force & Moment coefficient and dimensionless similarity parameters such as Reynolds number, Mach number, Incompressible flow, Compressible flow and Mach number, Models of the Fluid: Control volume, and Fluid Elements. Continuity, Momentum and Energy Equations.	**10 Hours** **L3**
Module 2 **INVISID, INCOMPRESSIBLE FLOW** Basic flows – Uniform parallel flow, Source and Sink, Doublet, Vortex Flow. Path lines, Streamlines, Streak lines, and Circulation. Combinations of basic flows, Non lifting flow and Lifting flow over circular cylinder. Kutta Joukowski's theorem and generation of lift. D' Alembert Paradox and Magnus effects.	**10 Hours** **L3**
Module 3 **INCOMPRESSIBLE FLOW OVER AIRFOILS:** Blasius theorem, Kutta condition, Airfoils Nomenclature and NACA series, Airfoil Characteristics, Stall condition and Flow separation. Vortex sheet, Kelvin Circulation theorem and the Starting Vortex. Classical Thin airfoil theory: The Symmetrical airfoil and its Applications.	**10 Hours** **L3**
Module 4 **INCOMPRESSIBLE FLOW OVER FINITE WING:** Introduction to Finite wing, Downwash and Induced Drag, Vortex Filament, the Biot -Savart law and Helmholtz's theorems, Horse shoe vortex, Prandtl's Classical Lifting line theory and its limitations, Elliptical lift distribution.	**10 Hours** **L3**

Module 5	
VISCOUS FLOW: Boundary layer, Laminar & Turbulent layer, Boundary layer Thickness, Displacement Thickness, Momentum Thickness, Energy Thickness, Boundary layer equation for a steady, two-dimensional incompressible flow, Boundary layer growth over a Flat Plate, Blasius Solution.	**10 Hours** **L3**

Laboratory Exercises

LIST OF EXPERIMENTS

1. Calibration of subsonic Wind tunnel.
2. Determination of lift for the given aerofoil section.
3. Pressure distribution over a smooth circular cylinder.
4. Pressure distribution over a rough circular cylinder.
5. Pressure distribution over a symmetric aerofoil.
6. Pressure distribution over a cambered aerofoil.
7. Force measurement using wind tunnel balancing set up.
8. Determination of Aerodynamic forces of Finite wing.
9. Flow visualization studies in low speed flows over cylinders.
10. Flow visualization studies in low speed flows over airfoil with different angle of incidence.
11. Calculation of total drag of a two-dimensional circular cylinder at low speeds using pitot-
    static probe wake survey.
12. Calculation of total drag of a two-dimensional cambered aerofoil at low speeds at incidence using pitot-static probe wake survey.
13. Calculation of aerodynamic coefficients and forces acting on a model aircraft at various Angle of Attack and speeds using wind tunnel balance (With and Without Yaw).
14. Measurement of a typical boundary layer velocity profile on the tunnel wall (at low speeds) using a pitot probe and calculation of boundary layer displacement and momentum
    thickness.

COURSE OUTCOMES:

Upon completion of this course, student will be able to:

CO1	Apply the Fundamental Conservative Principles of Nature to Obtain the Governing Equations in Fluid Flows.
CO2	Calculate the Basic Flow Properties of 2 - D geometries by using Potential flow theory and Superposition Principles.
CO3	Determine the Aerodynamic forces of Lift and Drag using Thin airfoil theory and Finite wing Theory.
CO4	Understand the Transport Properties of fluid due to Viscosity, Thermal Conductivity and Mass Diffusivity.

Textbooks:

1. **J. D. Anderson**, "Fundamentals of Aerodynamics", 5th Edition, McGraw Hill Education India Private Limited, 2010.
2. **L J Clancy**,"Aerodynamics" Paperback 2006

Reference books:

1. **E. L. Houghton**, "Aerodynamics for Engineering students", 6th edition, Elsevier, 2012.
2. **Ethirajan Radhakrishnan**, "Theoretical Aerodynamics", 1st Edition, Wiley Publications, 2013.

Scheme of Examination:

Semester End Examination (SEE):

SEE Question paper is to be set for 100 marks and the marks scored will be proportionately reducedto 50. There will be two full questions (with a maximum of four sub questions) from each module carrying 20 marks each. Students are required to answer any **five full questions** choosing at least **one full question from each module.**

Continuous Internal Evaluation (CIE):

Two Tests are to be conducted for 50 marks each. Marks scored in each test is reduced to 20 andadded to test component.

CIE is executed by way of two quizzes / Alternate Assessment Tools (AATs), and two tests.

Two quizzes are to be conducted and each quiz is evaluated for 5 marks adding up to 10 Marks.

Table 1: Distribution of weightage for CIE & SEE of Regular courses

	Component	Marks	Total Marks
CIE	CIE Test-1	**20**	**50**
	CIE Test-2	**20**	
	Quiz 1/AAT	**05**	
	Quiz 2/AAT	**05**	
SEE	Semester End Examination	**50**	**50**
Grand Total			**100**

CO/PO Mapping														
CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	2	2	2	-	-	-	-	-	-	-	-	3
CO2	3	3	2	2	2	-	-	-	-	-	-	-	-	3
CO3	3	3	2	2	2	-	-	-	-	-	-	-	-	3
CO4	3	3	2	2	2	-	-	-	-	-	-	-	-	3
Average	3	3	2	2	2	-	-	-	-	-	-	-	-	3

Low-1: Medium-2: High-3

SEMESTER – IV

COURSE: COMPUTER AIDED AIRCRAFT DRAWING

Course Code	**21ANE43**	**CIE Marks**	**50**
Hours/Week (L: T: P)	**3:0:2**	**SEE Marks**	**50**
No. of Credits	**4**	**Examination Hours**	**03**

Prerequisites: Computer Aided Engineering Drawing.

Course Objectives: To enable students to apply the knowledge of Computer Aided Aircraft Drawing in broad domain of Aeronautical engineering by making them to learn:

CLO1	To familiarize the students with Indian Standards on drawing practices and standard components.
CLO2	To make the students to understand and interpret riveted joints.
CLO3	To produce different views using orthographic projections using standard CAD packages.
CLO4	To gain practical experience in modelling in 3D and to assemble parts using standard CAD packages.
CLO5	Convert 3D Assembly into 2D drafting and generate Bill of materials for assembled drawing. Create exploded views using standard CAD packages..

Content	**CO/ RBT Levels**
Module-1 **GEOMETRICAL DIMENSIONING & TOLERANCES, THREAD FORMS AND FASTENERS:** Types of GD&T, Datum, scope of GD&T standards, Machine tool tests to check for Straightness, Flatness, Parallelism, Squareness, Roundness, Cylindricity, Runout, Limits, Fits and Tolerances, Principle of interchangeability and selective assembly, Hole base system & shaft base system. **Thread Forms:** Thread terminology, sectional views of threads. ISO Metric (Internal & External), BSW (Internal & External), Square and Acme, Sellers thread, American Standard thread. **Fasteners**: Hexagonal headed bolt and nut with washer (assembly), square headed bolt and nut with washer (assembly) simple assembly using stud bolts with nut and lock nut.	**10 Hours L2**
Module-2 **RIVETED JOINTS:** Single and double riveted lap joints, butt joints with single /double cover straps (Chain and Zigzag, using snap head rivets).	**10 Hours L3**
Module-3 **ORTHOGRAPHIC VIEWS:** Introduction to orthographic projection, Conversion of pictorial views into orthographic projections of simple machine parts with or without section. Principle of visualization of objects, sectional views, full and half-sectional views.	**10 Hours L3**
Module-4 **3D SKETCHING & PART MODELLING:** Conversion of 2D Aeronautical components to 3D parts and sectional views of simple Aeronautical components and Assign material properties and textures to parts: (Detailed 2D part drawings will be given). 1. Propeller and hub parts. 2. Wing parts. 3. Fuselage parts. 4. Engine mount parts.	**10 Hours L3**

5. Helicopter rotor blade parts. 6. Landing gear parts.	
Module-5 **ASSEMBLY AND DRAFTING:** Introduction to assembly drawing: 1. Propeller and hub assembly. 2. Wing assembly. 3. Fuselage assembly. 4. Engine mount assembly. 5. Helicopter rotor blade assembly. 6. Landing gear assembly. Exploding an assembly **Drafting:** Creating detailed drawings and conversion of different views of above mentioned assemblies to 2D drafting. Dimensions, Annotations and Parts Lists. Detailing a drawing, Bill of Materials.	**10 Hours** **L3**

COURSE OUTCOMES:

Upon completion of this course, student will be able to:

CO1	Implement the drawing standards, Fits and Tolerances, knowledge of Thread forms and fasteners.
CO2	Interpret types of riveted joints using in Aviation component manufacturing.
CO3	Sketch the orthographic views of machine components from isometric view.
CO4	Develop 3D model of Aircraft parts of assembly by reading the blueprint of each part.
CO5	Re-create part drawings, sectional views and assembly drawings as per standards, Bill of Materials and of components using CAD software.

Textbooks:

1. K R Gopalakrishna, Machine Drawing in First angle of Projection, Subhas Publications, 23, 2017.
2. N. D. Bhatt, Machine Drawing, Charotar Publication, 50th Edition 2016.

Reference books:

1. KL Narayana, P Kannaiah, K V Reddy, Machine Drawing, New Age International Publishers, 6th Edition, 2019.
2. Sidheshwar, Machine Drawing, Tata McGraw-Hill Education, 33 reprint 2006.
3. R. K. Dhawan, Machine Drawing, S Chand Publishing reprint, 2006.

E-Books / Web References

1. Solid Edge 2022 Part Design Tutorial for Beginner [COMPLETE].
https://www.youtube.com/watch?v=pgSHJmObd00
2. Solid Edge fundamentals
https://support.industrysoftware.automation.siemens.com/training/se/en/ST4/pdf/mt0141 3-s-1040_en.pdf.
3. Assembly :
https://support.industrysoftware.automation.siemens.com/training/se/en/ST4/pdf/spse016 60-s-1040_en.pdf
4. Explode — Animate application :
https://d2t1xqejof9utc.cloudfront.net/files/17325/SolidEdge_ERA_2.pdf?1357790407
5. Computer Mouse (Solid Edge Tutorial):
https://www.youtube.com/watch?v=0SuN3pVSE_8

Scheme of Examination:

Semester End Examination (SEE):

SEE Question paper is to be set for 100 marks and the marks scored will be proportionately reduced to 50. There will be two full questions (with a maximum of four sub questions) from each module carrying 20 marks each. Students are required to answer any **five full questions** choosing at least **one full question from each module.**

Continuous Internal Evaluation (CIE):

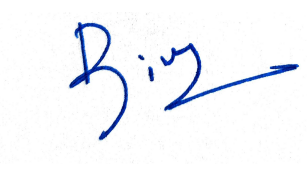
Two Tests are to be conducted for 40 marks each. CIE is executed by way of quizzes / Alternate Assessment Tools (AATs) for 10 marks

Table 1: Distribution of weightage for CIE & SEE of Regular courses

	Component	Marks	Total Marks
CIE	CIE Test-1	**40**	**50**
	CIE Test-2		
	Sketch Book	**10**	
SEE	Semester End Examination	**50**	**50**
Grand Total			**100**

CO/PO Mapping														
CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	2	-	3	-	-	-	-	-	-	2	-	3
CO2	3	3	2	-	3	-	-	-	-	-	-	2	-	3
CO3	3	3	2	-	3	-	-	-	-	-	-	2	-	3
CO4	3	3	2	-	3	-	-	-	-	-	-	2	-	3
CO5	3	3	2	-	3	-	-	-	-	-	-	2	-	3
Average	3	3	2	-	3	-	-	-	-	-	-	2	-	3

Low-1: Medium-2: High-3



SEMESTER – IV

COURSE: AERO PROPULSION-I

Course Code	**21ANE44**	**CIE Marks**	**50**
Hours/Week (L: T: P)	**2:2:0**	**SEE Marks**	**50**
No. of Credits	**3**	**Examination Hours**	**03**

Course Learning Objectives: To enable students to apply the knowledge of Aero Propulsion-I in broad domain of Aeronautical Engineering by making them to learn:

CLO1	To introduce basic concepts and salient features jet propelled engines and its components which are operated in atmosphere.
CLO2	To familiarize with Hypersonic propulsion

Content	**No. of Hrs/RBT Levels**
Module-1 **FUNDAMENTALS OF AIR BREATHING ENGINES** Operating principles of piston engines – thermal efficiency calculations – classification of piston engines - illustration of working of gas turbine engine – the 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.	**8 Hours L1, L2**
Module-2 **INLETS AND NOZZLES** Internal flow and Stall in subsonic inlets – relation between minimum area ratio and eternal deceleration ratio – diffuser performance – supersonic inlets – starting problem on supersonic inlets –shock swallowing by area variation – real flow in nozzles and nozzle efficiency – losses in nozzles –equilibrium flow and frozen flow in nozzles– ejector and variable area nozzles - thrust reversal.	**08 Hours L2, L3**
Module-3 **COMPRESSORS FOR JET ENGINES** Principle of operation of centrifugal compressor and axial flow compressor– Work done and pressure rise – velocity diagrams – degree of reaction – free vortex and constant reaction designs of axial flow compressor – performance characteristics of centrifugal and axial flow compressors– stage efficiency calculations - cascade testing.	**09 Hours L2, L3**
Module-4 **TURBINES FOR JET ENGINES** Principle of operation of axial flow turbines– limitations of radial flow turbines- Work done and pressure rise – Velocity diagrams – degree of reaction – free vortex and constant nozzle angle designs – performance characteristics of axial flow turbine– turbine blade cooling methods – stage efficiency calculations – basic blade profile design considerations – matching of compressor and turbine.	**09 Hours L2, L3**

Module-5 **JET ENGINE COMBUSTORS AND RAMJET PROPULSION** Classification of combustion chambers – combustion chamber performance – effect of operating variables on performance – flame stabilization. Operating principle of ramjet engine – various components of ramjet engines and their efficiencies – Combustion in ramjet engine – critical, subcritical and supercritical modes of operation -ramjet engine and its performance characteristics – sample ramjet design calculations – flame stability problems in ramjet combustors –integral ram rockets. Coding for jet engine problems.	**08 Hours** **L2, L3**

COURSE OUTCOMES:

Upon completion of this course, student will be able to:

CO1	To understand the working of various air breathing engines
CO2	To understand the design features of inlets and perform necessary calculations
CO3	To understand the design features of compressors and perform necessary calculations
CO4	To understand the design features of turbines and perform necessary calculations
CO5	To understand the design features of combustors and perform necessary calculations

Textbooks:

1. P.G. Hill and C.R. Peterson, "Mechanics & Thermodynamics of Propulsion", Addison - Wesley Longman INC, 2015.
2. M. L. Mathur and R. P. Sharma, "Gas Turbine, Jet and Rocket Propulsion", Standard Publishers & Distributors, Delhi, 2010.

Reference books:

1. Cohen, H. Rogers, G.F.C. and Saravana muttoo, H.I.H. “Gas Turbine Theory”, Longman, 1989.
2. Oates, G.C., “Aero thermodynamics of Aircraft Engine Components”, AIAA Education Series, New York, 1985.
3. Rathakrishnan., E, "Gas Dynamics”, Fifth edition Published by PHI Learning, 2014.

Scheme of Examination:

Semester End Examination (SEE):

SEE Question paper is to be set for 100 marks and the marks scored will be proportionately reduced to 50. There will be two full questions (with a maximum of four sub questions) from each module carrying 20 marks each. Students are required to answer any **five full questions** choosing at least **one full question from each module.**

Continuous Internal Evaluation (CIE):

Three Tests are to be conducted for 40 marks each. CIE is executed by way of quizzes/ Alternate Assessment Tools (AATs) for 10 marks.

Typical Evaluation pattern for regular courses is shown in Table 1.

Table1: Distribution of weightage for CIE& SEE of Regular courses

	Component	Marks	Total Marks
CIE	CIE Test-1	**40**	**50**
	CIE Test-2		
	CIE Test-3		
	Quiz 1/AAT	**10**	
SEE	Semester End Examination	**50**	**50**
Grand Total			**100**

CO/PO Mapping														
CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	2	-	-	-	-	-	-	-	-	2	3	-
CO2	3	2	2	-	-	-	-	-	-	-	-	2	3	-
CO3	3	2	2	-	-	-	-	-	-	-	-	2	2	-
CO4	2	2	2	-	-	-	-	-	-	-	-	2	3	-
CO5	3	2	2	-	-	-	-	-	-	-	-	2	2	-
Average	3	2	2	-	-	-	-	-	-	-	-	2	3	-

Low-1: Medium-2: High-3

SEMESTER – IV

COURSE: AIRCRAFT STRUCTURES-I

Course Code	**21ANE45**	**CIE Marks**	**50**
Hours/Week (L: T: P)	**2:2:0**	**SEE Marks**	**50**
No. of Credits	**3**	**Examination Hours**	**03**

Course Objectives: To enable students to apply the knowledge of Aircraft Structures-I in broad domain of Aeronautical Engineering by making them to learn:

CO1	Understand the types of loads experienced by aircraft structure and materials used for aircraft structures
CO2	Acquire knowledge on different methodologies to analyze statically determinate and indeterminate structures under various loading conditions
CO3	Apply the energy method concept to determine the strain energy using various methods
CO4	Discuss about the theory of failure of aircraft structure
CO5	Solve aircraft structural problems by applying the concepts of theory of elasticity and failure theory

Content	**No. of Hours/ RBT levels**
Module 1 **Introduction to Aircraft Structures:** Structural layout of the Airplane and components, loads acting on major components such as wing, fuselage, tails, landing gear etc. V-n diagram, Concept of allowable stress and margin of safety. Types of loads – load factor – Aerodynamics loads –Symmetric manoeuvre loads –Aircraft Materials.	**08 Hours L3**
Module 2 **STATICALLY DETERMINATE & INDETERMINATE STRUCTURES :** Plane truss analysis – method of joints – method of sections – method of shear – 3-D trusses – principle of super position, Clapeyron's 3 moment equation and moment distribution method for indeterminate beams	**10 Hours L3**
Module 3 **ENERGY METHODS:** Strain Energy in axial, bending, torsion and shear loadings. Castigliano's theorems and their applications. Energy theorems – dummy load & unit load methods – energy methods applied to statically determinate and indeterminate beams, frames, rings & trusses.	**08 Hours L3**
Module 4 **FAILURE THEORIES:** Ductile and brittle materials – maximum principal stress theory - maximum principal strain theory - maximum shear stress theory - distortion energy theory – octahedral shear stress theory	**08 Hours L3**
Module 5 **THEORY OF ELASTICITY:** Concept of stress and strain, derivation of Equilibrium equations, strain displacement relation, compatibility conditions and boundary conditions. Plane stress and Plane strain problems in 2D elasticity.	**08 Hours L3**

COURSE OUTCOMES:

Upon completion of this course, student will be able to:

CO1	Outline the types of loads experienced by aircraft structure and materials used for aircraft structures
CO2	Apply different methodologies to analyze statically determinate and indeterminate structures under various loading conditions
CO3	Apply the energy method concept to determine the strain energy
CO4	Discuss about the theory of failure of aircraft structure
CO5	Solve aircraft structural problems by applying the concepts of theory of elasticity and failure theory

Textbooks:

1. **'**Mechanics of Materials' by James M. Gere & Barry J Goodno, cengage Learning Custom Publishing; 8th edition, 2012.
2. Megson T M G, `Aircraft Structures for Engineering students' Butterworth-Heinemann publisher, 5th edition, 2012.
3. N.C. Pandya, C.S. Shah, "Elements of Machine Design", Charotar Publishing House, 15th edition, 2009.

Reference books:

1. Bruhn E F, 'Analysis and Design of Flight Vehicle Structures', Tri-State Off-set Company, USA, 1985
2. Donaldson, B.K., 'Analysis of Aircraft Structures - An Introduction' Cambridge University Press publishers, 2nd edition , 2008
3. Peery, D.J., and Azar, J.J., Aircraft Structures, 2nd edition, McGraw – Hill, N.Y., 1999

Scheme of Examination:

Semester End Examination (SEE):

SEE Question paper is to be set for 100 marks and the marks scored will be proportionately reducedto 50. There will be two full questions (with a maximum of four sub questions) from each module carrying 20 marks each. Students are required to answer any **five full questions** choosing at least **onefull question from each module.**

Continuous Internal Evaluation (CIE):

Three Tests are to be conducted for 40 marks each. CIE is executed by way of quizzes / Alternate Assessment Tools (AATs) for 10 marks

Table 1: Distribution of weightage for CIE & SEE of Regular courses

	Component	Marks	Total Marks
CIE	CIE Test-1	**40**	**50**
	CIE Test-2		
	CIE Test-3		
	Quizzes /Assignment	**10**	
SEE	Semester End Examination	**50**	**50**
Grand Total			**100**

CO/PO Mapping														
CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	3	-	-	-	-	-	-	-	-	-	2	-
CO2	3	3	3	-	-	-	-	-	-	-	-	-	2	-
CO3	3	3	3	-	-	-	-	-	-	-	-	-	2	-
CO4	3	3	3	-	-	-	-	-	-	-	-	-	2	-
CO5	3	3	3	-	-	-	-	-	-	-	-	-	2	-
Average	3	3	3	-	-	-	-	-	-	-	-	-	2	-

Low-1: Medium-2: High-3

SEMESTER – IV

COURSE: Balake Kannada (for Non-Kannadiga Students)

Subject Code	21KBK46	CIE Marks	100
Hours/Week (L: T: P)	0:2:0	SEE Marks	-
Credits	0	Examination Hours	-

Course Learning Objectives:

The course will enable the students to understand Kannada and communicate (converse) in Kannada language.

Table of Contents

- Abbreviations
- Key to Transcription
- Easy learning of a Kannada Language: A few tips
- Necessity of learning a local langauge:
- Tips to learn the language with easy methods.
- Hints for correct and polite conservation
- About Kannada Language (Kannada Bhashe)
- Eight Kannada authors who have won 'Jnanpith Award'
- Information about Karnataka State

Part : I

Instructions to Teachers

1. How to Teach the BaLake Kannada Book
2. Methods to be followed in Teaching of all the chapters/ concepts

Chapter – 1 Listening and Speaking - KelisikoLLuvudu mattu Maatanaduvudu

1. Pronouns – SarvanaamagaLu
2. Adjectives – Naama VisheshaNagaLu
3. Verbs – KriyapadagaLu
4. Adverbs – KriyavisheshaNagaLu

Necessity of learning a local langauge:

The learning of local language,

- Encourages the respect for other people: it fosters an understanding of the interrelation of language and human nature.
- Expands one's view of the world, liberalizes one's experiences, and makes one more flexible and tolerant.
- Limits the barriers between people: barriers cause distrust and fear.
- Opens the door to art, music, dance, fashion, cuisine, film, philosophy, science...etc.
- Leads to an appreciation of cultural diversity.
- Helps fluent communication.

Language learning helps to develop strong cognitive skills, such as a better concept formation, mental flexibility, multitasking, listening skills and problem-solving, in addition to improve social interaction and also encourages the connection between peers.

Use of local language help to mingle with the local society and ensures security, pleasant welcoming from auto/cab drivers, shop owners, employees of local government etc., and make the living easier and more comfortable.

Tips to learn the language with easy methods.

Apart from the conventional method of learning from teachers, the learning of language can be accelerated by adopting the following methods.

1. Love the learning without boredom.
2. Talk to classmates and others in Kannada without hesitation and with no concern to grammatical mistakes during the initial stages of learning the language.
3. Use English words to continue the conversation when you find difficulty in finding suitable Kannada word/s. Vocabulary improves with the use of language.
4. While reading, read aloud (not silently or in a whisper manner, but audibly so that others are not being disturbed or others can hear what is being read). Reading aloud not only helps proper/ correct pronunciation of words with variation in pitch, pace, volume, pauses etc., but also produces a fluent and enjoyable delivery during conversation/debate/presentation.
5. Listen to Kannada news and watch Kannada movies.
6. Listen to Kannada FM radios for news, live conversations and songs.
7. Use online applications (apps) for fast learning.

Easy learning of a Kannada Language: A few tips

1. Watching Kannada movies (preferably with subtitles), can be of great help. This is an important and entertaining way to improve your language skills.
2. Do not hesitate. Speak the language at every possible opportunity.
3. Never mind if you are using less Kannada and more English words. Kanglish is anyway popular in Bangalore. However constantly try to improve your Kannada vocabulary.
4. Watch Kannada news. This is not only helpful in learning the language, but will help you to know your city better.
5. If you are a user of public transport, carefully listen to co-passengers' conversations.
6. Enjoy the local tang of the language by listening to Kannada FM stations.
7. Do not completely rely on 'Learn Kannada in 30 days' type of books. Many Bangaloreans will fail to comprehend your textbook language and you are sure to face some embarrassment, if you go strictly by books.

Hints for correct and polite conservation

1. Be vigilant about the verbs, the pronouns, the genders and tense required for day to day Conversation.
2. Pronounce the words properly.
3. Use plural form to address others.
4. Use simple sentences for conversation.

About Kannada Language (Kannada Bhashe)

- Kannada is one of the classical (Shastreeya) languages of India since November 01, 2008, and is the official language of the Karnataka state.
- This language is not just confined within the borders of Karnataka, for you will find it spoken by people in parts of the neighboring states of Andhra Pradesh, Tamil Nadu and Maharashtra. Kannada is spoken in its various dialects by Six to Seven million people across the globe. It is one among the top 40 most spoken languages of the world.
- Spoken Kannada is in use since 2500 years, and has its own script since 1900 years. Spoken Kannada varies according to the regions of Karnataka, while the written form of Kannada remains almost the same. Kannada is the third oldest language of India (after Sanskrit and Tamil).
- The written form of Kannada is phonetic and it is written as it is spoken.
- The first Kannada-English Dictionary (ShabdaKosha) was compiled in 1894 by a German priest, Rev. Ferdinand Kittel. He also wrote a book on Kannada Grammar entitled, "A Grammar of the Kannada Language: Comprising the Three Dialects of the Language".
- Several noted centuries old literary works of Kannada have been translated into Sanskrit, and other languages.
- November 1st of every year is celebrated as Kannada Rajyotsava Day throughout Karnataka state and is declared as a state holiday. This was the day that the name Karnataka was given to the Mysore state in the year 1973.

ಅಖಂಡ

SEMESTER – IV

COURSE: Samskruthika Kannada

Subject Code	21KSK46	CIE Marks	100
Hours/Week (L: T: P)	0:2:0	SEE Marks	-
Credits	0	Examination Hours	-

ಸಾಂಸ್ಕೃತಿಕ ಕನ್ನಡ ಕಲಿಕೆಯ ಉದ್ದೇಶಗಳು:

- ಪದವಿ ವಿದ್ಯಾರ್ಥಿಗಳಾಗಿರುವುದರಿಂದ ಸಾಂಸ್ಕೃತಿಕ ಕನ್ನಡ ಜೊತೆಗೆ ಕ್ರಿಯಾತ್ಮಕ ಕನ್ನಡವನ್ನು, ಕನ್ನಡ ಸಾಹಿತ್ಯ, ಸಂಸ್ಕೃತಿ ಮತ್ತು ನಾಡು ನುಡಿಯ ಪರಿಚಯ ಮಾಡಿಕೊಡುವುದು.
- ವಿದ್ಯಾರ್ಥಿಗಳಲ್ಲಿ ಕನ್ನಡ ಭಾಷೆಯ ವ್ಯಾಕರಣದ ಬಗ್ಗೆ ಅರಿವು ಮೂಡಿಸುವುದು ಮತ್ತು ಕನ್ನಡ ಭಾಷಾ ರಚನೆಯಲ್ಲಿನ ನಿಯಮಗಳನ್ನು ಪರಿಚಯಿಸುವುದು.
- ಕನ್ನಡ ಭಾಷಾ ಬರಹದಲ್ಲಿ ಕಂಡುಬರುವ ದೋಷಗಳು ಹಾಗೂ ಅವುಗಳ ನಿವಾರಣೆ.
- ಸಾಮಾನ್ಯ ಅರ್ಜಿಗಳು, ಸರ್ಕಾರಿ ಮತ್ತು ಅರೆ ಸರ್ಕಾರಿ ಪತ್ರವ್ಯವಹಾರದ ಬಗ್ಗೆ ಅರಿವು ಮೂಡಿಸುವುದು.
- ಭಾಷಾಂತರ ಮತ್ತು ಪ್ರಬಂಧ ರಚನೆ ಬಗ್ಗೆ ಆಸಕ್ತಿ ಮೂಡಿಸುವುದು.
- ಕನ್ನಡ ಭಾಷಾಭ್ಯಾಸ, ಸಾಮಾನ್ಯ ಕನ್ನಡ ಹಾಗೂ ಆಡಳಿತ ಕನ್ನಡದ ಪದಗಳ ಪರಿಚಯ ಮಾಡಿಕೊಡುವುದು.

ಸಾಂಸ್ಕೃತಿಕ ಕನ್ನಡ ಪಠ್ಯಪುಸ್ತಕ

ಪರಿವಿಡಿ

ಭಾಗ – ಒಂದು ಲೇಖನಗಳು (ಕನ್ನಡ ನಾಡು, ನುಡಿ ಮತ್ತು ಸಂಸ್ಕೃತಿಗೆ ಸಂಬಂಧಿಸಿದ ಲೇಖನಗಳು)

೧. ಕರ್ನಾಟಕ ಸಂಸ್ಕೃತಿಗೆ : ಹಂಪ ನಾಗರಾಜಯ್ಯ

೨. ಕರ್ನಾಟಕದ ಏಕೀಕರಣ : ಒಂದು ಅಪೂರ್ವ ಚರಿತ್ರೆ – ಜಿ. ವೆಂಕಟಸುಬ್ಬಯ್ಯ

೩. ಆಡಳಿತ ಭಾಷೆಯಾಗಿ ಕನ್ನಡ – ವಿಶಾವಿಯ ಆಡಳಿತ ಕನ್ನಡ ಪುಸ್ತಕದಿಂದ ಆಯ್ದ ಲೇಖನ•

ಭಾಗ – ಎರಡು ಕಾವ್ಯ ಭಾಗ (ಆಧುನಿಕ ಪೂರ್ವ)

೪. ವಚನಗಳು : ಬಸವಣ್ಣ, ಅಕ್ಕಮಹಾದೇವಿ, ಅಲ್ಲಮಪ್ರಭು, ಆಯ್ದಕ್ಕಿ ಮಾರಯ್ಯ, ಜೇಡರ ದಾಸಿಮಯ್ಯ, ಆಯ್ದಕ್ಕಿ ಲಕ್ಕಮ್ಮ

೫. ಕೀರ್ತನೆಗಳು : ಅದರಿಂದೇನು ಫಲ ಇದರಿಂದೇನು ಫಲ – ಪುರಂದರದಾಸ

ತಲ್ಲಣಿಸಿದಿರು ಕಂಡ್ಯಶಾಳು ಮನವೆ – ಕನಕದಾಸ

೬. ತತ್ವಪದಗಳು : ಸಾವಿರ ಕೊಡಗಳ ಸುಟ್ಟು – ಶಿಶುನಾಳ ಷರೀಫ

ಶಿವಯೋಗಿ – ಬಾಲಲೀಲಾ ಮಹಾಂತ ಶಿವಯೋಗಿ

೭. ಜನಪದ ಗೀತೆ : ಬೀಸುವ ಪದ, ಬಡವರಿಗೆ ಸಾವ ಕೊಡಬೇಡ

ಭಾಗ – ಮೂರು ಕಾವ್ಯ ಭಾಗ (ಆಧುನಿಕ)

೮. ಮಂಕುತಿಮ್ಮನ ಕಗ್ಗ : ಡಿ.ವಿ.ಜಿ.

೯. ಕುರುಡು ಕಾಂಚಾಣಾ : ದ.ರಾ. ಬೇಂದ್ರೆ

೧೦. ಹೊಸಬಾಳಿನ ಗೀತೆ : ಕುವೆಂಪು

೧೧. ಹೆಂಡತಿಯ ಕಾಗದ : ಕೆ.ಎಸ್. ನರಸಿಂಹಸ್ವಾಮಿ

೧೨. ಮಬ್ಬಿನಿಂದ ಮಬ್ಬಿಗೆ : ಜಿ.ಎಸ್. ಶಿವರುದ್ರಪ್ಪ

೧೩. ಆ ಮರ ಈ ಮರ : ಚಂದ್ರಶೇಖರ ಕಂಬಾರ

೧೪. ಚೋಮನ ಮಕ್ಕಳ ಹಾಡು : ಸಿದ್ಧಲಿಂಗಯ್ಯ

ಭಾಗ – ನಾಲ್ಕು ತಾಂತ್ರಿಕ ವ್ಯಕ್ತಿ ಪರಿಚಯ, ಕಥೆ ಮತ್ತು ಪ್ರವಾಸ ಕಥನ

೧೫. ಡಾ. ಸರ್ ಎಂ. ವಿಶ್ವೇಶ್ವರಯ್ಯ – ವ್ಯಕ್ತಿ ಮತ್ತು ಐತಿಹ್ಯ : ಎ ಎನ್ ಮೂರ್ತಿರಾವ್

೧೬. ಯುಗಾದಿ : ವಸುಧೇಂದ್ರ

೧೭. ಮೆಗಾನೆ ಎಂಬ ಗಿರಿಜನ ಪರ್ವತ : ಹಿ.ಚಿ.ಬೋರಲಿಂಗಯ್ಯ

ಭಾಗ – ಐದು ವಿಜ್ಞಾನ ಮತ್ತು ತಂತ್ರಜ್ಞಾನ

೧೮. ಕರಕುಶಲ ಕಲೆಗಳು ಮತ್ತು ಪರಂಪರೆಯ ವಿಜ್ಞಾನ : ಕರೀಗೌಡ ಬೀಚನಹಳ್ಳಿ

೧೯. 'ಕ' ಮತ್ತು 'ಬ' ಬರಹ ತಂತ್ರಾಂಶಗಳು ಮತ್ತು ಕನ್ನಡದ ಟೈಪಿಂಗ್'

೨೦. ಕನ್ನಡ – ಕಂಪ್ಯೂಟರ್ ಶಬ್ದಕೋಶ'

೨೧. ತಾಂತ್ರಿಕ ಪದಕೋಶ : ತಾಂತ್ರಿಕ ಹಾಗೂ ಪಾರಿಭಾಷಿಕ ಕನ್ನಡ ಪದಗಳು'

'(ಏತಾವ ಯ ಆಡಳಿತ ಕನ್ನಡ ಪುಸ್ತಕದಿಂದ ಆಯ್ದ ಲೇಖನಗಳು – ಡಾ. ಎಲ್. ತಿಮ್ಮೇಶ ಮತ್ತು ಪ್ರೋ.ವಿ.ಕೇಶವಮೂರ್ತಿ)

SEMESTER – IV

COURSE: Constitution of India and Professional Ethics (CIP)

Course Code	**21CIP46**	**CIE Marks**	**50**
Hours/Week (L: T: P)	**0 : 2 : 0**	**SEE Marks**	**50**
Total Hours of Pedagogy	**02 Hours/Week**	**Total Marks**	**100**
No. of Credits	**01**	**Examination Hours**	**01 Hours**

Course Objectives:

CLO1	To know about the basic structure of Indian Constitution.
CLO2	To know the Fundamental Rights (FR's), DPSP's and Fundamental Duties (FD's) of our constitution.
CLO3	To know about our Union Government, political structure & codes, procedures.
CLO4	To know the State Executive & Elections system of India.
CLO5	To learn the Amendments and Emergency Provisions, other important provisions given by the constitution

Content	**No. of Hours**
Module 1 **Introduction to Indian Constitution:** The Necessity of the Constitution, The Societies before and after the Constitution adoption. Introduction to the Indian constitution, The Making of the Constitution, The Role of the Constituent Assembly. The Preamble of Indian Constitution & Key concepts of the Preamble. Salient features of India Constitution.	**03 Hours**
Module 2 **FR's, FD's and DPSP's:** Fundamental Rights and its Restriction and limitations in different Complex Situations. Directive Principles of State Policy (DPSP) and its present relevance in our society with examples. Fundamental Duties and its Scope and significance in Nation building	**03 Hours**
Module 3 **Union Executive :** Parliamentary System, Union Executive – President, Prime Minister, Union Cabinet, Parliament - LS and RS, Parliamentary Committees, Important Parliamentary Terminologies. Supreme Court of India, Judicial Reviews and Judicial Activism.	**03 Hours**
Module 4 **State Executive & Elections, Amendments and Emergency Provisions:** State Executive, Election Commission, Elections & Electoral Process. Amendment to Constitution (How and Why) and Important Constitutional Amendments till today. Emergency Provisions	**03 Hours**

Module 5	
Professional Ethics: Ethics & Values. Types of Ethics. Scope & Aims of Professional & Engineering Ethics. Positive and Negative Faces of Engineering Ethics. Clash of Ethics, Conflicts of Interest. The impediments to Responsibility. Trust & Reliability in Engineering, IPRs (Intellectual Property Rights), Risks, Safety and liability in Engineering.	**03 Hours**

COURSE OUTCOMES: Upon completion of this course, student will be able to

CO1	Analyse the basic structure of Indian Constitution
CO2	Remember their Fundamental Rights, DPSP's and Fundamental Duties (FD's) of our constitution.
CO3	know about our Union Government, political structure & codes, procedures.
CO4	Understand our State Executive & Elections system of India.
CO	Remember the Amendments and Emergency Provisions, other important provisions given by the constitution.

Textbooks:

1."Constitution of India" (for Competitive Exams) - Published by Naidhruva Edutech Learning Solutions, Bengaluru. – 2022

2. Engineering Ethics", M.Govindarajan, S.Natarajan, V.S.Senthilkumar, Prentice –Hall, 2004

Reference Books:

1. "Samvidhana Odu" - for Students & Youths by Justice HN Nagamohan Dhas, Sahayana, kerekon.
2. "Constitution of India, Professional Ethics and Human Rights" by Shubham Singles, Charles E. Haries, and et al: published by Cengage Learning India, Latest Edition – 2019.
3. "Introduction to the Constitution of India", (Students Edition.) by Durga Das Basu (DD Basu): Prentice –Hall, 2008.
4. "The Constitution of India" by Merunandan K B: published by Merugu Publication, Second Edition, Bengaluru

Assessment Details (both CIE and SEE)

The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%. The minimum passing mark for the CIE is 40% of the maximum marks (20 marks). A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/ course if the student secures not less than

35% (18 Marks out of 50)in the semester-end examination(SEE), and a minimum of 40% (40 marks out of 100) in the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together.

Continuous Internal Evaluation:

Three Unit Tests each of **20 Marks (duration 01 hour)**

1. First test at the end of 5th week of the semester
2. Second test at the end of the 10th week of the semester
3. Third test at the end of the 15th week of the semester

Two assignments each of **10 Marks**

4. First assignment at the end of 4th week of the semester
5. Second assignment at the end of 9th week of the semester

Group discussion/Seminar/quiz any one of three suitably planned to attain the COs and POs for 20 Marks **(duration 01 hours)**

6. At the end of the 13th week of the semester

The sum of three tests, two assignments, and quiz/seminar/group discussion will be out of 100 marks and will be scaled down to 50 marks

Total CIE : IA 20*3=60, Assignment 10+10=20, Quiz 20 = 100 /2 = 50

(to have less stressed CIE, the portion of the syllabus should not be common /repeated for any of the methods of the CIE. Each method of CIE should have a different syllabus portion of the course).

CIE methods /question paper is designed to attain the different levels of Bloom's taxonomy as per the outcome defined for the course.

Semester End Examination:

SEE will be conducted by University as per the scheduled timetable, with common question papers for the subject (**duration 02 hours)**

1. The question paper will have 50 questions. Each question is set for 01 mark.
2. Semester End Exam (SEE) Pattern will be in MCQ Model (Multiple Choice Questions) for 50 marks (60 minutes duration).

Suggested Learning Resources:

Textbook:

1. **"Constitution of India"** (for Competitive Exams) - Published by Naidhruva Edutech Learning Solutions, Bengaluru. – 2022.

2. **"Engineering Ethics",** M.Govindarajan, S.Natarajan, V.S.Senthilkumar, Prentice –Hall, 2004.

Reference Books:

1. **"Samvidhana Odu"** - for Students & Youths by Justice HN Nagamohan Dhas, Sahayana, kerekon.

2. **"Constitution of India, Professional Ethics and Human Rights"** by Shubham Singles, Charles E. Haries, and et al: published by Cengage Learning India, Latest Edition – 2019.

3. **"Introduction to the Constitution of India"**, (Students Edition.) by Durga Das Basu (DD Basu): Prentice –Hall, 2008.

4. **"The Constitution of India"** by Merunandan K B: published by Merugu Publication, Second Edition, Bengaluru.

SEMESTER – IV

COURSE: ABILITY ENHANCEMENT COURSE – II

Introduction to Artificial Intelligence and Machine Learning

Course Code	**21ANE471**	**CIE Marks**	**50**
Hours/Week (L: T: P)	**1:0:0**	**SEE Marks**	**50**
No. of Credits	**1**	**Examination Hours**	**03**

Course Objectives: To enable students to apply the knowledge of AI and ML in broad domain of Aeronautical Engineering by making them to learn:

CO1	To understand about the basics of Data science, AL and ML.
CO2	Acquire knowledge methods and models in ML
CO3	Understand Programming and trends in ML
CO4	Know about basics of AI

Content	No. of Hours/ RBT levels
MODULE 1 **INRODUCTION:** Introduction to Data Science and AI & ML, Data Science, AI & ML	**02 Hours L2**
MODULE 2 **MACHINE LEARNING:** Linear Methods, Linear Regression, Forecasting models.	**02 Hours L2**
MODULE 3 **MODEL AND PROGRAMMING:** Probabilistic Models, Dynamic programming and Reinforcement Programming.	**02 Hours L2**
MODULE 4 **FOUNDATIONS FOR AI:** Foundations for AI, AI Basics , AI Classification, Supervised Learning.	**02 Hours L2**
MODULE 5 **USE OF PYTHON AND R:** Introduction to ML with R and using Python, Python and R for Artificial Intelligence	**02 Hours L2**

COURSE OUTCOMES:

Upon completion of this course, student will be able to:

CO1	Outline the basics of data science, AI & ML
CO2	Understand about the basics of different models of machine learning.
CO3	Discuss programming and use of different models.
CO4	Discuss about AI classification and supervised learning.
CO5	Use of Python and R language for ML and AI.

Textbooks:

1. Stuart Russell and Peter Norvig, Artificial Intelligence: A modern Approach (3rd edition).
2. Deepak Khemani.A First Course in Artificial Intelligence, McGraw Hill Education (India), 2013.
3. Stefan Edelkamp and Stefan Schroedl. Heuristic Search: Theory and Applications, Morgan Kaufmann, 2011.

Reference books:

1. Peter Jackson, "Introduction to Expert Systems", 3rd Edition, Pearson Education, 2007
2. Stuart Russel and Peter Norvig "AI – A Modern Approach", 2nd Edition, Pearson Education 2007.
3. Deepak Khemani "Artificial Intelligence", Tata Mc Graw Hill Education 2013

Scheme of Examination:

Semester End Examination (SEE):

SEE Question paper is to be set for 100 marks and the marks scored will be proportionately reducedto 50. There will be two full questions (with a maximum of four sub questions) from each module carrying 20 marks each. Students are required to answer any **five full questions** choosing at least **onefull question from each module.**

Continuous Internal Evaluation (CIE):

Three Tests are to be conducted for 40 marks each. CIE is executed by way of quizzes / Alternate Assessment Tools (AATs) for 10 marks

Table 1: Distribution of weightage for CIE & SEE of Regular courses

	Component	Marks	Total Marks
CIE	CIE Test-1	**40**	**50**
	CIE Test-2		
	CIE Test-3		
	Quizzes /Assignment	**10**	
SEE	Semester End Examination	**50**	**50**
Grand Total			**100**

Low-1: Medium-2: High-3

CO/PO Mapping														
CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	1	-	-	2	-	-	-	2	2	-	2	-	-	2
CO2	1	-	-	2	-	-	-	2	2	-	2	-	-	2
CO3	1	-	-	2	-	-	-	2	2	-	2	-	-	2
CO4	1	-	-	2	-	-	-	2	2	-	2	-	-	2
CO5	1	-	-	2	-	-	-	2	2	-	2	-	-	2
Average	1	-	-	2	-	-	-	2	2	-	2	-	-	2

SEMESTER – IV

COURSE: Inter/Intra Institutional Internship

Course Code	**21INT48**	**CIE Marks**	**100**
Hours/Week (L: T: P)	**0:0:2**	**SEE Marks**	**-**
No. of Credits	**2**	**Examination Hours**	**-**

Inter/Intra Institutional Internship

All the students admitted to III year of BE/B. Tech shall have to undergo mandatory Inter/Intra Institutional internship of 2 weeks during the vacation of the semesters.

Internship examination shall be conducted during semester end and the prescribed credit shall be included semester end . Internship shall be considered as a head of passing and shall be considered for the award of degree. Those, who do not take-up/complete the internship shall be declared fail and shall have to complete during subsequent University examination after satisfying the internship requirements.

CIE procedure for Internship:

The CIE marks shall be awarded by a committee consisting of the Head of the concerned Department and two senior faculty members of the Department, one of whom shall be the Guide.

The CIE marks awarded for the Internship shall be based on the evaluation of Internship report, presentation skill and question and answer session in the ratio 50:25:25.

Table 1: Distribution of weightage for CIE & SEE of Regular courses

	Component	Marks	Total Marks
CIE	Review-1	**100**	**100**
Grand Total			**100**

Dean Academic
Global Academy of Technology,
Rajarajeshwarinagar, Bengaluru-98

Head of the Department
Dept. of Aeronautical Engineering
Global Academy of Technology
R.R. Nagar, Bengaluru - 560 098.