HINDUSTHAN COLLEGE OF ENGINEERING AND TECHNOLOGY

(An Autonomous Institution, Affiliated to Anna University, Chennai
Approved by AICTE, New Delhi & Accredited by NAAC with 'A' Grade)
Coimbatore – 641 032

B.E. AERONAUTICAL ENGINEERING

HINDUSTHAN EDUCATIONAL AND CHARITABLE TRUST

HICET

Curriculum & Syllabus

2017-2018

CHOICE BASED CREDIT SYSTEM

Department of Aeronautical Engineering

Vision of the Institute

To become a premier institution by producing professionals with strong technical knowledge, innovative research skills, and high ethical values

Mission of the Institute

IM1: To provide academic excellence in technical education through novel teaching methods

IM2: To empower students with creative skills and leadership qualities

IM3: To produce dedicated professionals with social responsibility

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Vision of the Department

To be a global player and prepare the students with knowledge, skills, and ethics for their successful deployment in Aeronautical Engineering.

Mission of the Department

DM1: To nurture the students technically based on current trends and opportunities in the global Aerospace industry.

DM2: To develop the students as innovative engineers to address the contemporary issues in the Aeronautical field.

DM3: To inculcate professional and social responsibility based on an innate ethical value system.

Program Educational Objectives (PEOs) of the Department

PEO1: Graduates shall exhibit their sound theoretical and practical knowledge with skills for successful employment, advanced education, research, and entrepreneurial endeavors.

PEO2: Graduates shall establish deep-rooted mastering abilities, professional ethics, and communication alongside business abilities and initiative through lifelong learning experiences.

PEO3: Graduates shall become leaders and innovators by devising engineering solutions to care for modern society.

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Program Outcomes (POs)

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, responsibilities, and norms of the engineering practice.
PO9	Individual and team work	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.

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Program Specific Outcomes (PSOs)

The graduates will be able to

PSO1: Apply the knowledge of aerodynamics, structures, propulsion, avionics, and aircraft maintenance to give solutions for complex engineering problems.

PSO2: Use progressive methodology and tools involving design, analyze, and experiment in aircraft design.

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CURRICULUM

DETAILS OF CHANGES CARRIED OUT IN CURRICULUM & SYLLABUS

CBCS PATTERN

UNDERGRADUATE PROGRAMMES

B. E. AERONAUTICAL ENGINEERING (UG)

REGULATION-2016

For the students admitted during the academic year 2017-2018 and onwards

SEMESTER I

S.No.	Course Code	Course Title	L	T	P	C	CIA	ESE	TOTAL
THEORY									
1	16MA1101	Engineering Mathematics I (Matrices and Calculus)	3	1	0	4	25	75	100
2	16PH1101	Engineering Physics	3	0	0	3	25	75	100
3	16CY1101	Engineering Chemistry	3	0	0	3	25	75	100
4	16HE1101R	Essential English for Engineers – I	3	1	0	4	25	75	100
5	16GE1101	Computer Programming	3	0	0	3	25	75	100
6	16GE1102	Engineering Graphics	3	1	0	4	25	75	100
PRACTICAL									
7	16PS1001	Physical Science Lab – I	0	0	2	1	50	50	100
8	16GE1001	Computer Programming Lab	0	0	4	2	50	50	100
9	16GE1002	Engineering Practices Laboratory	0	0	4	2	50	50	100
10	16GE1003	Value Added Course I : Language Competency Enhancement Course-I	0	0	2	1	0	100	100
		Total:	**18**	**3**	**12**	**27**	**300**	**700**	**1000**

SEMESTER II

S.No.	Course Code	Course Title	L	T	P	C	CIA	ESE	TOTAL
THEORY									
1	16MA2102	Engineering Mathematics-II	3	1	0	4	25	75	100
2	16PH2102	Physics of Materials	3	0	0	3	25	75	100
3	16CY2102	Environmental Sciences	3	0	0	3	25	75	100
4	16HE2102R	Essential English for Engineers - II	3	1	0	4	25	75	100
5	16GE2101	Engineering Mechanics	3	1	0	4	25	75	100
6	16EE2202	Basics of Electrical and Electronics Engineering	3	0	0	3	25	75	100
PRACTICAL									
7	16PS2001	Physical Sciences Lab – II	0	0	2	1	50	50	100

8	16ME2001	Computer Aided Drafting Lab	0	0	4	2	50	50	100
9	16GE2001	Value Added Course-II: Language Competency Enhancement Course-II	0	0	2	1	0	100	100
		Total:	**18**	**3**	**8**	**25**	**250**	**650**	**900**

For the students admitted during the academic year 2016-2017 and onwards

SEMESTER III

S.No.	Course Code	Course Title	L	T	P	C	CIA	ESE	TOTAL
THEORY									
1	16MA3103	Fourier Analysis and Statistics	3	1	0	4	25	75	100
2	16AE3201	Aero Engineering Thermodynamics	3	0	0	3	25	75	100
3	16AE3202	Solid Mechanics	3	0	0	3	25	75	100
4	16AE3203	Engineering Fluid Mechanics	3	0	0	3	25	75	100
5	16AE3204	Elements of Aeronautics	3	0	0	3	25	75	100
6	16AE3205	Aircraft Systems and Instruments	3	0	0	3	25	75	100
PRACTICAL									
7	16AE3001	Fluid mechanics and Thermodynamics Lab	0	0	4	2	50	50	100
8	16AE3002	Aircraft component Drawing Laboratory	0	0	4	2	50	50	100
		Total :	**18**	**1**	**8**	**23**	**250**	**550**	**800**

SEMESTER IV

S.No.	Course Code	Course Title	L	T	P	C	CIA	ESE	TOTAL
THEORY									
1	16MA4107	Numerical Methods	3	1	0	4	25	75	100
2	16AE4201	Aerodynamics	3	0	0	3	25	75	100
3	16AE4202	Mechanics of Machines	3	1	0	4	25	75	100
4	16AE4203	Gas Turbine Propulsion	3	0	0	3	25	75	100
5	16AE4204	Aircraft Strength of Materials	3	1	0	4	25	75	100
6	16EI4231	Control Engineering	3	0	0	3	25	75	100
PRACTICAL									
7	16AE4001	Aerodynamics Laboratory	0	0	4	2	50	50	100
8	16AE4002	Aircraft Strength of Materials Laboratory	0	0	4	2	50	50	100
		Total	**18**	**3**	**8**	**25**	**250**	**550**	**800**

Credit Distribution

Semester	I	II	III	IV	V	VI	VII	VIII	Total
Credits	27	25	23	25	24	25	22	16	**187**

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SYLLABUS

SEMESTER I

PROGRAMME	COURSE CODE	NAME OF THE COURSE	L	T	P	C
B.E.	16MA1101	ENGINEERING MATHEMATICS – I (COMMON TO ALL BRANCHES)	3	1	0	4

Course Objective

1. Develop the skill to use matrix algebra techniques that is needed by engineers for practical applications.
2. Find curvature, evolutes and envelopes using the concept of differentiation.
3. Solve ordinary differential equations of certain types using Wronskian technique.
4. Familiarize the functions of several variables which are needed in many branches of engineering.
5. Understand the concept of double and triple integrals.

Unit	Description	Instructional Hours
I	**MATRICES** Eigen values and Eigen vectors of a real matrix – Properties of Eigen values and Eigen vectors (without proof) – Cayley - Hamilton Theorem (excluding proof) – Orthogonal matrices – Diagonalization of matrices by orthogonal transformation–Reduction of a quadratic form to canonical form by orthogonal transformation.	12
II	**DIFFERENTIAL CALCULUS** Curvature in cartesian co-ordinates – Radius and Centre of curvature - Circle of curvature – Involutes and Evolutes(parabola, ellipse, cycloid, asteroid) – Envelopes - single parameter and two parameter family of curves.	12
III	**ORDINARY DIFFERENTIAL EQUATIONS** Second and higher order linear differential equations with constant coefficients and with RHS of the form e^{ax} , x^n, sinax or cosax , $e^{ax}f(x)$ and $xf(x)$ where $f(x)$ is sinbx or cosbx – Method of variation of parameters – Linear differential equations with variable coefficients (Euler's equation)	12
IV	**FUNCTIONS OF SEVERAL VARIABLES** Total differentiation (excluding implicit functions) - Partial derivatives of composite functions - Taylor's series for functions of two variables- Maxima and minima of functions of two variables - Lagrange's method of undetermined multipliers – Jacobians.	12
V	**MULTIPLE INTEGRALS** Double integrals in Cartesian coordinates – Change of order of integration – Area enclosed by the plane curves (excluding surface area) – Triple integrals in Cartesian co-ordinates – Volume of solids using Cartesian co-ordinates.	12
	TOTAL INSTRUCTIONAL HOURS	**60**

Course Outcome

CO1: Calculate Eigen values and Eigen vectors for a matrix which are used to determine the natural frequencies (or Eigen frequencies) of vibration and the shapes of these vibrational modes
CO2: Apply the concept of differentiation to find the radius, centre and circle of curvature of any curve
CO3: Develop sound knowledge of techniques in solving ordinary differential equations that model engineering problems
CO4: Identify the maximum and minimum values of surfaces.
CO5: Computation of area of a region in simpler way by changing the order of integration and evaluation of triple integrals to compute volume of three dimensional solid structures

TEXT BOOKS:

T1- Ravish R Singh, Mukul Bhatt, "Engineeing Mathematics", McGraw Hill education (India) Private Ltd.,Chennai,2017.
T2- Veerarajan T, "Engineering Mathematics–I", McGraw Hill Education(India) Pvt Ltd, New Delhi, 2016

REFERENCE BOOKS :

R1-Bali N.P & Manish Goyal, "A Text book of Engineering Mathematics", 8th Edition, Laxmi Pub. Pvt. Ltd. 2011.
R2- Grewal B.S, "Higher Engineering Mathematics", 42nd Edition, Khanna Publications, Delhi, 2012.
R3- Peter V. O'Neil, "Advanced Engineering Mathematics", 7th Edition, Cengage learning.2012.
R4-Sivarama Krishna Das P and Rukmangadachari E., "Engineering Mathematics" Vol I, Second Edition, Pearson publishing, 2011.
R5- Wylie & Barett, "Advanced Engineering Mathematics", McGraw Hill Education, 6th edition, 2003

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PROGRAMME	COURSE CODE	NAME OF THE COURSE	L	T	P	C
B.E.	16CY1101	ENGINEERING CHEMISTRY (COMMON TO ALL BRANCHES)	3	0	0	3

Course Objective

1. The student should be conversant with boiler feed water requirements, related problems and water treatment techniques.
2. The student should be conversant with the principles of polymer chemistry and engineering applications of polymers and composites
3. The student should be conversant with the principles and generation of energy in batteries, nuclear reactors, solar cells, wind mills and fuel cells.
4. To acquaint the student with important concepts of spectroscopy and its applications.
5. To acquaint the students with the basics of nano materials, their properties and applications

Unit	Description	Instructional Hours
	WATER TECHNOLOGY	
I	Hard water and soft water- Disadvantages of hard water- Hardness: types of hardness, calculations, estimation of hardness of water – EDTA method - scales and sludges – boiler corrosion – priming and foaming – caustic embrittlement; Conditioning methods of hard water – External conditioning - demineralization process- Internal conditioning - domestic water treatment: screening, sedimentation, coagulation, filtration, disinfection – chlorine – UV method; desalination: definition, reverse osmosis.	9
	POLYMER & COMPOSITES	
II	Polymerization – types of polymerization – addition and condensation polymerization – mechanism of free radical addition polymerization – copolymers – plastics: classification – thermoplastics and thermosetting plastics, preparation, properties and uses of commercial plastics – PVC, Teflon – moulding of plastics (extrusion and compression); rubber: vulcanization of rubber, synthetic rubber – butyl rubber, SBR; composites: definition, types of composites – polymer matrix composites – FRP.	9
	ENERGY SOURCES AND STORAGE DEVICES	
III	Introduction- nuclear energy- nuclear fission- controlled nuclear fission- nuclear fusion differences between nuclear fission and fusion- nuclear chain reactions- nuclear reactor power generator- classification of nuclear reactor- light water reactor- breeder reactor- solar energy conversion- solar cells- wind energy. Batteries and fuel cells: Types of batteries- alkaline battery lead storage battery- nickel-cadmium battery- lithium battery- fuel cell H_2 -O_2 fuel cell applications.	9
	ANALYTICAL TECHNIQUES	
IV	Beer-Lambert's law – UV-visible spectroscopy and IR spectroscopy – principles – instrumentation (block diagram only) – estimation of iron by colorimetry – flame photometry – principle – instrumentation (block diagram only) – estimation of sodium by flame photometry – atomic absorption spectroscopy – principles – instrumentation (block diagram only) – interferences - estimation of nickel by atomic absorption spectroscopy.	9
	NANOMATERIALS	
V	Basics - distinction between molecules, nanoparticles and bulk materials; size-dependent properties. Nanoparticles: definition, carbon nanotubes (CNT), types of carbon nano tubes – single walled and multi walled carbon nanotubes – synthesis of carbon nanotubes: chemical vapour deposition – laser ablation – arc-discharge method; properties of CNT: mechanical, electrical, thermal and optical properties; applications of carbon nanotubes in chemical field, medicinal field, mechanical field and current applications.	9
	TOTAL INSTRUCTIONAL HOURS	**45**

Course Outcome

CO1: Illustration of the basic parameters of water, different water softening processes and effect of hard water in industries.
CO2: Knowledge on basic properties and application of various polymers and composites as an engineering material.
CO3: Summarize the various energy sources and energy storage devices
CO4: Analyze various analytical skills in handling various machines, instruments, apart from understanding the mechanism involved.
CO5: Describe the basic properties and application of nano materials.

TEXT BOOKS

T1 - P.C.Jain and Monica Jain, "Engineering Chemistry" Dhanpat Rai Pub. Co., New Delhi (2015).
T2 - O.G.Palanna, "Engineering chemistry" McGraw Hill Education India (2017).

REFERENCES

R1 - B.Sivasankar "Engineering Chemistry" Tata McGraw-Hill Pub.Co.Ltd, New Delhi (2008).
R2 - B.K.Sharma "Engineering Chemistry" Krishna Prakasan Media (P) Ltd., Meerut (2005).
R3 - S.S.Dara "A Text book of Engineering Chemistry" S.Chand & Co.Ltd., New Delhi (2010).

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PROGRAMME	COURSE CODE	NAME OF THE COURSE	L	T	P	C
B.E.	16HE1101R	ESSENTIAL ENGLISH FOR ENGINEERS – I (COMMON TO ALL BRANCHES)	3	1	0	4

Course Objective

1. It fulfills the necessary skills needed in today's global workplaces.
2. Student will be able to interpret and illustrate formal communication.
3. It empowers students in choosing right lexical techniques for effective presentation
4. It equips the learner to analyze and list out things in logical order
5. The learner develops the ability to create and integrate ideas in a professional way.

Unit	Description	Instructional Hours
I	Getting to know people – Introduction – Talking about jobs (Present Simple) – Talking about working conditions(Adverb of Frequency) - Talking about company history and structure (Past simple, Prepositions of Time) – Talking about company activities (Connectors of addition and contrast, Present Continuous) – Focus on language – Parts of Speech – Gerund and Infinitives – Instruction-**General Vocabulary**.	12
II	Vocabulary practice – (Telephoning Leaving and taking messages) – requests and obligation – Describing trends (Adjectives and Adverbs) – Talking about company performance (present perfect and past simple, Reasons and consequences) – Reading Test Practice Describing products Dimensions, (Comparatives and Superlatives, Question formation) – Talking about product development (Sequencing words, Present continuous and going to) – Articles – Prepositions- Synonyms – Antonyms- Recommendations- **Interpretation of a chart.**	12
III	Talking about business equipment (Giving Instruction) – Letter Phrases- Writing Test Practice- Talking about facilities(Asking for and giving direction)- Presentation on a general topic -Talking about traffic and transport(making predictions)-**Discussion on current affairs**– Tenses- Present –Past-Future-Forms of verbs- Word techniques- Formation-Prefixes-Suffixes.	12
IV	Talking about conference arrangement(checking and confirming) – Talking about a conference before, after, when, until etc. – Listening Test Practice- talking about production process – passive- Talking about quality control Conditional 1 (real) (Making suggestions) – Itinery- Jumbled sentences- Paragraph writing- Essay writing – Checklist- Letter to Inviting Dignitaries – Accepting invitation- Declining Invitation.	12
V	Talking about call centers, insurance and changes in working practices (future possibility/probability)- Talking about banking- Speaking Test practice – Talking about delivery services (preposition of Time)- Talking about trading (Tense review)- Talking about recruitment conditional 2 (hypothetical) – talking about job applications (indirect questions) – Reading, Writing and Listening Test – Job application Letter and Resume Writing- Permission letters.	12
	TOTAL INSTRUCTIONAL HOURS	**60**

Course Outcome

CO1: Recognize different parts of speech for better usage.
CO2: Interpret and illustrate formal communication
CO3: Choosing right lexical techniques for effective presentation.
CO4: Analyze and list out things in logical order.
CO5: Create and integrate ideas in a professional way.

TEXT BOOKS:

T1 - Norman Whitby, Cambridge English: Business BENCHMARK Pre-intermediate to Intermediate – 2nd Edition. 2014.
T2 - Ian Wood and Anne Willams. "Pass Cambridge BEC Preliminary", Cengage Learning press 2013.

REFERENCE BOOKS :

R1 - Meenakshi Raman and Sangeetha Sharma. "Technical Communication-Principles and Practice", Oxford University Press, 2009.
R2 - Rizvi, Ashraf. M. Effective Technical Communication. Tata McGraw-Hill, New Delhi. 2005
R3 - Kamalesh Sadanan "A Foundation Course for the Speakers of Tamil-Part-I &II", Orient Blackswan, 2010.

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PROGRAMME	COURSE CODE	NAME OF THE COURSE	L	T	P	C
B.E.	16GE1101	COMPUTER PROGRAMMING (COMMON TO ALL BRANCHES)	3	0	0	3

Course Objective

1. Learn the fundamentals of computers.
2. Learn the basics of C programming
3. Learn the basics of Arrays and String
4. Learn the uses of functions and pointers.
5. Learn the basics of structures and unions.

Unit	Description	Instructional Hours
I	**BASICS OF COMPUTER** Generation and Classification of Computers- Basic Organization of a Computer –Input and Output Devices–Hardware and Software definitions- Categories of Software- Number System Conversion and problems. Need for logical analysis and thinking – Algorithm -Pseudo code – Flow Chart.	9
II	**BASICS OF 'C' PROGRAMMING** Fundamentals of ' C' programming – Structure of a 'C' program – compilation and linking processes – Constants, Variables – Data Types –Expressions using operators in 'C' – Managing Input and Output operations-Decision making-Branching and Looping-Case study	9
III	**ARRAYS AND STRINGS** Arrays – Initialization – Declaration – One dimensional and Two dimensional arrays. String- String Library functions – String Arrays. Matrix operations-Addition-Subtraction-Multiplication-Transpose-Case study.	9
IV	**FUNCTIONS AND POINTERS** Function – definition – Declaration – Types of Function definition – call by value-call by reference- Recursion – Pointers - Definition – Initialization – Pointers arithmetic – Pointers and arrays-Case study.	9
V	**STRUCTURES AND UNIONS** Structure- data type – definition – declaration –Nesting of structure - Union – Storage classes, Pre-processor directives-Case study.	9
	TOTAL INSTRCTIONAL HOURS	**45**

Course Outcome

CO1:Use computers at user level, including operating systems, programming environments and differentiate between basic concepts of computer hardware and software.
CO2: Analyze problems, design and implementing algorithmic solutions.
CO3:Use data representation for the fundamental data types, read, understand and trace the execution of programs written in C language.
CO4: Write the C code using a modular approach and recursive concepts.
CO5: Explain the use of pointers, Structures and union.

TEXT BOOKS:

T1 – Balagurusamy "Programming in ANSI C", Seventh Edition, McGraw-Hill, 2016.
T2 - Anita Goel and Ajay Mittal, "Computer Fundamentals and Programming in C", Dorling Kindersley (India) Pvt. Ltd., Pearson Education in South Asia, 2011.

REFERENCE BOOKS:

R1 - Yashavant P. Kanetkar, " Let Us C", BPB Publications, 2011.
R2- M.Rajaram and P.Uma maheswari, "Computer Programming with C" Dorling Kindersley (India) Pvt. Ltd., Pearson Education in South Asia, 2014.
R3 - Dr.N.Sengottaiyan and K.Ramya, "Computer Programming",Cengage Learning (India) Pvt. Ltd.,2016

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PROGRAMME	COURSE CODE	NAME OF THE COURSE	L	T	P	C
B.E.	16GE1102	ENGINEERING GRAPHICS (COMMON TO ALL BRANCHES)	3	1	0	4

Course Objective

1. To provide drafting skills for communicating the Engineering concepts and ideas.
2. To expose to BIS and International standards related to engineering drawings.

UNIT	DESCRIPTION	TOTAL HOURS
I	**PLANE CURVES** Importance of engineering drawing, drafting instruments, drawing sheets – layout and folding, Lettering and dimensioning, BIS standards and scales. Geometrical constructions, Construction of ellipse, parabola and Hyperbola by eccentricity method, construction of cycloids and involutes of square and circle – Drawing of tangents and normal to the above curves.	15
II	**PROJECTIONS OF POINTS, LINES AND PLANE SURFACES** Introduction to Orthographic projections- Projection of points. Projection of straight lines inclined to both the planes, Determination of true lengths and true inclinations by rotating line method. Projection of planes (polygonal and circular surfaces) inclined to both the planes by rotating object method (First angle projections only).	15
III	**PROJECTIONS OF SOLIDS** Projection of simple solids like prisms, pyramids, cylinder and cone when the axis is perpendicular and inclined to one plane and objects inclined to both the planes by rotating object method.	15
IV	**SECTION OF SOLIDS AND DEVELOPMENT OF SURFACES** Sectioning of simple solids with their axis in vertical position when the cutting plane is inclined to one of the principal planes and perpendicular to the other – Obtaining true shape of section. Development of lateral surfaces of simple and sectioned solids – Prisms, pyramids, cylinder and cone. Development of lateral surfaces of truncated solids. Intersection of solids-cylinder vs cylinder.	15
V	**ISOMETRIC AND ORTHOGRAPHIC PROJECTIONS** Isometric views and projections of simple and truncated solids such as - Prisms, pyramids, cylinders, cones- combination of two solid objects in simple vertical positions. Free hand sketching of multiple views from a pictorial drawing. Perspective projection of solids in simple position using visual ray method.	15
	TOTAL INSTRUCTIONAL HOURS	**75**

Course Outcome

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

CO1: Draw the orthographic and isometric views of regular solid objects including sectional views.

CO2: Recognize the International Standards in Engineering Drawing practices.

TEXT BOOKS:

T1. K.Venugopal, V.Prabu Raja, "Engineering Drawing, AutoCAD, Building Drawings", 5th Edition New Age International Publishers, New delhi 2016.

T2. K.V.Natarajan, "A textbook of Engineering Graphics", Dhanalaksmi Publishers, Chennai.

REFERENCE BOOKS:

R1. Basant Agrawal and C.M.Agrawal, "Engineering Drawing", Tata McGraw Hill Publishing Company Limited,New Delhi 2008.

R2. K. R. Gopalakrishnan, "Engineering Drawing" (Vol. I & II), Subhas Publications, Bangalore, 1998.

R3. M.B.Shah and B.C.Rana, "Engineering Drawing", Pearson Education, India, 2005.

R4. N.S. Parthasarathy, Vela Murali, "Engineering Drawing", Oxford University press, India 2015.

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PROGRAMME	COURSE CODE	NAME OF THE COURSE	L	T	P	C
B.E.	16PS1001	PHYSICAL SCIENCES LAB – I (COMMON TO ALL BRANCHES)	0	0	2	1

PHYSICS LAB - I

Course Objective

1. Evaluate the particle size of micro particles and acceptance angle of fibres.
2. Employ instrumental method to determine Young's modulus of a beam of metals.
3. Apply the concept of diffraction and getting ability to calculate the wavelength of the mercury spectrum

Expt. No.	Description of the Experiments
1.	Determination of Wavelength, and particle size using Laser
2.	Determination of acceptance angle and numerical aperature in an optical fiber.
3.	Determination of velocity of sound and compressibility of liquid – Ultrasonic Interferometer.
4.	Determination of wavelength of mercury spectrum – spectrometer grating
5.	Determination of thermal conductivity of a bad conductor – Lee's Disc method
6.	Determination of Young's modulus by Non uniform bending method
7.	Determination of specific resistance of a given coil of wire – Carey Foster's Bridge.
8.	Post office box Measurement of an unknown resistance

TOTAL PRACTICAL HOURS 30

Course Outcome

CO1: Point out the particle size of micro particles and acceptance angle of fibres using diode laser.
CO2: Assess the Young's modulus of a beam using non uniform bending methods.
CO3: Illustrate the concept of diffraction and getting ability to calculate the wavelength of the mercury spectrum
Using spectrometer.
CO4: Identify the velocity of ultrasonic's in the given liquid.
CO5: Illustrate phenomena of thermal conductivity of a bad conductor.

CHEMISTRY LAB-I

Course Objective

1. Acquire practical skills in the determination of water quality parameters.
2. Acquaint the students with the determination of molecular weight of a polymer by viscometry.
3. Acquaint the students with the estimation of chemical substances using instrumental analysis techniques.

Expt. No.	Description of the Experiments
1.	Preparation of molar and normal solutions and their standardization.
2.	Estimation of total, permanent and temporary hardness of Water by EDTA
3.	Determination of chloride content of water sample by argentometric method.
4.	Determination of available chlorine in bleaching powder.
5.	Conductometric titration of strong acid vs strong base (HCl vs NaOH).
6.	Conductometric titration (Mixture of weak and strong acids)
7.	Conductometric precipitation titration using $BaCl_2$ and Na_2SO_4
8.	Determination of molecular weight and degree of polymerization using viscometry.
9.	Estimation of iron content of the water sample using spectrophotometer.(1,10 phenanthroline / thiocyanate method).

Total Practical Hours 30

Course Outcome

CO1: Estimate the different types of hardness in a water sample.
CO2: Determine the chloride content of water sample.
CO3: Calculate the strength of acid using conductometric titrations.
CO4: Calculate the strength of strong and weak acid using conductometric titrations.
CO5: estimate the amount of salt using conductometric precipitation titrations.

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PROGRAMME	COURSE CODE	NAME OF THE COURSE	L	T	P	C
B.E.	16GE1001	COMPUTER PROGRAMMING LAB (COMMON TO ALL BRANCHES)	0	0	4	2

Course Objective

1. Be familiar with Microsoft office software.
2. Be exposed to role of constants, variables, identifiers, operators and other building blocks of C Language.
3. Be familiar with the use of conditional expressions and looping statements to solve problems associated with conditions and repetitions.
4. Be familiar with the concept of Array and pointers dealing with memory management.
5. Be exposed to Structures and unions.

S.No	Description of the Experiments	Total Practical Hours
1.	**a. Word Processing:** 1. Document creation, Text manipulation with Scientific notations 2. Table creation, Table formatting and conversion 3. Mail merge and Letter preparation 4. Flow Chart	3
2.	**b. Spread Sheet:** 1. Chart - Line, XY, Bar and Pie. 2. Formula - formula editor. 3. Spread sheet - inclusion of object, picture and graphics, protecting the document and sheet. 4. Sorting and Import / Export features.	6
3.	**c. Basic C programming:** C program using I/O Statements	3
4.	C program using arithmetic operations	3
5.	Decision making statement & Looping Concepts • Designing a simple arithmetic calculator. (Use switch statement) • Performing the following operations: (Use loop statement) • Generate Pascal's triangle. • Construct a Pyramid of numbers.	6
6.	**d. Arrays and Strings** C program using one dimensional arrays	3
7.	C program using two dimensional arrays	3
8.	C program using string functions	3
9.	**e. Functions and pointers** Perform the following operations: (Use recursive functions) i. Find the factorial of a given integer. ii. Find the GCD (Greatest Common Divisor) of two given integers. iii. Solve Towers of Hanoi problem.	6
10.	Program to swap two numbers using pointers - call by reference.	3
11.	**f. Structures and Unions** C Program using Structures	3
12.	C Program using Unions	3
	TOTAL PRACTICAL HOURS	**45**

Course Outcome

CO1: Use office packages for documentation and presentation.
CO2: Implement program using control structures.
CO3: Handle arrays and strings.
CO4: Handle functions and pointers.
CO5: Form heterogeneous data using structure and union.

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PROGRAMME	COURSE CODE	NAME OF THE COURSE	L	T	P	C
B.E.	16GE1002	ENGINEERING PRACTICES LABORATORY (COMMON TO ALL BRANCHES)	0	0	4	2

Course Objective To provide exposure to the students with hands on experience on various basic engineering practices in Civil, Mechanical, Electrical and Electronics Engineering.

GROUP A (CIVIL & MECHANICAL)

S. NO	DESCRIPTION OF THE EXPERIMENTS	TOTAL PRACTICAL HOURS
	I CIVIL ENGINEERING PRACTICE	
	Study of plumbing and carpentry components of Residential and Industrial buildings.	
	(A) PLUMBING WORKS:	
1	Study on pipe joints, its location and functions: Valves, taps, couplings, unions, reducers, elbows in household fittings.	
2	Study of pipe connection requirements for pumps.	
3	Preparation of plumbing line sketches for water supply and sewage works.	
	Hands-on-exercise:	9
4	➢ Basic pipe connections – Mixed pipe material connection – Pipe connections with different joining components.	
5	Demonstration of plumbing requirements of high-rise buildings.	
	(B) CARPENTRY USING POWER TOOLS ONLY:	
1	Study of the joints in roofs, doors, windows and furniture.	
2	Hands-on-exercise in wood works by sawing, planning and cutting.	
	II MECHANICAL ENGINEERING	
	(A) Welding:	
1	Preparation of arc welding of Butt joints, Lap joints and Tee joints	
	(B) Machining:	
1	Practice on Simple step turning and taper turning	
2	Practice on Drilling Practice	
	(C) Sheet Metal Work:	13
1	Practice on Models– Trays, cone and cylinder.	
	DEMONSTRATION	
	(D) Smithy	
	➢ Smithy operations: Upsetting, swaging, setting down and bending.	
	➢ Demonstration of – Production of hexagonal headed bolt.	
	Gas welding	
	Foundry Tools and operations.	

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GROUP B (ELECTRICAL & ELECTRONICS)

S.NO	DESCRIPTION OF THE EXPERIMENTS	TOTAL PRACTICAL HOURS
	ELECTRICAL ENGINEERING PRACTICES	
1	Residential house wiring using switches, fuse, indicator, lamp and energy meter.	
2	Fluorescent lamp wiring	
3	Stair case wiring.	10
4	Measurement of electrical quantities – voltage, current, power & power factor in RLC circuit.	
5	Measurement of energy using single phase energy meter.	
	ELECTRONICS ENGINEERING PRACTICES	
1	Study of Electronic components and equipments – Resistors - colour coding	
2	Measurement of DC signal - AC signal parameters (peak-peak, RMS period, frequency) using CRO.	
3	Study of logic gates AND, OR, NOT and NAND .	13
4	Soldering practice – Components Devices and Circuits – Using general purpose PCB.	
5	Measurement of average and RMS value of Half wave and Full Wave rectifiers.	
	TOTAL INSTRUCTIONAL HOURS	**45**

Course Outcome

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

CO1: Fabricate wooden components and pipe connections including plumbing works.

CO2: Fabricate simple weld joints.

CO3: Fabricate electrical and electronics circuits.

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PROGRAMME	COURSE CODE	NAME OF THE COURSE	L	T	P	C
B.E.	16GE1003	VALUE ADDED COURSE-I LANGUAGE COMPETENCY ENHANCEMENT COURSE - 1 (COMMON TO ALL BRANCHES)	0	0	2	1

Topic No.	Description of the Experiments	
1.	INTRODUCTION TO AERONAUTICAL ENGINEERING	
2.	LEADERSHIP FOR ENGINEERS	
3.	4G – NETWORK ESSNTIALS	
4.	COMP. SCIENCE ESSENTIALS FOR SOFTWARE DEVELOPMENT	
5.	INTRODUCTION ANALYTICS MODELLING	
6.	MATERIAL SCIENCE AND ENGINEERING	
	Total Marks	100

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SEMESTER II

PROGRAMME	COURSE CODE	NAME OF THE COURSE	L	T	P	C
B.E.	16MA2102	ENGINEERING MATHEMATICS – II (COMMON TO ALL BRANCHES)	3	1	0	4

Course Objective

1. Learn the basics of vector calculus comprising gradient, divergence, Curl and line, surface, volume integrals.
2. Understand analytic functions of complex variables and conformal mappings.
3. Know the basics of residues, complex integration and contour integration.
4. Apply Laplace transform techniques to solve linear differential equations.
5. Know the effective mathematical tools for the solutions of partial differential equations that model several physical problems in mathematical physics

Unit	Description	Instructional Hours
I	**VECTOR CALCULUS** Gradient, divergence and curl – Directional derivative – Irrotational and solenoidal vector fields – Vector integration – Green's theorem in a plane, Gauss divergence theorem and Stokes' theorem (excluding proofs) – Simple applications involving cubes and rectangular parallelopipeds.	12
II	**ANALYTIC FUNCTIONS** Analytic function - Cauchy-Riemann equations - sufficient conditions (excluding proof) – Harmonic - conjugate harmonic functions– Construction of analytic functions (Milne-Thompson method) – Conformal mapping: $w = z+c$, cz, $1/z$ and bilinear transformation without problems related to the concept of conformal mapping.	12
III	**COMPLEX INTEGRATION** Complex integration – Statements of Cauchy's integral theorem – Taylor's and Laurent's series expansions - Singular points – Residues – Cauchy's residue theorem – Evaluation of real definite integrals as contour integrals around unit circle.	12
IV	**LAPLACE TRANSFORM** Laplace transform –Basic properties – Transforms of derivatives and integrals of functions - Transforms of unit step function and impulse function – Transform of periodic functions. Inverse Laplace transform - Convolution theorem (with out proof) – Solution of linear ODE of second order with constant coefficients using Laplace transformation techniques.	12
V	**PARTIAL DIFFERENTIAL EQUATIONS** Formation of partial differential equations by elimination of arbitrary constants and arbitrary functions-Solution of standard types of first order partial differential equations of the form $f(p,q) = 0$, Clairaut's type: $z = px + qy + f(p, q)$ – Lagrange's linear equation- Linear homogeneous partial differential equations of second and higher order with constant coefficient.	12
	Total Instructional Hours	**60**

Course Outcome

CO1: Know the gradient, divergence and curl of vectors useful for engineering application like fluid flow, electricity and magnetism.
CO2: Test the analyticity to construct the analytic function and transform complex functions from one plane to another plane graphically.
CO3: Evaluate real and complex integrals over suitable closed paths or contours.
CO4: Know the applications of Laplace transform and its properties and to solve certain linear differential equations using Laplace transform technique.
CO5: Solve the engineering problems using Partial Differential Equations.

TEXT BOOKS:

T1- Ravish R Singh, Mukul Bhatt, "Engineeing Mathematics", McGraw Hill education (India) Private Ltd.,Chennai,2017.
T2- Veerarajan T, "Engineering Mathematics–II", McGraw Hill Education(India) Pvt Ltd, New Delhi, 2016

REFERENCE BOOKS :

R1-Bali N.P & Manish Goyal, "A Text book of Engineering Mathematics", 8th Edition, Laxmi Pub. Pvt. Ltd. 2011.
R2- Grewal B.S, "Higher Engineering Mathematics", 42nd Edition, Khanna Publications, Delhi, 2012.
R3- Peter V. O'Neil, "Advanced Engineering Mathematics", 7th Edition, Cengage learning,2012.
R4-Sivarama Krishna Das P and Rukmangadachari E., "Engineering Mathematics" Vol II, Second Edition, Pearson publishing, 2011.
R5- Wylie & Barett, "Advanced Engineering Mathematics", McGraw Hill Education, 6th edition, 2003

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PROGRAMME	COURSE CODE	NAME OF THE COURSE	L	T	P	C
B.E.	16PH2102	PHYSICS OF MATERIALS (COMMON TO ALL BRANCHES)	3	0	0	3

Course Objective

1. Gain knowledge about conducting materials.
2. Provide fundamental knowledge of semiconducting materials which is related to the engineering program.
3. Extend the properties of magnetic materials, applications and super conducting materials.
4. Defend the various types of dielectric materials and their uses.
5. Expose the students to smart materials and the basis of nano technology.

Unit	Description	Instructional Hours
I	**CONDUCTING MATERIALS** Introduction – Conductors – Classical free electron theory of metals – Electrical and thermal conductivities – Wiedemann–Franz law – Lorentz number – Draw backs of classical theory – Quantum theory – Fermi distribution function – Effect of temperature on Fermi function – Density of energy states – Carrier concentration in metals.	9
II	**SEMICONDUCTING MATERIALS** Introduction – Intrinsic semiconductor – carrier concentration derivation – Fermi level – Variation of Fermi level with temperature – electrical conductivity – band gap determination – compound semiconductors –direct and indirect band gap of semiconductors- derivation of carrier concentration in n-type and p-type semiconductor – variation of Fermi level with temperature and impurity concentration — Hall effect –Determination of Hall coefficient – Applications	9
III	**MAGNETIC & SUPERCONDUCTING MATERIALS** **Magnetic Materials**: Origin of magnetic moment – Bohr magneton – comparison of Dia. Para and Ferro magnetism – Domain theory – Hysteresis – soft and hard magnetic materials – anti ferromagnetic materials – Ferrites and its applications. **Superconducting Materials :** Superconductivity : properties(Messiner effect, effect of magnetic field, effect of current and isotope effects) – Type I and Type II superconductors – BCS theory of superconductivity(Qualitative) - High Tc superconductors – Applications of superconductors – SQUID, cryotron, magnetic levitation.	9
IV	**DIELECTRIC & COMPOSITES MATERIALS** Introduction – Electrical susceptibility – dielectric constant – polarization - electronic, ionic, orientation and space charge polarization –internal field – Claussius – Mosotti relation (derivation) – dielectric loss and dielectric breakdown (qualitative) Introduction to composites materials – types of composites materials – polymer, metallic and ceramic matrix composites (qualitative). Application in surgery, sports equipment.	9
V	**SMART MATERIALS AND NANOTECHNOLOGY** **New Engineering Materials:** Metallic glasses – preparation, properties and applications – shape memory alloys (SMA) – characteristics, properties of NiTi alloy applications. **Nano Materials**: Synthesis - plasma arcing – Chemical vapour deposition – properties of nanoparicles and applications. – Carbon nano tubes – fabrication – pulsed laser deposition - Chemical vapour deposition - properties & applications.	9
	TOTAL INSTRUCTIONAL HOURS	**45**

Course Outcome

CO1: Illustrate the electrical / thermal conductivity of conducting materials.
CO2: Understand the purpose of the acceptor or donor levels and the band gap of a semiconductor.
CO3: Interpret the basic idea behind the process of magnetism and applications of magnetic materials in every day life
CO4: Identify and compare the various types of dielectric polarization and dielectric breakdown.
CO5: Evaluate the properties and applications of various advanced engineering materials and develop the new ideas to synthesis Nano materials.

TEXT BOOKS:

T1 - S.O.Pillai "Solid State Physics" New Age International Publishers, New Delhi – 2011
T2- Rajendran V "Materials Science" McGraw-Hill Education" New Delhi -2016.

REFERENCE BOOKS:

R1 – William D Callister, Jr "Material Science and Engineering" John wiley and Sons, New York, 2014.
R2 - Raghavan, V. "Materials Science and Engineering – A First Course" Prentice Hall of India, New Delhi 2016.
R3 -Dr. G. Senthilkumar "Engineering Physics – II" VRB publishers Pvt Ltd., 2013

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PROGRAMME	COURSE CODE	NAME OF THE COURSE	L	T	P	C
B.E.	16CY2102	ENVIRONMENTAL SCIENCES (B.E., B.TECH., AERO, AUTO, CSE, ECE, EEE, EIE, IT, MECH, MECT)	3	0	0	3

Course Objective

1. To gain knowledge on the importance of environmental education, ecosystem and biodiversity.
2. To acquire knowledge about environmental pollution – sources, effects and control measures of environmental pollution.
3. To find and implement scientific, technological, economic and political solutions to environmental problems.
4. To study about the natural resources, exploitation and its conservation
5. To be aware of the national and international concern for environment and its protection.

Unit	Description	Instructional Hours
I	**ENVIRONMENT, ECOSYSTEMS AND BIODIVERSITY** Importance of environment – need for public awareness - concept of an ecosystem – structure and function of an ecosystem – producers, consumers and decomposers- energy flow in the ecosystem – ecological succession processes – Introduction, types, characteristic features, structure and function of the (a) forest ecosystem (b) grassland ecosystem (c) desert ecosystem (d) aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries) – Introduction to biodiversity definition: genetic, species and ecosystem diversity – biogeographical classification of India – value of biodiversity: consumptive use, productive use, social, ethical, aesthetic and option values – Biodiversity at global, national and local levels – India as a mega-diversity nation – hot-spots of biodiversity – threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts – endangered and endemic species of India – conservation of biodiversity: In-situ and ex-situ conservation of biodiversity.	9
II	**ENVIRONMENTAL POLLUTION** Definition – causes, effects and control measures of: Air pollution – Air pollution standards – control methods- Water pollution – Water quality parameters- Soil pollution - Marine pollution - Noise pollution- Thermal pollution - Nuclear hazards–role of an individual in prevention of pollution – pollution case studies.	9
III	**NATURAL RESOURCES** Forest resources: Use and over-exploitation, deforestation, case studies- timber extraction, mining, dams and their effects on forests and tribal people – Water resources: Use and overutilization of surface and ground water, dams-benefits and problems – Mineral resources: Use and exploitation, environmental effects of extracting and using mineral resources, case studies – Food resources: World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity, case studies – Energy resources: Growing energy needs, renewable and non renewable energy sources, use of alternate energy sources. Land resources: Land as a resource, land degradation, man induced landslides, soil erosion and Desertification – role of an individual in conservation of natural resources – Equitable use of resources for sustainable lifestyles.	9
IV	**SOCIAL ISSUES AND THE ENVIRONMENT** From unsustainable to sustainable development – urban problems related to energy- energy conversion – electrical energy calculations- environmental ethics: Issues and possible solutions – 12 Principles of green chemistry- Current Environmental issues at Country level – management of municipal sewage, municipal solid waste, Hazardous waste and Bio-medical waste – Global issues –Climatic change, Acid rain, greenhouse effect and Ozone layer depletion. Disaster management: floods, earthquake, cyclone and landslides.	9

V	**HUMAN POPULATION AND THE ENVIRONMENT** Population growth, variation among nations – population explosion – family welfare programme – environment and human health – human rights – value education – HIV / AIDS – women and child welfare –Environmental impact analysis (EIA)- GIS-remote sensing-role of information technology in environment and human health – Case studies.	9
	Total Instructional Hours	**45**

Course Outcome

CO1: Understand the natural environment and its relationships with human activities.
CO2: Characterize and analyze human impacts on the environment
CO3: Apply systems concepts and methodologies to analyze and understand interactions between social and environmental processes
CO4: Reflect critically about their roles and identities as citizens, consumers and environmental actors in a complex, interconnected world.
CO5: Understand and implement scientific research strategies, including collection, management, evaluation, and interpretation of environmental data.

TEXT BOOKS:

T1- Anubha Kaushik and C. P. Kaushik, "Environmental Science and Engineering", Fourth edition, New Age International Publishers, New Delhi, 2014.
T2 – Deeksha Dave and S.S.Katewa, "Textbook of Environmental Studies", Second Edition, Cengage Learning, 2012.

REFERENCES:

R1 - Trivedi R.K. "Handbook of Environmental Laws, Rules, Guidelines, Compliances and Standards", Vol. I and II, Enviro Media.
R2 - G.Tyler Miller, Jr and Scott E. Spoolman"Environmental Science" Thirteenth Edition, Cengage Learning, 2010.
R3 - Gilbert M. Masters, "Introduction to Environmental Engineering and Science", 2nd edition, Pearson Education, 2004

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PROGRAMME	COURSE CODE	NAME OF THE COURSE	L	T	P	C
B.E.	16HE2102R	ESSENTIAL ENGLISH FOR ENGINEERS – II (COMMON TO ALL BRANCHES)	3	1	0	4

Course Objective

1. The learner will be introduced to global corporate culture and professional communication
2. It helps the students to focus on organizing professional event and documentation
3. The student will be able to describe the events and process in an effective way
4. It trains the student to analyze the problems and to find solution to it
5. The learner will be familiar with business communication

Unit	Description	Instructional Hours
I	Introduction- talking about teamwork- Making arrangements- Improving Communication in spoken language – Taking and leaving Voice mail messages (present Tense, Past Tense and Present Perfect) Talking about Business Hotel- (Speaking Activity) Talking about Corporate Hospitality- Formal and Informal Language – Making accepting and declining invitations (Auxiliary Verb, Countable or Uncountable Nouns) – Focus on Language – Definitions and Extended Definitions-**Reading comprehension.**	12
II	Talking about orders – Clarity Written Language – Phone and Letter Phrases – Talking about Company Finances – Conditional 1 and 2 – Managing Cash Flow (Intention and Arrangements Conditional 1 and 2) – Talking about Brands and Marketing – Ethical Banking- Talking about Public Relations – Organizing a PR Event – Describing Duties and Responsibilities – (Future Tense and Articles) – Reported Speech – Modal Verbs and Passive, Impersonal Passive Voice-**interpretation of posters or advertisements.**	12
III	Talking about relocation – Report Phrases – Talking about Similarity and difference- Giving Directions- Asking for Information and Making Suggestions – Talking about Location (Comparatives and Superlatives, Participles) – Talking about Company Performances- Describing Trends – Describing Cause and Effect – Talking about Environmental Impact – Discussing Green Issues – Language of Presentations (Adjectives and Adverbs, Determiners)- Homophones – Homonyms- Acronyms-Abbreviations- British and American words.	12
IV	Talking about Health and Safety – Expressing Obligation- Discussing Regulations- Talking about personnel Problems – Passives – Talking about Problem at Work (modal Verbs, Passives)- Talking about Expenses Claims- Talking about Air Travel (Relative Pronoun, Indirect Questions) – **E-mail Writing - Note completion-** Transcoding.	12
V	Talking about staff Benefits- Talking about Appraisal Systems (gerunds and Infinitives, Reported Speech) – Talking about Marketing Disasters – Expressing hypothetical Situations- Talking about entering Foreign Market (Conditional 3, Grammar review) – Letter for calling quotations, Replying for quotations – Placing an order and Complaint and **reply to a complaint**.	12
	TOTAL INSTRUCTIONAL HOURS	**60**

Course Outcome

CO1: Introduced corporate culture and professional communication.
CO2: It focused on organizing a professional event and its documentation.
CO3: Improved the ability to describe the events and process in an effective way
CO4: Trained to analyze the problems and to find solution to it.
CO5: Practiced to make business communication.

TEXT BOOKS:

T1 - Norman Whitby, Cambridge English: Business BENCHMARK Pre-intermediate to Intermediate – 2nd Edition. 2014.
T2 - Ian Wood and Anne Willams. "Pass Cambridge BEC Preliminary", Cengage Learning press 2013.

REFERENCE BOOKS :

R1 - Communication Skills for Engineers, Sunitha Misra & C.Murali Krishna, Pearson Publishers
R2 - Technical Communication, Daniel G. Riordan, Cengage learning publishers.
R3 - Kamalesh Sadanan "A Foundation Course for the Speakers of Tamil-Part-I &II", Orient Blackswan,2010.

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PROGRAMME	COURSE CODE	NAME OF THE COURSE	L	T	P	C
B.E.	16GE2101	ENGINEERING MECHANICS	3	1	0	4

Course Objective

The main objectives of the course are to:
- Understand the vector and scalar representation of forces and moments
- Understand the static equilibrium of particles and rigid bodies both in two dimensions.
- Understand the principle of work and energy.
- Comprehend the effect of friction on equilibrium.
- Write the dynamic equilibrium equation.

UNIT	DESCRIPTION	TOTAL HOURS
I	**BASICS & STATICS OF PARTICLES** Introduction – Units and Dimensions – Laws of Mechanics – Lame's theorem, Parallelogram and triangular Law of forces – Vectors – Vector representation of forces and moments – Coplanar Forces – Resolution and Composition of forces – Equilibrium of a particle –Forces in space – Equilibrium of a particle in space – Equivalent systems of forces – Principle of transmissibility.	12
II	**EQUILIBRIUM OF RIGID BODIES** Free body diagram – Types of supports and their reactions – requirements of stable equilibrium – Moments and Couples – Moment of a force about a point and about an axis– Scalar components of a moment – Varignon's theorem – Single equivalent force – Equilibrium of Rigid bodies in two dimensions.	12
III	**PROPERTIES OF SURFACES AND SOLIDS** Determination of Areas and Volumes – First moment of area and the Centroid of sections – Rectangle, circle, triangle from integration – T section, I section, - Angle section, Hollow section by using standard formula – Second and product moments of plane area – Rectangle, triangle, circle from integration – T section, I section, Angle section, Hollow section by using standard formula – Parallel axis theorem and perpendicular axis theorem – Polar moment of inertia – Principal moments of inertia of plane areas.	12
IV	**DYNAMICS OF PARTICLES** Displacements, Velocity and acceleration, their relationship – Relative motion – Curvilinear motion – Newton's law – Work Energy Equation of particles – Impulse and Momentum – Impact of elastic bodies, Co-efficient of restitution.	12
V	**FRICTION** Frictional force – Laws of Coloumb friction – Simple contact friction – Rolling resistance – Wedge friction - Belt friction, Applications of friction.	12
	TOTAL INSTRUCTIONAL HOURS	60

Course Outcome

The outcomes of the course are the students shall have the ability:
- CO1: To solve engineering problems dealing with force, displacement, velocity and acceleration.
- CO2: To analyze the forces in any structure.
- CO3: To solve rigid body subjected to dynamic forces.

TEXT BOOKS:

1. F.P.Beer, and Jr. E.R.Johnston., "Vector Mechanics for Engineers (In SI Units): Statics and Dynamics", 8th Edition, Tata McGraw-Hill Publishing company, New Delhi (2004).

REFERENCE BOOKS:

1. R.C.Hibbeller, and Ashok Gupta, "Engineering Mechanics: Statics and Dynamics", 11th Edition, Pearson Education 2010.
2. S.Rajasekaran and G.Sankarasubramanian, "Engineering Mechanics Statics and Dynamics", 3rd Edition, Vikas Publishing House Pvt. Ltd., 2005.
3. S.S.Bhavikatti, and K.G.Rajashekarappa, "Engineering Mechanics", New Age International (P) Limited Publishers, 1998.

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PROGRAMME	COURSE CODE	NAME OF THE COURSE	L	T	P	C
B.E.	16EE2202	BASICS OF ELECTRONICAL AND ELECTRONICS ENGINEERING	3	0	0	3

Course Objective

1. To explain the basic electronic circuits and the different components.
2. To explain the fundamentals of semiconductor and applications.
3. To explain the fundamentals of power supply circuits.
4. To explain the principles of digital electronics.
5. To impart knowledge of communication engineering

Unit	Description	Instructional Hours
I	**ELECTRIC CIRCUIT ANALYSIS** Ohm's Law – Kirchoff's Laws – Series and Parallel circuits –Voltage and Current division techniques - Mesh current and Node voltage method for DC Circuits – Introduction to AC Circuits – Waveforms and RMS Value – Power and Power factor – Single Phase Circuits – R,RL,RC,RLC Circuits.	15
II	**SEMI CONDUCTOR DEVICES AND APPLICATIONS** Characteristics of PN Junction Diode – Zener Diode and its Characteristics – Zener Effect – Voltage Regulation. Bipolar Junction Transistor (BJT) – CB, CE, CC Configurations and Characteristics. UJT -Characteristics.	15
III	**POWER TRANSISTORS AND POWER SUPPLY CIRCUITS** Halfwave and Fullwave Rectifier - Filter Types - Capacitive Filter - Configurations and Characteristics of SCR – FET – MOSFET - Linear Mode & Switched Mode Power Supply (Block Diagram Approach only)	15
IV	**DIGITAL ELECTRONICS** Logic Gates – Boolean Algebra – Half and Full Adders – Flip-Flops: RS, JK, T & D FF – A/D and D/A Conversion (Dual Slope, SAR, Binary-weighted and R-2R)	15
V	**FUNDAMENTALS OF COMMUNICATION ENGINEERING** Types of Signals: Analog and Digital Signals – Modulation and Demodulation: Principles of Amplitude and Frequency Modulations - Satellite and Optical Fiber communication (Block Diagram Approach only).	15
	TOTAL INSTRUCTIONAL HOURS	**60**

Course Outcome

CO1: Ability to identify the electronic components
CO2: Ability to explain the characteristics of electronic devices.
CO3: Ability to understand power transistors and design power supply circuits.
CO4: Understand the basic principles of digital electronics.
CO5: Understand the fundamentals of Communication Engineering.

TEXT BOOKS:

T1 - Muthusubramanian R, Salivahanan S and Muraleedharan K A; "Basic Electrical, Electronics and Computer Engineering", Tata McGraw Hill, Second Edition, 2006.
T2 - David A. Bell, "Electronic Devices and Circuits", Prentice Hall of India, 2004.

REFERENCE BOOKS :

R1 - Mehta V K, "Principles of Electronics", S.Chand& Company Ltd. 1994.
R2 - Donald A Neamen, "Electronic Circuit Analysis and Design", Tata McGraw Hill, 3rd Edition, 2003.
R3 - Floyd, "Electron Devices", Pearson Asia 5th Edition, 2001.
R4 - MSedha R.S., "Applied Electronics", S. Chand & Co., 2006.
R5 - Wayne Tomasi, "Electronic Communication Systems", Pearson Education, 3rd Edition,2001.

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PROGRAMME	COURSE CODE	NAME OF THE COURSE	L	T	P	C
		PHYSICAL SCIENCES LAB – II				
B.E.	16PS2001	(COMMON TO ALL BRANCHES)	0	0	2	1

PHYSICS LAB-II

Course Objective

1. Evaluate the band gap of a semiconductor.
2. Apply the concept of interference and calculate the thickness of thin wire.
3. Acquire the practical skills in Young's modulus by uniform bending method.

Expt. No.	Description of the Experiments
1.	Determination of Young's modulus by uniform bending method
2.	Determination of band gap of a semiconductor
3.	Determination of Coefficient of viscosity of a liquid –Poiseuille's method
4.	Determination of Dispersive power of a prism – Spectrometer
5.	Determination of thickness of a thin wire – Air wedge method
6.	Determination of Rigidity modulus – Torsion pendulum
7.	Magnetic hysteresis experiment
8.	Calibration of ammeter using potentiometer

TOTAL PRACTICAL HOURS 30

Course Outcome

CO1: Experiment involving the physical phenomena of the Rigidity modulus of wire.
CO2: Determine the band gap of a semiconductor and variation of Energy Gap (E_g) with temperature.
CO3: Assess the Young's modulus of a beam using non uniform bending method.
CO4: Explain the concept of interference and calculate the thickness of thin wire and other fine objects.
CO5: Experiment provides a unique opportunity to validate Dispersive power of a prism using Spectrometer.

CHEMISTRY LAB – II

Course Objective

1. Acquire practical skills in the quantitative analysis of water quality parameters.
2. Acquire practical skills in the instrumental methods for quantitative estimation of metal ion content.
3. Gain knowledge in determination of rate of corrosion.

Expt. No.	Description of the Experiments
1.	Determination of Dissolved Oxygen in water by Winkler's method.
2.	Estimation of alkalinity of water sample by indicator method.
3.	Estimation of hydrochloric acid by pH metry.
4.	Estimation of ferrous iron by Potentiometry.
5.	Estimation of Copper by EDTA
6.	Determination of sodium by flame photometry
7.	Determination of corrosion rate of mild steel by weight loss method.

Total Practical Hours 30

Course Outcome

CO1: Determine the level of DO in a water sample.
CO2: Identify and estimate the different types of alkalinity in water sample.
CO3: Estimate the acidity of water sample using pH metry.
CO4: Estimate the amount of copper in a brass sample.
CO5: Determine the metal ion content using instrumental methods.

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PROGRAMME	COURSE CODE	NAME OF THE COURSE	L	T	P	C
B.E.	16ME2001	COMPUTER AIDED DRAFTING LABORATORY (COMMON TO AERO, AUTO, MECH & MECHATRONICS)	0	0	4	2

Course Objective
1. To develop skills on using software for preparing 2D Drawings.
2. To provide the importance of computer aided drawing in engineering society.

S.No	Description Of The Experiments	Total Practical Hours

Concepts and Conventions:
Understand the basic idea of software and its features like draw panel, modify panel, line types, creating dimensions, hatching techniques, layer Creations, text styles, and template drawings, use of Blocks, Design Center, Tool Palettes and Plotting.

LIST OF EXERCISES USING DRAFTING SOFTWARE

1	Study of drafting software– Coordinate systems (absolute, relative, polar, etc.) – Creation of simple geometries like polygon and general multi-line figures.
2	Drawing the conic and special curves.
3	Draw the orthographic projections of simple solids like Prism, Pyramid, Cylinder, Cone and its dimensioning.
4	Draw the symbols of fasteners, weld, rivets, bolts nuts and screws.
5	Drawing Isometric projection of simple objects.
6	Draw the orthographic projections of Bush bearing.
7	Draw the orthographic projections of Oldham's coupling.
8	Draw the orthographic projections of cotter joint.
9	Draw the orthographic projections of simple gate valve.
10	Draw the Plan and Elevation of simple Residential Building.
	Total Instructional Hours **45**

Course Outcome
The outcome of the course are:
CO1: The students shall be able to use the software package for drafting
CO2: The students shall be able to create 2D Drawing of Engineering Components
CO3: The students shall be able to apply basic concepts to develop construction drawing techniques

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PROGRAMME	COURSE CODE	NAME OF THE COURSE	L	T	P	C
B.E.	16GE2001	VALUE ADDED COURSE-II LANGUAGE COMPETENCY ENHANCEMENT COURSE (COMMON TO ALL BRANCHES)	0	0	2	1

Topic No.	Description of the Experiments
1.	A HANDS ON INTRODUCTION TO ENG.SIMULATIONS
2.	INTRODUCTION STEEL
3.	ENTERPRENUER DEVELOPMENT
4.	DRINKING WATER TREATMENT
5.	MECHANICAL BEHAVIOUR OF MATERIALS (LINEAR ELASTIC
6.	FASCINATING WORLD OF ROBOTS AND ROBOTICS
	Total Marks 100

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SYLLABUS

SEMESTER III

Programme	Course Code	Name of the Course	L	T	P	C
B.E.	16MA3103	FOURIER ANALYSIS AND STATISTICS (COMMON TO AERO, AUTO, MECH, EEE AND E&I)	3	1	0	4

Course Objective

1. Introduce Fourier series analysis which is central to many applications in engineering.
2. Solve boundary value problems by applying Fourier series.
3. Acquaint with Fourier transform techniques used in wide variety of situations.
4. Provide the necessary basic concepts of some statistical methods.
5. Manipulate different kinds of problems occurring in engineering and technology by applying the design of experiments

Unit	Description	Instructional Hours
I	**FOURIER SERIES** Dirichlet's conditions- General Fourier Series – Odd and Even Functions – Half range sine and cosine series – Change of Interval - Parseval's Identity - Harmonic analysis. A spring -mass system deriven by an alterating square force. A series circuit with a sqaure –wave voltage, power delievered by a periodic current and modelling radiation intensity..	12
II	**BOUNDARY VALUE PROBLEMS** Classification – solution of one dimensional wave equation – one dimensional heat equation – steady state solutions of two dimensional heat equations (excluding insulated edges) - Fourier series solution in Cartesian coordinates.	12
III	**FOURIER TRANSFORMS** Fourier Transform Pairs - Fourier sine and cosine transforms – Properties - Transforms of Simple functions – Convolution Theorem – Parseval's identity.	12
IV	**TESTING OF HYPOTHESIS** Large sample test based on Normal distribution for single mean and difference of means - Tests based on t (for single mean and difference of means) - F distribution – for testing difference of variance, Chi – Square test for Contingency table (Test for Independency) – Goodness of fit	12
V	**DESIGN OF EXPERIMENTS** One way and two way classifications - Completely randomized design – Randomized block design – Latin square design.	12
	Total Instructional Hours	**60**

Course Outcome

CO1: Understand the mathematical principles of Fourier series which would provide them the ability to formulate and solve some of the physical problems of engineering.
CO2: Acquire the knowledge of application of Fourier series in solving the heat and wave equations.
CO3: Obtain the knowledge of Fourier transform techniques which extend its applications in Electrical circuit analysis, control system design and signal processing.
CO4: Acquire skills in analyzing statistical methods.
CO5: Have a clear perception of the statistical ideas and demonstrate the applications of these techniques to problems drawn from industry, management and other engineering fields.

TEXT BOOKS:

T1 - Veerarajan. T., "Transforms and Partial Differential Equations", Tata McGraw Hill Education Pvt. Ltd., Second reprint, New Delhi, 2012.
T2 - Gupta, S.C., & Kapoor, V.K., Fundamentals of Mathematical Statistics, Sultan Chand & Sons, Reprint 2011.

REFERENCE BOOKS:

R1 – C.Roy Wylie " Advance Engineering Mathematics" Louis C. Barret, 6th Edition, Mc Graw Hill Education India Private Limited, New Delhi, 2003.
R2 - Kandasamy P., Thilagavathy K. and Gunavathy K.,"Engineering Mathematics Volume III", S.Chand & Company Ltd., New Delhi, 1996.
R3- Walpole. R.E., Myers. R.H., Myers. S.L., and Ye. K., "Probability and Statistics for Engineers and Scientists", 8th Edition, Pearson Education,Asia,2007.

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Programme	Course Code	Name of the Course	L	T	P	C
B.E.	16AE3201	AERO ENGINEERING THERMODYNAMICS	3	0	0	3

Course Objective

6. To provide in-depth study of thermodynamic principles, thermodynamics of state,
7. To teach the basic thermodynamic relations for various equipment's and their flow energy
8. To teach students about properties of pure substances and to analyze the performance of thermodynamic air and vapour power cycles.
9. To teach performance calculation of refrigeration systems.
10. To enlighten the basic concepts of propulsion cycles.

Unit	Description	Instructional Hours
I	**INTRODUCTION TO BASIC CONCEPTS AND FIRST LAW** Concept of continuum, macroscopic approach, thermodynamic systems - closed, open and isolated. Property, State, Path and Process, Quasi-static Process, Work, modes of work, Zeroth law of thermodynamics - concept of temperature and heat, internal energy, specific heat capacities, enthalpy - concept of ideal and real gases. First law of thermodynamics - applications to closed and open systems - steady flow processes with reference to various thermal equipment's.	9
II	**SECOND LAW AND ENTROPY** Second law of thermodynamics - Kelvin Planck and Clausius statements of second law. Reversibility and Irreversibility - Carnot theorem, Carnot cycle efficiency - thermodynamic temperature scale - Clausius inequality, concept of entropy, entropy of ideal gas, principle of increase of entropy.	8
III	**POWER CYCLES** Otto, Diesel, Dual and Brayton cycles - air standard efficiency - mean effective pressure. Properties of pure substances - thermodynamic properties of pure substances in solid, liquid and vapour phases, phase rule, P-V, P-T, T-V, T -S, H-S diagrams, PVT surfaces, thermodynamic properties of steam - calculations of work done and heat transfer in non-flow and flow processes - standard Rankine cycle	10
IV	**REFRIGERATION AND AIR CONDITIONING** Reversed Carnot cycle - COP - principles of refrigeration, air conditioning - heat pumps - vapour compression - vapour absorption types - coefficient of performance, properties of refrigerants.	9
V	**BASICS OF PROPULSION** Classification of jet engines - simple jet propulsion system - thrust equation - specific impulse - ideal and non-ideal cycle analysis - Introduction to rocket propulsion.	9
	Total Instructional Hours	**45**

Course Outcome

CO1: Demonstrate an understanding of the concepts such as conservation of mass, conservation of energy, work interaction, heat transfer and first law of thermodynamics.
CO2: Apply the concept of second law to design simple systems and critically analyse the problem of energy flow in various systems.
CO3: Analyze the performance of gas and vapor power cycles and identify methods to improve thermodynamic performance.
CO4: Able to perform the thermodynamic performance analysis in varied refrigeration conditions.
CO5: Apply the thermodynamic principles and laws on the propulsion systems.

TEXT BOOKS:

BOOKS:

T1 - Nag.P.K., "Engineering Thermodynamics", Tata McGraw-Hill, New Delhi, 2007.
T2 - Rathakrishnan E., "Fundamentals of Engineering Thermodynamics", Prentice-Hall India, 2005.

REFERENCE BOOKS:

R1 - Ramalingam K.K. "Thermodynamics", Sci-Tech Publications, 2006
R2 - Yunus A.Cengal. "Thermodynamics an Engineering Approach", Tata McGraw-Hill Co. Ltd., 3rd Edition, 2002.
R3 - Arora C.P, "Thermodynamics", Tata McGraw-Hill, New Delhi, 2003.

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Programme	Course Code	Name of the Course	L	T	P	C
B.E.	16AE3202	SOLID MECHANICS	3	0	0	3

Course Objective

1. To introduce various behaviors of materials and analyze the structural components under axial loading conditions.
2. To Sketch the Shear Force and bending moment diagram for beams with various loadings.
3. To calculate the deflections of the beams under various loading conditions.
4. To Predict the Buckling Loads of the columns and to analyze the springs.
5. To give brief descriptions on the behavior of materials due to axial, bending and torsional and combined loads.

Unit	Description	Instructional Hours
I	**INTRODUCTION** Definition of stress, strain and their relations – relations between material constants – axial loading - statically determinate and indeterminate problems in tension & compression.	9
II	**STRESSES IN BEAMS** Shear force & bending moment diagrams: bending and shear stress variation in beams of symmetric sections, beams of uniform strength	9
III	**DEFLECTION OF BEAMS** Double integration method – Macaulay's method – moment area method – conjugate beam method – Maxwell's reciprocal theorem - principle of super position	10
IV	**TORSION – SPRINGS – COLUMNS** Torsion of solid and hollow circular shafts – shear stress variation – open and closed-coiled helical springs – stresses in helical springs - classification of columns – Euler buckling – columns with different end conditions.	10
V	**BIAXIAL STRESSES** Stresses in thin-walled pressure vessels – combined loading of circular shaft with bending, torsion and axial loadings – Mohr's circle and its construction – determination of principal stresses.	7
	Total Instructional Hours	**45**

Course Outcome

CO1: Ability to learn the behaviors of materials under axial loading conditions.
CO2: To draw the Shear Force and bending moment diagram for beams with various loadings.
CO3: To analyze the deflections of the beams under various loading conditions.
CO4: Evaluate the springs and to calculate the Buckling Loads of the columns.
CO5: Ability to draw Mohr's circle for materials due to axial, bending and torsional and combined loads.

TEXT BOOKS:

T1 - William Nash, "Strength of Materials", Tata McGraw Hill, 4th edition, 2010.
T2 - Timoshenko,S. and Young, D.H., 'Elements of Strength of Materials', T.Van Nostrand Co. Inc., Princeton, N.J., 1990.

REFERENCE BOOKS:

R1 - Dym,C.L., and Shames,I.H., 'Solid Mechanics', McGraw Hill, Kogakusha, Tokyo, 1973.
R2 - Stephen Timoshenko, 'Strength of Materials', Vol I & II, CBS Publishers and Distributors, Third Edition, 2016.
R3-R C Hibbeler, "Mechanics of materials", Pearson Education Inc Sixth Edition, 2005.

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Programme	Course Code	Name of the Course	L	T	P	C
B.E.	16AE3203	ENGINEERING FLUID MECHANICS	3	0	0	3

Course Objective

1. To be familiar with the fluid properties and flow characteristics
2. To understand the importance of conservation laws to flow through circular conduits.
3. To comprehend the importance of dimensional analysis
4. To examine the performance of Pumps
5. To examine the performance of Turbines

Unit	Description	Instructional Hours
I	**PROPERTIES OF FLUID AND FLOW CHARACTERISTICS** Units and dimensions - Properties of fluids - Continuum, density, viscosity, surface tension, compressibility and bulk modulus, concept of pressure. Flow characteristics - concept of control volume - application of continuity equation, momentum and energy equation.	8
II	**FLOW THROUGH CIRCULAR CONDUITS** Hydraulic and energy gradient - Laminar flow through circular conduits and circular annuli - Boundary layer concepts - types of boundary layer thickness - Darcy Weisbach equation - friction factor - Moody diagram - commercial pipes - minor losses - Flow through pipes in series and parallel..	8
III	**DIMENSIONAL ANALYSIS** Need for dimensional analysis - methods of dimensional analysis - Similitude - types of similitude - Dimensionless parameters - application of dimensionless parameters - Model analysis.	9
IV	**HYDRAULIC PUMPS** Impact of jets - Euler's equation - Theory of roto-dynamic machines - various efficiencies - velocity components at entry and exit of the rotor - velocity triangles - Centrifugal pumps - working principle - work done by the impeller - performance curves - Reciprocating pump - working principle - Rotary pumps - classification.	10
V	**HYDRAULIC TURBINES** Classification of turbines - heads and efficiencies - velocity triangles. Axial, radial and mixed flow turbines. Pelton wheel, Francis turbine and Kaplan turbine - working principles - work done by water on the runner - draft tube. Specific speed - unit quantities - performance curves for turbines - governing of turbines.	10
	Total Instructional Hours	**45**

Course Outcome

CO1: Ability to apply mathematical knowledge to predict the properties and characteristics of a fluid.
CO2: Capacity in working with the conservative laws and flow through circular conduits
CO3: Proficiency in Dimensional Analysis
CO4: Capability to analyze the performance of pumps
CO5: Aptitude to evaluate the performance of turbines

TEXT BOOKS:

T1 - R. K. Bansal, "Fluid Mechanics and Hydraulics Machines", 5th Edition, Laxmi Publications Ltd., New Delhi, 2005.
T2 - Modi P.N. and Seth, S.M. "Hydraulics and Fluid Mechanics", Standard Book House, New Delhi 2004.

REFERENCE BOOKS:

R1 - Robert W.Fox, Alan T. McDonald, Philip J.Pritchard, "Fluid Mechanics and Machinery", 2011.
R2 - Kumar K. L., "Engineering Fluid Mechanics", Eurasia Publishing House(p) Ltd., New Delhi 2004
R3 - Graebel. W.P, "Engineering Fluid Mechanics", Taylor & Francis, Indian Reprint, 2011

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Programme	Course Code	Name of the Course	L	T	P	C
B.E.	16AE3204	ELEMENTS OF AERONAUTICS	3	0	0	3

Course Objective

1. To introduce the concepts of flying and history of aeronautics and to identify the different components of an aircraft
2. To understand the structure of atmosphere and concept of flight mechanics
3. To know about the various systems and instruments used in aircraft
4. To identify and learn about the basic principles of power plants used in airplanes.
5. To comprehend the various material used in aircraft.

Unit	Description	Instructional Hours
I	**INTRODUCTION** Introduction - Balloon flight – ornithopters - biplanes and monoplanes, Early Airplanes- Pre Wright Brothers era, Wright Flyer, developments in aerodynamics, materials, structures and propulsion over the years. Components of an Airplane and their functions. Components of a rotorcraft and their functions.	9
II	**BASICS OF FLIGHT MECHANICS** Physical properties and structure of the atmosphere, temperature, pressure and altitude relationships, Newton's law of motions applied to aeronautics, Evolution of Lift, Drag and Moment., typical wing plan forms, aerodynamic characteristics of Airfoils, concept of boundary layer, Mach Number, Maneuvers.	9
III	**AIRCRAFT CONFIGURATIONS** Different Types of Flight Vehicles, Classifications. Introduction to stability and control- purpose of controls - Conventional Control, Powered Controls. Typical Systems for control Actuation, basic Instruments for flying. Introduction to Rotorcraft, UAV and MAVs.	9
IV	**AIRCRAFT PROPULSION** Basic Ideas about Air breathing and non-air breathing propulsion – working principle of Piston engine, gas turbine engines and RAM Jet and SCRAM jet Engines - Use of Propeller and Jets for Thrust Production. Comparative Merits - Principles of Operation of Rocket - Types of Rocket and typical applications,	10
V	**AIRCRAFT STRUCTURES AND MATERIALS, AIRWORTHINESS** General Types of Construction, Monocoque, Semi monocoque and Geodesic Construction, Typical Wing and Fuselage Structure. Different materials from wood to super alloys for airplane and engine applications. Materials for space vehicles, FRP materials. Airplane design, type certification and airworthiness certificate,	8
	Total Instructional Hours	**45**

Course Outcome

1: Able to Identify the component of Flight and familiarize withy the history of aviation
2: To perform basic performance calculation of flight mechanics
3: Ability to choose the suitable systems and to measure various flying conditions in aircraft
CO4: Apply the thermodynamic principles to study the performances of different power plants used in aircraft
CO5:Ability to identify the suitable materials for different parts of aircraft

TEXT BOOKS:

T1 - Anderson, J.D., "Introduction to flight", 5th edition, McGraw Hill, 2005
T2 - A.C. Kermode, "Flight without formulae", Pearson education, 5th edition, 2010.

REFERENCE BOOKS:

R1 - Kroes et Aircraft Maintenance and Repair al, 7th edition, McGraw Hill, 2013.
R2 - George P. Sutton and Oscar Biblarz, Rocket Propulsion Elements, 7th edition, John Wiley& Sons, Inc., New York, 2001.
R3 - Houghton, E.L., and Caruthers, N.B., "Aerodynamics for Engineering students", 5th edition, Butterworth-Heinemann Publishers, London, 2003.

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Programme	Course Code	Name of the Course	L	T	P	C
B.E.	16AE3205	AIRCRAFT SYSTEMS AND INSTRUMENTS	3	0	0	3

Course Objective

1. To impart knowledge of the hydraulic and pneumatic systems components
2. To impart knowledge on operation of airplane control system
3. To know the various systems in an aircraft Engine
4. To enumerate the air-conditioning system in an airplane
5. To identify the types of instruments and its operation including navigational instruments to the students

Unit	Description	Instructional Hours
I	**CONVENTIONAL AIRCRAFT SYSTEMS** Hydraulic systems – components – hydraulic systems controllers – modes of operation – pneumatic systems – working principles – brake system – components, landing gear systems – classification – shock absorbers – retractive mechanism.	8
II	**AIRPLANE CONTROL SYSTEMS** Conventional Systems – power assisted and fully powered flight controls – power actuated systems – engine control systems -Full Authority Digital Engine Control (FADEC) system.– modern control systems – digital fly by wire systems – auto pilot system-Advanced flight control systems.	11
III	**ENGINE SYSTEMS** Fuel systems – piston and jet engines – components - multi-engine fuel systems, lubricating systems - piston and jet engines – engine starting system-Main and After burner fuel control systems.	8
IV	**AIRCONDITIONING AND PRESSURIZING SYSTEM** Basic evaporative air cycle systems – evaporative vapour cycle systems, boot-strap air cycle system – oxygen systems – fire protection systems, deicing and anti icing system.	8
V	**AIRCRAFT INSTRUMENTS** Flight instruments, Navigation and Communication instruments, Gyroscope, Accelerometers, Airspeed indicator, Mach meter, Electronic horizontal situation indicator, Horizontal situation indicator, Multi-Function Display, Attitude director indicator, Primary Flight Display, Engine instruments and display – Operation and principles, Flight Data Recorder (FDR), Cockpit Voice Recorder (CVR).	10
	Total Instructional Hours	**45**

Course Outcome

CO1: Understand the components of airplane systems.
CO2: Knowledge on operation of airplane control system.
CO3: Identify the various systems in an aircraft Engine.
CO4: Understand the operation of air conditioning and pressing system.
CO5: Know the operation of air data instruments system.

TEXT BOOKS:

T1 - Mekinley, J.L. and R.D. Bent, "Aircraft Power Plants", McGraw Hill 1993.
T2 - Pallet, E.H.J, "Aircraft Instruments & Principles", Pitman & Co 1993.

REFERENCE BOOKS :

R1 - Treager, S., "Gas Turbine Technology", McGraw Hill 1997.
R2 - Mckinley, J.L. and Bent R.D. "Aircraft Maintenance & Repair", McGraw Hill,1993.
R3 - Handbooks of Airframe and Power plant Mechanics, US dept. of Transportation, Federal, Aviation Administration, The English Book Store, New Delhi, 1995.

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Programme	Course Code	Name of the Course	L	T	P	C
B.E.	16AE3001	FLUID MECHANICS AND THERMODYNAMICS LAB	0	0	4	2

Course Objective

1. Upon Completion of this subject, the students can able to have hands on experience in flow measurements using different devices and also perform calculation related to losses in pipes and also perform characteristic study of pumps and turbines
2. To enhance the basic knowledge in basic thermodynamics, heat transfer and Refrigeration systems
3. To provide the basic knowledge about the refrigeration systems

Expt. No.	Description of the Experiments
1.	Determination of the Coefficient of discharge of given Orifice/Venturi meter.
2.	Calculation of the rate of flow using Water/Rota meter.
3.	Determination of friction factor for a given set of pipes.
4.	Conducting experiments and drawing the characteristic curves for the given pump
5.	Conducting experiments and drawing the characteristic curves for the given turbine.
6.	Valve timing of a 4 – stroke engine and port timing of a 2 stroke engine
7.	Determination of thermal conductivity of solid.
8.	Determination of thermal resistance of a composite wall
9.	COP test on a vapour compression refrigeration test rig
10.	COP test on a vapour compression air-conditioning test rig

Total Practical Hours 45

Course Outcome

CO1: Ability to use the measurement equipment for flow measurement
CO2: Carryout Performance trust on different fluid machinery
CO3: Exposure to the characteristics of Pumps and Turbines
CO4: Ability to perform tests on petrol/ diesel engines.
)5: Able to do performance test in the Refrigeration systems

List of Equipment (for a batch of 30 students)

Sl.No.	Name of the Equipment	Qty.
1	Orifice/Venturi meter.	1
2	Water/Rota meter.	1
3	Pipe Flow analysis setup	1
4	Centrifugal/ Submergible/ Reciprocating/ Gear pump	1
5	Pelton wheel/ Francis/ Kaplan turbine setup	1
6	Cut section model of 4 stroke diesel engine and cut section model of 2 stroke petrol engine	1
7	Conductive heat transfer set up	1
8	Composite wall	1
9	Vapour compression refrigeration test rig	1
10	Vapour compression air-conditioning test rig	1

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Programme	Course Code	Name of the Course	L	T	P	C
B.E.	16AE3002	AIRCRAFT COMPONENT DRAWING LABORATORY	0	0	4	2

Course Objective

1. To design and draft the different aircraft components.
2. To design and draft the different control components.
3. To draw the three different views of a typical aircraft.

Expt. No.	Description of the Experiments
1.	Layout of simple structural components.
2.	Layout of typical wing structure.
3.	Layout of typical fuselage structure.
4.	Layout of landing gear structure
5.	Layout of aircraft control system.
6.	Modelling and drafting control components of cam.
7.	Modelling and drafting control components of bell crank.
8.	Modelling and drafting control components of gear.
9.	Modelling and drafting control components of push pull rod.
10.	Drafting three views of a typical aircraft.

Total Practical Hours 45

Course Outcome

CO1: To draft the design of control components in the aircraft.
CO2: To draft the primary structures of aircraft.
CO3: To design and draft various aircraft components in control system.
CO4: To draft the complete structure of aircraft in three different views.
CO5: To understand the working of all the control components.

List of Equipment (for a batch of 30 students)

Sl.No.	Name of the Equipment	Quantity
1	Computer Nodes	30
2	Modeling Software	30 licenses
3	UPS	1

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SEMESTER – IV

Programme	Course Code	Name of the Course	L	T	P	C
B.E.	16MA4107	NUMERICAL METHODS	3	1	0	4

(COMMON TO AERO, AUTO, MECH, EEE &EIE)

Course Objective

Solve algebraic, transcendental and system of linear equations by using various techniques.
Apply various methods to find the intermediate values for the given data.
Be familiar with the concepts of numerical differentiation and integration of the unknown functions.
Understand the concept of solving Ordinary Differential Equations by applying single and multi step methods.
5. Appraise the methods introduced in the solution of ordinary differential equations and partial differential equations.

Unit	Description	Instructional Hours
I	**SOLUTION OF ALGEBRAIC AND TRANSCENDENTAL EQUATIONS** Solution of equation – Fixed point iteration : x = g(x) method – Newton-Raphson method – Solution of linear system by Gauss Elimination and Gauss Jordan method – Iterative method : Gauss seidel method.	12
II	**INTERPOLATION** Interpolation: Newton's forward and backward difference formulae – Lagrangian interpolation for unequal intervals – Divided difference for unequal intervals : Newton's divided difference formula.	12
III	**NUMERICAL DIFFERENTIATION AND INTEGRATION** Differentiation using interpolation formula – Newton's forward and backward interpolation formulae for equal intervals – Newton's divided difference formula for unequal intervals - Numerical integration by Trapezoidal and Simpson's 1/3 and 3/8 rules – Romberg's method – Double integration using Trapezoidal and Simpson's rules	12
IV	**INITIAL VALUE PROBLEMS FOR ORDINARY DIFFERENTIAL EQUATIONS** Single step methods: Taylor's series method – Euler and Modified Euler methods for first order equation – Fourth order Runge- kutta method for solving first order equations – Multi step method: Milne's predictor and corrector method and Adam – Bash forth predictor corrector method.	12
V	**BOUNDARY VALUE PROBLEMS IN ORDINARY AND PARTIAL DIFFERENTIAL EQUATIONS** Finite difference solution of second order ordinary differential equation – Finite difference solution of one dimensional heat equation by explicit and implicit methods – One dimensional Wave equation – Two dimensional Heat equations – Laplace and Poisson Equations.	12
	Total Instructional Hours	**60**

Course Outcome

CO1: Solve the system of linear algebraic equations representing steady state models and non linear equations arising in the field of engineering.
CO2: Understand the concept of interpolation in both cases of equal and unequal intervals.
CO3: Express the information from discrete data set through numerical differentiation and summary information through numerical integration.
CO4: Classify and solve ordinary differential equations by using single and multi step methods.
CO5: Acquire knowledge of finding the solution of ordinary and partial differential equations which are useful in attempting any engineering problem.

TEXT BOOKS:

T1 - Sankara Rao K, "Numerical Methods for Scientists and Engineers", 3rd edition, Prentice Hall of India Private limited, New Delhi.2007..
T2 – M.K.Jain, S.R.K.Iyengar, R.K.Jain "Numerical Methods for Scientific and Computation", Fifth Edition., New age International Publishers 2010.

REFERENCE BOOKS:

R1 - Kreyszig.E. "Advanced Engineering Mathematics", Eight Edition, John Wiley and sons (Asia) limited.
R2 - Grewal B.S. and Grewal J.S. " Numerical Methods in Engineering and Science ", 6th Edition , Khanna publishers, New Delhi 2004.
R3 - S.K.Gupta, Numerical Methods for Engineers" , New Age Internationalm Pvt.Ltd Publishers,2015.

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Programme	Course Code	Name of the Course	L	T	P	C
B.E.	16AE4201	AERODYNAMICS	3	0	0	3

Course Objective

1. To provide accumulated knowledge of fluid mechanics.
2. To provide the mathematical understanding of basic flows and their combinations.
3. To demonstrate a fundamental understanding of fluid mechanics applicable to flight, and the forces and moments on airfoil and its conformal transformation.
4. To apply the aerodynamic tools to develop the three dimensional wing and study aerodynamic behavior.
5. To understand the behavior of airflow over bodies with particular emphasis on airfoil sections in the incompressible flow regime.

Unit	Description	Instructional Hours
I	**REVIEW OF BASIC FLUID MECHANICS** Continuity, momentum and energy equations-Differential and Integral forms	6
II	**TWO DIMENSIONAL FLOWS AND GENERATION OF LIFT** Basic flows – Source, Sink, Free and Forced vortex, uniform parallel flow. Their combinations, Pressure and velocity distributions on bodies with and without circulation in ideal and real fluid flows Kutta Joukowski's theorem, Kutta condition.	12
III	**CONFORMAL TRANSFORMATION AND AIRFOIL THEORY** Cauchy-Riemann relations, complex potential, methodology of conformal transformation, Kutta-Joukowski transformation and its applications. Thin airfoil theory and its applications.	11
IV	**SUBSONIC WING THEORY** Vortex filament, Biot and Savart law, bound vortex and trailing vortex, horse shoe vortex, lifting line theory and its limitations.	8
V	**INTRODUCTION TO BOUNDARY LAYER** Newton's law of viscosity, Boundary Layer, Navier-Stokes equation, displacement, Momentum thickness, Flow over a flat plate, Blasius solution.	8
	Total Instructional Hours	**45**

Course Outcome

CO1: To apply governing equation to various fluid flow models
CO2: Able to apply the knowledge of basic flows to the various bodies in the atmosphere for the generation of lift.
CO3: Able to solve the aerodynamic problems associated with the airfoils and the transformation.
CO4: Able to simulate wings with help of aerodynamic tools for various ambient conditions
CO5: Knowledge on incompressible flow and viscous flow.

TEXT BOOKS:

T1 - Houghton, E.L., and Caruthers, N.B., "Aerodynamics for Engineering students", Edward Arnold Publishers Ltd., London, 1982.
T2 - Anderson, J.D., "Fundamentals of Aerodynamics", McGraw Hill Book Co., 6th edition, 2016.

REFERENCE BOOKS:

R1 - John J Bertin., "Aerodynamics for Engineers", Pearson Education Inc, 2002
R2 - Clancey, L J.," Aerodynamics", Pitman, 1986
R3 - Milne Thomson, L.H., "Theoretical aerodynamics", Macmillan, 2007.

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Programme	Course Code	Name of the Course	L	T	P	C
B.E.	16AE4202	MECHANICS OF MACHINES (COMMON TO AERO, AUTO)	3	1	0	4

Course Objective

1. To know different types of inversions in the mechanisms.
2. Study about the working principle gear and gear applications.
3. To know the frictional forces acting and how to resolve the friction.
4. Students should analyze the forces acting on various members in a mechanism.
5. To know the importance of balancing and vibration acting on systems.

Unit	Description	Instructional Hours
I	**KINEMATIC OF MECHANICS** Mechanisms – Terminology and definitions – kinematics inversions of 4 bar and slide crank chain – cams – classifications – displacement diagrams - layout of plate cam profiles – derivatives of followers motion – circular arc and tangent cams.	13
II	**GEARS AND GEAR TRAINS** Spur gear – law of toothed gearing – involute gearing – Interchangeable gears – Gear tooth action interference and undercutting – nonstandard teeth – gear trains – parallel axis gears trains – Epicyclic gear trains – automotive transmission gear trains.	12
III	**FRICTION** Sliding and Rolling Friction angle – friction in threads – Friction Drives – Friction clutches – Belt and rope drives – brakes – Tractive resistance.	11
IV	**FORCE ANALYSIS** Applied and Constrained Forces – Free body diagrams – static Equilibrium conditions – Two, Three and four members – Static Force analysis in simple machine members. Dynamic Force Analysis – Inertia Forces and Inertia Torque – Alembert's principle – Superposition principle – Dynamic Force Analysis in simple machine members.	12
V	**BALANCING AND VIBRATION** Static and Dynamic balancing – Balancing of revolving and reciprocating masses – Balancing machines. Free vibrations – Equations of motion – natural Frequency – Damped Vibration – bending critical speed of simple shaft – Torsional vibration – Forced vibration – harmonic Forcing – Vibration isolation.	12
	Total Instructional Hours	**60**

Course Outcome

CO1. Upon completion of this course, the students can design various mechanical components.
CO2. Students have the knowledge on gears and gear trains.
CO3. Students are able to utilize the frictional force into effect.
CO4. Students can analyze the forces acting on the mechanism.
CO5. Students are having the ability to balance the forces and vibration in a machine.

TEXT BOOKS:

T1 - Ambekar A.G., "Mechanism and Machine Theory" Prentice Hall of India, New Delhi, 2007.
T2 - Shigley J.E., Pennock G.R and Uicker J.J., "Theory of Machines and Mechanisms", Oxford University Press, 2003.

REFERENCE BOOKS:

R1 - Ghosh.A, and A.K.Mallick, "Theory and Machine", Affiliated East-West Pvt. Ltd., New Delhi, 1988.
R2 - Ramamurthi. V, "Mechanisms of Machine", Narosa Publishing House, 2002.
R3 - Robert L. Norton, "Design of Machinery", McGraw-Hill, 2004.

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Programme	Course Code	Name of the Course	L	T	P	C
B.E.	16AE4203	GAS TURBINE PROPULSION	3	0	0	3

Course Objective

1. To know the fundamentals of gas turbines and its components
2. To learn about the design and performance of inlets
3. To familiarize with the design and performance characteristics of combustion chamber
4. To understand the design and performance of various aircraft nozzles
5. To teach about the blade design and performance characteristics of different types of compressors

Unit	Description	Instructional Hours
I	**FUNDAMENTALS OF GAS TURBINE ENGINES** Illustration of working of gas turbine engine - Thrust equation - Factors affecting thrust. Effect of pressure, velocity and temperature changes of air entering compressor. Methods of thrust augmentation. Characteristics of turboprop, turbofan, turbojet and turbo shaft engines - Performance characteristics- Numerical Problems.	9
II	**SUBSONIC AND SUPERSONIC INLETS FOR JET ENGINES** Internal flow and Stall in subsonic inlets - Boundary layer separation - Major features of external flow near a subsonic inlet - Relation between minimum area ratio and external deceleration ratio - Diffuser performance - Supersonic inlets - Starting problem on supersonic inlets - Shock swallowing by area variation - External declaration - Modes of inlet operation.	9
III	**COMBUSTION CHAMBERS FOR JET ENGINES** Introduction to combustion Chemistry- Classification of Gas turbine combustion chambers - Important factors affecting combustion chamber design - Combustion process - Combustion chamber performance - Effect of operating variables on performance - Flame tube cooling - Flame stabilization - Use of flame holders.	7
IV	**COMPRESSORS FOR JET ENGINES** Principle of operation of centrifugal compressor - Work done and pressure rise - Velocity diagrams - Diffuser vane design considerations - Concept of prewhirl - Rotation stall - Elementary theory of axial flow compressor - Velocity triangles - Degree of reaction - Three dimensional - Air angle distributions for free vortex and constant reaction design - Compressor blade design - Centrifugal and axial compressor performance characteristics.	10
V	**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.	10
	Total Instructional Hours	**45**

Course Outcome

CO1: Analyze thermodynamics of an aircraft jet engine and calculate the performance measures, such as thrust and specific fuel consumption in terms of design requirement.
CO2: Apply the knowledge to design suitable inlets for aircraft at different conditions
CO3: Ability to choose suitable combustion chamber for various aircraft.
CO4: Ability to design various nozzles and do performance calculations
CO5: Evaluate the operating characteristics of compressors and turbines in terms of given blade shapes, angles, and direction of rotation.

TEXT BOOKS:

T1 - Hill, P.G. & Peterson, C.R. "Mechanics & Thermodynamics of Propulsion" Addison - Wesley Longman INC, 1999.
T2 - Cohen, H. Rogers, G.F.C. and Saravanamuttoo, H.I.H. "Gas Turbine Theory", Longman,5th edition, 2001.

REFERENCE BOOKS:

R1 - Oates, G.C., "Aero thermodynamics of Aircraft Engine Components", AIAA Education Series, New York, 1985.
R2 - Mathur, M.L. and Sharma, R.P., "Gas Turbine, Jet and Rocket Propulsion", 2nd edition, Standard Publishers & Distributors, Delhi, 2008.
R3 - Gorden, C. V., "Aerothermodynamics of Gas Turbine & Rocket Propulsion", AIAA Education Series, New York, 1997

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Programme	Course Code	Name of the Course	L	T	P	C
B.E.	16AE4204	AIRCRAFT STRENGTH OF MATERIALS	3	1	0	4

Course Objective

1. To know the theoretical and methodological approaches to the static analysis of determinate and indeterminate aircraft structural components.
2. To familiarize with different types of beams subjected to various types of loading and support conditions.
3. To analyze the stability of column and determine critical buckling loads for various end conditions.
4. To know about the different failure criteria for engineering materials.
5. To develop the knowledge of induced stresses on the aircraft structural components.

Unit	Description	Instructional Hours
I	**STATICALLY DETERMINATE & INDETERMINATE STRUCTURES** Plane truss analysis – method of joints – method of sections – Clapeyron's 3 moment equation and moment distribution method for indeterminate beams.	12
II	**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 beams & trusses.	13
III	**COLUMNS** Euler's column curve – inelastic buckling – effect of initial curvature – the Southwell plot – columns with eccentricity – theory of beam columns – beam columns with different end conditions – stresses in beam columns.	13
IV	**FAILURE THEORIES** Maximum principal stress theory - maximum principal strain theory - maximum shear stress theory - distortion energy theory – octahedral shear stress theory.	12
V	**INDUCED STRESSES** Thermal stresses – impact loading – Fatigue – Creep - Stress Relaxation - Factors affecting Stress Relaxation and Creep.	10
	Total Instructional Hours	**60**

Course Outcome

CO1: Ability to analysis the forces on beams, trusses under various types of loading and support conditions.
CO2: Ability to calculate deflection and forces for statically determinate and indeterminate aircraft structural components.
CO3: Ability to understand the stability of the column used as aircraft component.
CO4: Ability to design the aircraft structural component using different theories of failure.
CO5: Ability to describe the effects of induced stresses and how this is managed in an aging of aircraft.

TEXT BOOKS:

T1 - Timoshenko and Gere, "Mechanics of Materials", Tata McGraw Hill, 1993.
T2 - Megson T M G, "Aircraft Structures for Engineering students" Elsevier Science and Technology, 2007

REFERENCE BOOKS:

R1 - Donaldson, B.K., "Analysis of Aircraft Structures - An Introduction", McGraw Hill, 1993.
R2 - Peery, D.J. and Azar,J.J., "Aircraft Structures", 2nd Edition, McGraw – Hill, N.Y, 1999.
R3 - Bruhn E F, "Analysis and Design of Flight Vehicle Structures", Tri-State Off-set Company, USA, 1985.

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Programme	Course Code	Name of the Course	L	T	P	C
B.E.	16EI4231	CONTROL ENGINEERING	3	0	0	3

Course Objective

1. State the basic elements of control systems and their transfer function models.
2. Describe the methods of representing and construction of control system components.
3. Discuss time response system analysis.
4. Establish methods of stability analysis and Frequency domain specifications.
5. Outline discrete and sampled data control systems.

Unit	Description	Instructional Hours
I	**INTRODUCTION TO CONTROL SYSTEMS** Historical review of control system – Basic elements in control system – Simple Pneumatic, Hydraulic and Thermal systems – Transfer Function models – Mechanical Translational, Rotational systems – Analogies –mechanical and electrical analogous systems – Development of flight control systems, AFCS.	9
II	**OPEN AND CLOSED LOOP SYSTEMS** Feedback control systems – Control system components – Open and Closed loop system – Block diagram representation of control systems, Reduction of block diagrams, Signal flow graphs – Construction– Mason's Gain Formula.	9
III	**TIME RESPONSE ANALYSIS** Laplace transformation – Standard test signals – Order and Type of a system – impulse, step response of first order systems – second order system (under damped and critically damped) –Time domain specifications – Controllers: P,PI,PID – steady state errors and error constants.	9
IV	**STABILITY AND FREQUENCY RESPONSE ANALYSIS** Necessary and sufficient conditions, Routh Array, Routh – Hurwitz criteria – relative stability, Frequency response – advantages – Frequency domain specifications, Types – Root locus and Bode techniques.	9
V	**SAMPLED AND DIGITAL CONTROL SYSTEMS** Z-Transforms, properties – sampled data control systems – sampling process – ZOH and First order Hold – mapping between S and Z planes. Introduction to digital control system, Digital Controllers and Discrete PID controllers – Positional and Velocity Algorithm.	9
	Total Instructional Hours	**45**

Course Outcome

CO1: Apply the knowledge for modeling of mechanical and electrical control systems.
CO2: Represent the control system components and reduce them.
CO3: Deduct the different order systems with various inputs and their response.
CO4: Investigate the open and closed loop control systems stability and frequency specifications.
CO5: Analyze sampled and discrete control systems for Aircraft control.

TEXT BOOKS:

T1 - Katsuhiko Ogata, "Modern Control Engineering", Prentice-Hall of India Pvt. Ltd., New Delhi, 1998.
T2 - M.Gopal, "Control Systems: Principles and Design", Tata McGraw-Hill Education, 2002.

REFERENCE BOOKS:

R1 - Houpis, C.H. and Lamont, G.B. "Digital Control Systems", McGraw Hill Book Co.,New York,U.S.A.1995.
R2 – A.Nagoor Kani, "Control Systems Engineerig", RBA Publications,Second Edition, 2012.
R3 - Pallet, E.H.J. "Automatic Flight Control", Shroff Publishers, India, 2004.

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Programme	Course Code	Name of the Course	L	T	P	C
B.E.	16AE4001	AERODYNAMICS LABORATORY	0	0	4	2

Course Objective

1. To study Pressure distribution around different profiles
2. To measure Force around Airfoils
3. To visualize flow over a structure

Expt. No.	Description of the Experiments
1.	Study of subsonic wind tunnel
2.	Calibration of a subsonic Wind tunnel.
3.	Determination of lift for the given airfoil section.
4.	Pressure distribution over a rough circular cylinder.
5.	Pressure distribution over a smooth circular cylinder.
6.	Pressure distribution over symmetric airfoil.
7.	Pressure distribution over cambered airfoil.
8.	Smoke flow visualization studies in subsonic flows.
9.	Water flow visualization studies in subsonic flows using water flow channels
10.	Force measurement on an airfoil using blower balance for small aspect ratio models

Total Practical Hours 45

Course Outcome

CO1: An exposure in the calibration of Wind Tunnel
CO2: Ability to measure force around Airfoils
CO3: Ability to measure force for small Aspect ratio models
CO4: Expertise in study of pressure around different profiles
CO5: Visualize flow using Smoke and water channel

List of Equipment (for a batch of 30 students)

Sl. No.	Name of the Equipment	Quantity
1	Subsonic Wind tunnel	1
2	Models (aerofoil, rough and smooth cylinder, small aspect ratio models)	1 each
3	Blower balance	1
4	Water flow channel	1

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Programme	Course Code	Name of the Course	L	T	P	C
B.E.	16AE4002	AIRCRAFT STRENGTH OF MATERIALS LABORATORY	0	0	4	2

Course Objective

1. To study the properties of materials used in Aircraft structure.
2. To study the failure of different component under different loading condition.
3. Study to improve the hardness of the materials.

Expt. No.	Description of the Experiments
1.	Tension test on mild steel rod.
2.	Double shear test on mild steel and Aluminium rods.
3.	Torsion test on mild steel rod.
4.	Impact test on metal specimen.
5.	Hardness test on metals -Brinell and Rockwell Hardness Number
6.	Compression test on helical spring.
7.	Tempering – Improvement Mechanical properties comparison i) Unhardened specimen ii) Quenched Specimen iii) Quenched and tempered Specimen.
8.	Deflection of a simply-supported beam and cantilever beam.
9.	Verification of superposition theorem
10.	Verification of Maxwell's reciprocal theorem
11.	Construction of south well plot
12.	Truss analysis.
13.	Determination of Elastic constants for a Composite Flexural Specimen.

Total Practical Hours 45

Course Outcome

CO1: Capability to perform various destructive testing.
CO2: Ability to characteristics materials.
CO3: Capability to improve the hardness of the materials.
CO4: Ability to find the deflection of the beams under various loads
CO5: Ability to validate the strength of materials approach with experimental results.

List of Equipment (for a batch of 30 students)

S.No.	Name of the Equipment	Quantity	Experiment No.
1	400 kN Universal Testing Machine	1	1,2,13
2	Torsion testing machine (60 NM capacity)	1	3
3	Impact testing machine (300 J Capacity)	1	4
4	Brinnel Hardness testing machine	1	5
5	Rockwell Hardness testing machine	1	5
6	Spring Testing Machine for tensile and compressive loads (2500 N)	1	6
7	Metallurgical Microscopes	3	5
8	Muffle Furnace	1	7
9	Beams with weight hangers and dial gauges	6	8,9,10
10	Column set up with dial gauges	1	11
11	Truss model	1	12

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MAPPING OF COURSE OUTCOMES (COs), PROGRAM OUTCOMES (POs) AND PROGRAM SPECIFIC OUTCOME (PSOs)

B. E. AERONAUTICAL ENGINEERING (UG)

Academic Year 2017-2018

REGULATION-2016 (Revised)

SEMESTER-I														
16MA1101-Engineering Mathematics I														
CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	3	2	2	-	-	-	-	-	-	2	2	2
CO2	3	3	3	2	2	-	-	-	-	-	-	2	2	2
CO3	3	3	3	2	2	-	-	-	-	-	-	2	2	2
CO4	3	3	3	2	2	-	-	-	-	-	-	2	2	2
CO5	3	3	3	2	2	-	-	-	-	-	-	2	2	2
AVG	3	3	3	2	2	-	-	-	-	-	-	2	2	2
16PH1101-Engineering Physics														
CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	1	1	2	1	-	-	-	-	-	-	2	2
CO2	3	2	1	1	1	-	-	-	-	-	-	-	2	1
CO3	3	2	1	2	2	1	-	-	-	-	-	-	2	2
CO4	3	2	1	1	2	-	2	-	-	-	-	-	2	1
CO5	3	2	-	1	2	-	-	-	-	-	-	-	2	1
AVG	3	2.2	1	1.2	1.8	1	2	-	-	-	-	-	2	1.4
16CY1101-Engineering Chemistry														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	2	-	2	1	1	-	-	-	-	1	1	1
CO2	3	2	2	-	2	1	-	-	-	-	-	1	1	1
CO3	3	2	2	-	2	1	1	-	-	-	-	1	1	1
CO4	3	2	2	2	2	1	-	-	-	-	-	1	1	1
CO5	3	2	2	2	2	1	1	-	-	-	-	1	1	1
AVG	3	2	2	2	2	1	1	-	-	-	-	1	1	1
16HE1101R- Essential English For Engineers I														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	1	-	-	-	-	1	1	-	-	3	-	1	-	1
CO2	1	1	-	2	-	2	1	-	2	3	-	2	1	1

CO3	1	-	1	-	-	3	-	-	2	3	-	1	-	1
CO4	1	1	1	1	-	1	1	-	2	3	-	2	1	1
CO5	1	-	1	1	-	2	1	-	-	3	-	2	1	1
AVG	1	1	1	1.33	-	1.8	1	-	2	3	-	1.6	1	1
16GE1103 - Problem Solving and Python Programming														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	-	-	2	-	-	-	-	-	-	-	2	2
CO2	3	3	2	-	2	-	-	-	2	-	-	3	3	1
CO3	3	3	2	1	2	-	-	-	2	-	-	3	3	2
CO4	3	3	2	1	2	-	-	-	-	-	-	3	3	1
CO5	3	3	-	-	2	-	-	-	-	2	-	-	2	2
AVG	3	3	2	1	2	-	-	-	2	2	-	3	2.6	1.6
16GE1102-Engineering Graphics														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	2	-	-	-	-	-	-	3	-	1	-	1
CO2	3	2	2	-	-	-	-	-	-	2	-	-	-	1
CO3	3	2	3	-	2	-	-	-	-	2	-	1	-	2
CO4	3	2	3	-	2	-	-	-	-	2	-	-	2	2
CO5	3	2	3	-	2	-	-	-	-	2	-	-	2	2
AVG	3	2	2.6	-	2	-	-	-	-	2.2	-	1	2	1.6
16PS1001-Physical Science Lab - I														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	1	1	2	1	-	-	-	-	-	-	2	2
CO2	3	2	1	1	1	-	-	-	-	-	-	-	2	1
CO3	3	2	1	2	2	1	-	-	-	-	-	-	2	2
CO4	3	2	1	1	2	-	2	-	-	-	-	-	2	1
CO5	3	2	-	1	2	-	-	-	-	-	-	-	2	1
AVG	3	2.2	1	1.2	1.8	1	2	-	-	-	-	-	2	1.4
16GE1004 - Problem Solving and Python Programming Lab														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	-	-	2	-	-	-	-	-	-	-	2	2
CO2	3	3	2	-	2	-	-	-	2	-	-	3	3	1
CO3	3	3	2	1	2	-	-	-	2	-	-	3	3	2
CO4	3	3	2	1	2	-	-	-	-	-	-	3	3	1
CO5	3	3	-	-	2	-	-	-	-	2	-	-	2	2
AVG	3	3	2	1	2	-	-	-	2	2	-	3	2.6	1.6
16GE1002-Engineering Practices Lab														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	2	-	-	-	-	-	-	3	-	1	-	1
CO2	3	2	2	-	-	-	-	-	-	2	-	-	-	1
CO3	3	2	3	-	2	-	-	-	-	2	-	1	-	2
CO4	3	2	3	-	2	-	-	-	-	2	-	-	2	2

CO5	3	2	3	-	2	-	-	-	-	2	-	-	2	2
AVG	3	2	2.6	-	2	-	-	-	-	2.2	-	1	2	1.6
16GE1003- VAC 1 - Language Competency Enhancement course-1														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	1	-	-	-	-	1	1	-	-	3	-	1	-	1
CO2	1	1	-	2	-	2	1	-	2	3	-	2	1	1
CO3	1	-	1	-	-	3	-	-	2	3	-	1	-	1
CO4	1	1	1	1	-	1	1	-	2	3	-	2	1	1
CO5	1	-	1	1	-	2	1	-		3	-	2	1	1
AVG	1	1	1	1.33	-	1.8	1	-	2	3	-	1.6	1	1
SEMESTER-II														
16MA2102-Engineering Mathematics- II														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	3	2	2	-	-	-	-	-	-	2	2	1
CO2	3	3	3	2	2	-	-	-	-	-	-	2	2	1
CO3	3	3	3	2	2	-	-	-	-	-	-	2	2	2
CO4	3	3	3	2	2	-	-	-	-	-	-	2	2	1
CO5	3	3	3	2	2	-	-	-	-	-	-	2	1	2
AVG	3	3	3	2	2	-	-	-	-	-	-	2	1.8	1.4
16PH2102-Physics Of Materials														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	1	1	1	1	-	-	-	-	-	-	2	1
CO2	3	3	1	1	2	-	-	-	-	-	-	-	2	2
CO3	3	2	1	2	2	-	-	-	-	-	-	-	2	3
CO4	3	3	1	2	2	1	-	-	-	-	-	-	2	2
CO5	3	2	2	3	2	1	-	-	-	-	-	-	2	3
AVG	3	2.4	1.2	1.8	1.8	1	-	-	-	-	-	-	2	2.2
16CY2102-Environmental Sciences														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	-	-	-	-	2	3	3	2	-	2	2	2	1
CO2	2	1	1	-	-	2	3	3	2	-	2	2	2	1
CO3	2	0	0	-	-	2	3	3	2	-	2	2	2	1
CO4	2	1	2	-	-	2	3	3	2	-	2	2	2	2
CO5	2	1	2	-	-	2	3	3	2	-	2	2	2	2
AVG	2	0.75	1.25	-	-	2	3	3	2	-	2	2	2	1.4
16HE2102R- Essential English For Engineers-II														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	-	-	-	-	-	-	-	-	1	3	-	-	2	-
CO2	2	2	-	-	-	2	-	-	3	3	-	2	2	2
CO3	2	-	2	-	-	-	-	-	2	3	-	-	2	1
CO4	-	1	-	1	-	-	-	-	1	2	-	2	-	-
CO5	2	1	2	-	1	-	-	-	1	3	-	-	2	2

AVG	2	1.33	2	1	1	2	-	-	1.6	2.8	-	2	2	1.67
16GE2101-Engineering Mechanics														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	1	1	-	1	2	-	-	2	-	2	2	2
CO2	2	3	2	2	-	-	1	-	-	1	-	1	2	2
CO3	3	2	3	2	-	-	-	-	-	-	-	-	1	1
CO4	2	2	2	1	-	-	1	-	-	-	-	1	-	-
CO5	2	2	3	-	-	-	-	-	-	-	-	-	-	-
AVG	2.4	2.4	2.2	1.5	-	1	1.33	-	-	1.5	-	1.33	1.67	1.67
16EE2202-Basics Of Electrical And Electronics														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	1	-	-	-	-	-	-	-	-	1	3	2
CO2	3	3	1	-	-	-	-	-	-	-	-	2	2	2
CO3	2	-	3	-	1	-	-	-	-	-	-	1	3	3
CO4	2	-	3	2	-	-	-	-	-	-	-	1	3	3
CO5	3	-	-	-	2	-	1	-	-	-	-	2	2	1
AVG	2.6	2.5	2	2	1.5	-	1	-	-	-	-	1.4	2.6	2.2
16PS2001-Physical Sciences Lab - II														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	1	1	2	1	-	-	-	-	-	-	2	2
CO2	3	2	1	1	1	-	-	-	-	-	-	-	2	1
CO3	3	2	1	2	2	1	-	-	-	-	-	-	2	2
CO4	3	2	1	1	2	-	2	-	-	-	-	-	2	1
CO5	3	2	-	1	2	-	-	-	-	-	-	-	2	1
AVG	3	2.2	1	1.2	1.8	1	2	-	-	-	-	-	2	1.4
16ME2001-Computer Aided Drafting Lab														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	2	-	-	-	-	-	-	3	-	1	-	1
CO2	3	2	2	-	-	-	-	-	-	2	-	-	-	1
CO3	3	2	3	-	2	-	-	-	-	2	-	1	-	2
CO4	3	2	3	-	2	-	-	-	-	2	-	-	2	2
CO5	3	2	3	-	2	-	-	-	-	2	-	-	2	2
AVG	3	2	2.6	-	2	-	-	-	-	2.2	-	1	2	1.6
16GE2001-VAC 2 - Language Competency Enhancement course-2														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	-	-	-	-	-	-	-	-	1	3	-	-	2	-
CO2	2	2	-	-	-	2	-	-	3	3	-	2	2	2
CO3	2	-	2	-	-	-	-	-	2	3	-	-	2	1
CO4	-	1	-	1	-	-	-	-	1	2	-	2	-	-
CO5	2	1	2	-	1	-	-	-	1	3	-	-	2	2
AVG	2	1.3	2	1	1	2	-	-	1.6	2.8	-	2	2	1.67
SEMESTER-III														

16MA3103-Fourier Analysis and Statistics														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	2	2	1	-	-	-	-	-	-	2	3	2
CO2	3	3	2	2	-	-	-	-	-	-	-	2	3	2
CO3	3	3	2	2	-	-	-	-	-	-	-	2	3	2
CO4	3	3	2	2	-	-	-	-	-	-	-	2	3	2
CO5	3	3	2	2	-	-	-	-	-	-	-	2	3	2
	3	3	2	2	1	-	-	-	-	-	-	2	3	2
16AE3201-Aero Engineering Thermodynamics														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	2	-	-	-	-	-	-	-	-	1	3	2
CO2	3	3	2	-	-	-	1	-	-	-	-	1	3	2
CO3	3	3	2	-	-	-	1	-	-	-	-	1	3	2
CO4	3	3	2	-	-	-	1	-	-	-	-	1	3	2
CO5	3	3	2	-	-	-	1	-	-	-	-	2	3	2
	3	3	2	-	-	-	1	-	-	-	-	1.2	3	2
16AE3202-Solid Mechanics														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	1	-	-	1	1	-	-	-	-	2	3	2
CO2	3	3	1	-	-	1	1	-	-	-	-	2	3	2
CO3	3	3	1	-	-	1	1	-	-	-	-	2	3	2
CO4	3	3	1	-	-	1	1	-	-	-	-	2	3	2
CO5	3	3	1	-	-	1	1	-	-	-	-	2	3	2
	3	3	1	-	-	1	1	-	-	-	-	2	3	2
16AE3203-Engineering Fluid Mechanics														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	-	-	-	-	-	-	-	-	-	2	3	1
CO2	3	2	-	-	-	-	-	-	-	-	-	2	3	1
CO3	3	3	2	2	-	-	-	-	-	-	-	2	3	1
CO4	3	3	2	3	-	-	-	-	-	-	-	2	2	2
CO5	3	3	2	3	-	-	-	-	-	-	-	2	2	2
AVG	3	2.8	2	2.667	-	-	-	-	-	-	-	2	2.6	1.4
16AE3204-Elements of Aeronautics														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	-	-	-	-	-	-	-	-	-	-	-	2	1

CO2	3	-	-	-	-	-	-	-	-	-	-	-	2	1
CO3	3	-	-	-	-	-	-	-	-	-	-	-	2	1
CO4	3	-	-	-	-	-	-	-	-	-	-	-	2	1
CO5	3	-	-	-	-	-	-	-	-	-	-	-	2	1
AVG	3	-	-	-	-	-	-	-	-	-	-	-	2	1
16AE3205-Aircraft Systems and Instruments														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	-	2	-	-	-	-	-	-	-	-	-	3	2
CO2	3	-	2	-	-	-	-	-	-	-	-	-	3	2
CO3	3	-	2	-	-	-	-	-	-	-	-		3	2
CO4	3	-	2	-	-	-	2	-	-	-	-	3	3	2
CO5	3	2	2	-	2	-	-	-	-	-	-	-	3	2
AVG	3	2	2	-	2	-	2	-	-	-	-	3	3	2
16AE3001-Fluid mechanics and Thermodynamics Lab														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	2	3	-	-	-	-	2	-	-	1	3	2
CO2	3	3	3	3	-	-	-	-	2	-	-	2	3	2
CO3	3	3	3	2	-	-	-	-	2	-	-	1	3	2
CO4	3	3	3	2	-	-	-	-	2	-	-	2	3	2
CO5	3	3	3	2	-	-	2	-	2	-	-	1	3	2
AVG	3	3	2.8	2.4	-	-	2	-	2	-	-	1.4	3	2
16AE3002-Aircraft component Drawing Laboratory														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	-	3	2	3	-	-	-	1	2	1	2	2	2
CO2	3	-	3	2	3	-	-	-	1	2	1	2	1	2
CO3	3	-	3	2	2	-	-	-	1	2	1	2	1	2
CO4	3	-	3	2	3	-	-	-	1	2	1	2	1	2
CO5	3	-	3	2	3	-	-	-	1	2	1	2	1	2
AVG	3	-	3	2	2.8	-	-	-	1	2	1	2	1.2	2
SEMESTER-IV														
16MA4107-Numerical Methods														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	2	2	-	-	-	-	-	-	-	2	3	2
CO2	3	3	2	2	-	-	-	-	-	-	-	2	3	2
CO3	3	3	2	2	-	-	-	-	-	-	-	2	3	2

CO4	3	3	2	2	-	-	-	-	-	-	-	2	3	2
CO5	3	3	2	2	-	-	-	-	-	-	-	2	3	2
AVG	3	3	2	2	-	-	-	-	-	-	-	2	3	2
16AE4201-Aerodynamics														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	2	-	-	-	-	-	-	-	-	1	3	2
CO2	3	2	2	2	-	-	-	-	-	-	-	1	3	2
CO3	3	2	2	2	2	-	-	-	-	-	-	2	3	2
CO4	3	2	2	2	2	-	-	-	-	-	-	2	3	2
CO5	2	2	-	-	-	-	-	-	-	-	-	1	2	1
AVG	2.8	2	2	2	2	-	-	-	-	-	-	1.4	2.8	1.8
16AE4202-Mechanics of Machines														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	-	-	-	-	-	-	-	-	-	-	3	2
CO2	3	2	1	-	1	-	-	-	-	-	-	-	2	1
CO3	3	2	-	1	-	-	-	-	-	-	-	-	2	1
CO4	3	2	-	-	-	-	-	-	-	-	-	-	2	1
CO5	3	2	-	1	-	-	-	-	-	-	-	-	2	2
AVG	3	2	1	1	1	-	-	-	-	-	-	-	2.2	1.4
16AE4203-Gas Turbine Propulsion														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2		2	-	-	-	-	-	-	-	-	3	-
CO2	3	2	1	2	-	-	-	-	-	-	-	-	3	-
CO3	3	2	1	2	-	-	1	-	-	-	-	2	3	2
CO4	3	2	1	3	-	-	-	-	-	-	-	-	3	2
CO5	3	2	2	3	-	-	-	-	-	-	-	2	3	2
AVG	3	2	1.25	2.4	-	-	1	-	-	-	-	2	3	2
16AE4204-Aircraft Strength of Materials														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	1	-	-	-	-	-	-	-	-	2	3	2
CO2	3	2	1	-	-	-	-	-	-	-	-	2	3	2
CO3	3	2	1	-	-	-	-	-	-	-	-	2	3	2
CO4	3	2	1	-	-	-	-	-	-	-	-	2	3	2
CO5	3	2	1	-	-	-	-	-	-	-	-	2	3	2
AVG	3	2	1	-	-	-	-	-	-	-	-	2	3	2

16EI4231-Control Engineering														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	-	3	2	3	-	-	-	-	-	-	1	2	1
CO2	3	-	3	2	3	-	-	-	-	-	-	1	-	1
CO3	3	3	3	2	3	-	-	-	-	-	-	1	2	1
CO4	3	3	3	2	3	-	-	-	-	-	-	1	2	1
CO5	3	3	3	2	3	-	-	-	-	-	-	1	2	2
AVG	3	3	3	2	3	-	-	-	-	-	-	1	2	1.2
16AE4001-Aerodynamics Laboratory														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	-	-	-	-	-	-	-	2	2	-	-	3	1
CO2	3	2	2	2	2	-	-	-	2	2	1	2	3	2
CO3	3	2	2	2	2	-	-	-	2	2	1	2	3	2
CO4	3	2	2	2	2	-	-	-	2	2	1	2	3	2
CO5	3	-	-	-	-	-	-	-	2	2	-	2	3	2
AVG	3	2	2	2	2	-	-	-	2	2	1	2	3	1.8
16AE4002-Aircraft Strength of Materials Laboratory														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	1	-	-	1	-	-	2	-	-	1	2	3
CO2	3	2	1	-	-	1	-	-	2	-	-	1	2	3
CO3	3	2	1	-	-	1	-	-	2	-	-	2	2	3
CO4	3	2	1	-	-	1	-	-	2	-	-	1	2	3
CO5	3	2	1	-	-	1	-	-	2	-	-	1	2	3
AVG	3	2	1	-	-	1	-	-	2	-	-	1.2	2	3

Chairman - BoS
AERO - HiCET

Chairman

Dean (Academics)
HiCET