ACAM-102 Engineering Mathematics-II

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Objective/s and Expected outcome: The learning objectives of core mathematics courses can be put into three categories:

Content Objectives: Students should learn fundamental mathematical concepts and how to apply them.

Skill Objectives: Students should learn critical thinking, modeling/problem solving and effective uses of technology. Communication Objectives: Students should learn how to read mathematics and use it to communicate knowledge. The students are expected to understand the fundamentals of the mathematics to apply while designing technology and creating innovations.

PART A

1. Ordinary Differential Equations of first order Exact Differential equations, Equations reducible to exact form by integrating factors; Equations of the first order and higher degree. Clairaut's equation. Leibniz's linear and Bernoulli's equation

2. Linear Ordinary Differential Equations of second & higher order Solution of linear Ordinary Differential Equations of second and higher order; methods of finding complementary functions and particular integrals. Special methods for finding particular integrals: Method of variation of parameters, Operator method. Cauchy's homogeneous and Legendre's linear equation, Simultaneous linear equations with constant coefficients.

3. Applications of Ordinary Differential Equations Applications to electric R-L-C circuits, Deflection of beams, Simple harmonic motion, Simple population model.

PART B

4. Linear Algebra Rank of a matrix, Elementary transfonnations, Linear independence and dependence of vectors, Gauss-Jordan method to find inverse of a matrix, reduction to normal form, Consistency and solution of linear algebraic equations, Linear transformations, Orthogonal transformations, Eigen values, Eigen vectors, Cayley-Hamilton Theorem, Reduction to diagonal form, orthogonal, unitary, Hermitian and similar matrices.

5. Infinite Series Convergence and divergence of series, Tests of convergence (without proofs): Comparison test, Integral test, Ratio test, Rabee's test, Logarithmic test, Cauchy's root test and Gauss test. Convergence and absolute convergence of alternating series

6. Complex Numbers and elementary functions of complex variable De-Moivre's theorem and its applications. Real and Imaginary parts of exponential, logarithmic,

circular, inverse circular, hyperbolic, inverse hyperbolic functions of complex variables. Summation of trigonometric series. (C+iS method) (7)

Suggested Readings / Books:

1. Kreyszig,E., Advanced Engineering Mathematics, Eighth edition, John W iley.

2. Michael D. Greenberg., Advanced Engineering Mathematics, Second Edition, Pearson Education.

3. Peter. V. O'Nil, Advanced Engineering Mathematics, Wadsworth- Publishing Company.

4. Jain, R.K. and Iyengar, S.R.K., Advanced Engineering Mathematics, Narosa Publishing House, New Delhi.

5. Grewal, B.S., Higher Engineering Mathematics, Khanna Publishers, Delhi.

6. Pipes, L.A. and Harvill, L.R., Applied Mathematics for Engineers and Physicists, McGraw Hill

7. Taneja, H. C., Engineering Mathematics, Volume-I & Volume-II, 1. K. Publisher.

8. Babu Ram, Advance Engineering Mathematics, Pearson Education.

9. Bindra, J. S., Applied Mathematics, Volume-II, Kataria Publications.

ACEE 101 Basic Electrical and Electronics Engineering

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Objective/s and Expected outcome:
This course is mandatory for all the branches for understanding the basic concepts of Electrical and Electronics Engineering. Students of all branches have to deal with the applications of Electrical Engineering and Electronics Engineering. This course gives a basic knowledge of circuits, transducers, semiconductor devices with which a building of innovative technology can be created. The students are expected to learn and understand the importance and applications of electric and electronics material. This knowledge give them a brief outline of the fundamentals that would be the foundations of today's and tomorrow's technology.

Part A (Electrical Engineering)

1. Direct Current (DC) Circuits:
Circuit elements and connected terminology, Kirchoff‟s Laws- Statement and Illustrations, Method of solving circuits by Kirchoff‟s law, Star-Delta Conversion, Computation of resistance at constant temperature, resistance at different temperatures, Ohm's Law- Statement, Illustration and Limitation, Units- Work, Power and Energy (Electrical, Thermal and Mechanical

2. Alternating Current (AC) Fundamentals:
Peak, Root Mean Square and Average value of alternating current, Phasor representation of alternating quantities, Analysis of AC Circuit Representation of Alternating Quantities in Rectangular and polar forms. Introduction of Resistive, Inductive & Capacitive circuits and their series and parallel combinations. Concept of resonance in series and parallel circuits, Analysis of balanced 03 phase system with star-delta connections.

3. Magnetic Circuits and Transformer:
Comparison between magnetic and electric circuits, Law of Electromagnetic Induction and its law, Self Inductance, Mutual Inductance, Single Phase Transformer: Construction, Working principle, Efficiency, Voltage regulation and applications

4. Rotating Electrical Machines:
D.C. machines (motors and generators), Three phase Induction motor, Synchronous machines (motors and generators): construction, working principle, and applications

Part B (Electronics Engineering)

5. Transducers:

Introduction, working and application of LVDT, Strain Gauge and Thermistor.

Introduction and application of Digital Multimeter.

6. Semiconductor Devices:

Principle of operation characteristic and application of PN Junction Diode, Rectifiers, Zener Diode, Principle of operation characteristic and application of Bipolar Junction Transistor, Regulated Power Supply

7. Digital Electronics:

Binary, Decimal, Octal and Hexadecimal number System, Logic gates, Introduction of R-S, J-K, D and T Flip Flops & its truth tables.

Suggested Readings/ Books

1. Basic Electrical and Electronics and Computer Engineering by R Muthusubramanian, S Salivahanan,K A Muraleedharan, Tata McgrawHill
2. A Textbook of Electrical Techology by B.L Theraja.& A.K Theraja, S Chand publishers.
3. Electrical Technology, Edward Hughes, Addisin Wesley Longman Limited.
4. A Course in electrical and electronic Measurements & Instumentation by A.K Sawhney, Dhanpat Rai & Co

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ACEE 102 Basic Electrical and Electronics Engineering Lab.

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List of Experiments to be performed

1. To verify Ohm‟s Law and its limitations.
2. To verify Kirchoff‟s Laws.
3. To measure the resistance and inductance of a coil by ammeter-voltmeter method.
4. To find voltage-current relationship in a R-L series circuit and to determine the power factor of the circuit.
5. To verify the voltage and current relations in star and delta connected systems.
6. To measure power and power factor in a single- phase AC circuit.
7. To verify series and parallel resonance in AC circuits.
8. To observe the B-H loop of ferromagnetic core material on CRO.
9. To use a bridge rectifier for full- wave rectification of AC supply and to determine the relationship between RMS and average values of the rectified voltage.
10. To measure the minimum operating voltage, current drawn, power consumed, and the power factor of a fluorescent tube light.
11. To verify the working of a). Thermocouple b). Strain Gauge c). LVDT.
12. To verify the rating of compact fluorescent lamp (CFL).
13. To obtain the characteristics of a P-N junction diode.
14. To verify the truth table of logic gates.
15. To connect the following ,measuring instruments to measure current, voltage and power in AC/DC circuits:
    i. Moving Coil Instruments
    ii. Moving Iron Instruments
    iii. Dynamometer Instruments
    iv. Multimeter- both Digital and Analog Type
16. To obtain the characteristics of a transistor under common base (CB) and common emitter (CE) configuration.
17. To perform open- and short circuit tests on a single phase transformer and calculate its efficiency
18. To start and reverse the direction of rotation of a
    i. DC motor
    ii. Induction motor

Note: Each student is required to perform at least ten experiments **Suggested Readings / Books**

1. S.K. Bhattacharya and R.K. Rastogi, Experiments in Electrical Engineering, New Age International Publishers Ltd., New Delhi.
2. D.R. Kohli and S.K. Jain, Experiments in Electrical Machines.

ACHU-103 Communicative English Lab
B.Tech 1st Semester

L	T	P
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Lab Exercises

Listening and Speaking

The audio CD accompanying S.P. Dhanavel‟s book shall be played in the lab to get the students familiar with the standard spoken English. The students must develop a high degree of understanding of spoken material as used in academic and professional environment. The teacher shall help them in the following:

a) With the accent of the speaker if it is unfamiliar to them.

b) The Standard English sounds and pronunciation of words.

c) With the topical vocabulary and the idiomatic expressions which are generally part of colloquial speech.

d) With the implied relationships in larger texts, if they are not stated explicitly.

In addition to the above, extended listening sessions shall be arranged to promote speaking activities among students. The teachers shall play the CDs selectively in the lab and involve the students in the practice work based on them. While taking up lessons, the teacher must promote the use of dictionaries for correct pronunciation and give ample practice on word stress and weak forms. The students are also supposed to supplement their listening practice by regularly viewing news/knowledge channels on the TV or lecture videos on the internet.

At the end of a session, a good speaker must:

a) Be able to produce long turns without much hesitation in an accent that is understood all around.

b) Have ready access to a large lexis and conventional expressions to speak fluently on a variety of topics.

c) Have a knack for structured conversation or talk to make his transitions clear and natural to his listeners.

The teacher may use following different classroom techniques to give practice and monitor the progress of the students:

- **Self Introduction**
- **Telephonic Conversation / Interviews**
- **Role Play**
- **Group Discussion**

ACHU- 104 Communicative English Lab.
B.Tech 2nd Semester

L	T	P
0	0	2

Lab Exercises
Listening and Speaking

The audio CD accompanying S.P. Dhanavel‟s book shall be played in the lab to get the students familiar with the standard spoken English. The students must develop a high degree of understanding of spoken material as used in academic and professional environment. The teacher shall help them in the following:

a) With the accent of the speaker if it is unfamiliar to them.
b) The Standard English sounds and pronunciation of words.
c) With the topical vocabulary and the idiomatic expressions which are generally part of colloquial speech.
d) With the implied relationships in larger texts, if they are not stated explicitly.

In addition to the above, extended listening sessions shall be arranged to promote speaking activities among students.

The teachers shall play the CDs selectively in the lab and involve the students in the practice work based on them. While taking up lessons, the teacher must promote the use of dictionaries for correct pronunciation and give ample practice on word stress and weak forms.

The students are also supposed to supplement their listening practice by regularly viewing news/knowledge channels on the TV or lecture videos on the internet.

The teacher may use following different classroom techniques to give practice and monitor

the progress of the students:

- **Oral Presentation/PPT Presentation**
- **Extempore**
- **Story Telling**
- **Mock Dialogues**
- **Mock Interview**

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ACHU- 101 Communicative English- I

B.Tech 1st Semester

L	T	P
3	0	0

Objective/s and Expected outcome:

The objective is to help the students to become independent users of English language. Students should be able to understand spoken and written English language of varied complexity on most including some abstract topics; particularly the language of their chosen technical field. They must show awareness of appropriate format and a capacity for explaining their views in a rational manner. The students should be able to converse fluently, without strain with international speakers of English in an accent and lexis that is widely understood across the globe. They will be able to produce on their own texts which are clear and coherent.

1. **Reading:** Reading texts of varied complexity; speed reading for global and detailed meaning; processing factual and implied meanings
2. **Vocabulary:** Building up and expansion of vocabulary; active use of the prescribed expressions in the appropriate context
3. **Grammar:** Revising and practicing a prescribed set of grammar items; using grammar actively while processing or producing language
4. **Writing:** The qualities of good writing; Learning the prescribed written expressions of conventional use; writing business letters, Job Application Letter & Resume / CV and various forms of descriptive and argumentative Writing.

Syllabus Outline and Study Scheme (Theory Paper)

1. Comprehension of seen/unseen textual component as per S.P. Dhanavel's English and Communication Skills for Students of Science and Engineering.

2. Vocabulary: Especially given in 'Word Power' of the recommended text book. (Unit I to V)

   Revising and practicing a prescribed set of grammar items based

   -Parts of
   Speech -Prefix /
   Suffix -Tenses
   -Voice
   -Gerunds/Infinitives

-Collocations
-Homographs/Homonyms/Homophones
-Sentence Structure
-Subject Verb Agreement

3. Creative Writing: Writing or developing a paragraph about 250-300 words

4. Developing business letter, letters to the editor and other subjects as per S.P. Dhanavel's prescribed text and Anne Laws Writing Skills.

5. Report/Proposal writing as per formats discussed in the recommended text book.

Suggested Readings/ Books

1. Vandana R Singh, The Written Word, Oxford University Press, New Delhi

2. KK Ramchandran, et al Business Communication, Macmillan, New Delhi

3. Swati Samantaray, Busines Commnication and Commnicative English, Sultan Chand, New Delhi.

4. S.P. DhanavelEnglish and Communication Skills for Students of Science and Engineering (with audio CD)

ACHU-102 Communicative English-II

(B. Tech 2nd Semester)

L	T	P
3	0	0

Objective/s and Expected outcome:

The objective is to help the students to become independent users of English language. Students should be able to understand spoken and written English language of varied complexity on most including some abstract topics; particularly the language of their chosen technical field. They must show awareness of appropriate format and a capacity for explaining their views in a rational manner. The students should be able to converse fluently, without strain with international speakers of English in an accent and lexis that is widely understood across the globe. They will be able to produce on their own texts which are clear and coherent.

1. **Reading:** Reading texts of varied complexity; speed reading for global and detailed meaning; processing factual and implied meanings
2. **Vocabulary:** Building up and expansion of vocabulary; active use of the prescribed expressions in the appropriate context
3. **Grammar:** Revising and practicing a prescribed set of grammar items; using grammar actively while processing or producing language
4. **Writing:** The qualities of good writing; Learning the prescribed written expressions of conventional use; writing business letters, Job Application Letter & Resume / CV and various forms of descriptive and argumentative Writing.

Syllabus Outline and Study Scheme (Theory Paper)

1. Comprehension/Interpretation of seen or unseen passage/summarizing/precise writing.
2. Vocabulary: Especially given in 'Word Power' of the recommended text book.

   (Unit VI to X)

   Grammar: Revising and Practising a prescribed set of grammar items based on:

   -Narration (Direct/Indirect Speech)
   -Modals

-Antonyms/Synonyms
-Conjunctions (Simple/Compound/Complex Sentences)
-One word substitution
-Combine pairs of sentences
-If clause

3. Topic of general interest; reproduction from business, daily life, travel, health, buying-selling, company structure, systems etc.

4. Detailed topic discussion and developing Job Application/Resume/Curriculum Vitae along with covering letter on a given situation.

5. Questions based on Textual Reading from the following prescribed articles from English Literature:

   i) The School for Sympathy – E.V. Lucas (Prose)
   ii) Beauty and the Beast - R.K. Narayan (Prose)
   iii) The Lament – Anton Pavlovich Chakhov (Short Story)

Suggested Readings/ Books

1. Vandana R Singh, The Written Word, Oxford University Press, New Delhi

2. KK Ramchandran, et al Business Communication, Macmillan, New Delhi

3. Swati Samantaray, Busines Commnication and Commnicative English, Sultan Chand, New Delhi.

4. S.P. DhanavelEnglish and Communication Skills for Students of Science and Engineering (with audio CD)

ACME-101 Elements of Mechanical Engineering

L	T	P
4	0	0

Objectives and Expected Outcome:- In the vast spectrum of Mech. Engg., this subject gives a very very primitive but general information finding vide application in day to day life with emphasis upon the principles and fundamentals involved in the inter-conversion of thermal energy into mechanical energy and vice versa, viz. all Automobile, Air-Craft, Generator and other stationary Heat Engines besides cooling machinery like Refrigerators, Air-Conditioners and water-coolers etc. The subject also offers a birds eye-view to all students about the common engineering materials finding vide application in Mech. Engg. Industry and about their strength and other related vital aspects. Since every student of engineering is already exposed to all afore-said machinery, he/she would feel very much self-satisfied and self-confident after learning the basic intricacies and whys and hows related with the fundamentals of the aforesaid machinery.

Part-A

1. **Basic concepts of thermodynamics-**Definition of thermodynamic: Need to study thermodynamics; Application areas of thermodynamic, Thermodynamic System : definition, types (Open, Closed and Isolated) and their examples; Thermodynamic System Boundary: definition, types and their examples; Surroundings; Control(fixed) mass and Control Volume concept and their example ; Thermodynamic State;Thermodynamic Property: definition, types citing their examples; condition for any quantity to be a property; Thermodynamic path, Thermodynamic process: definition, concept of reversible process, quasi-static (or, quasi-equilibrium) process, irreversible process, conditions for reversibility and how these are met with, non-flow processes and flow processes, method of representation of reversible and irreversible process on propertydiagrams; Cyclic process;Thermodynamic Cycle: definition and its concept; Energy transfer across system boundary i.e. transient energies (heat and work) (Numerical);Difference between heat and work; Sign conventions for heat and work interactions;heat and work as path functions; Equality of Temperature and Zeroth law of Thermodynamics.

2. **First law of thermodynamics and its applications-**Definition, essence and corollaries or consequences of first law of Thermodynamics; Expressions for

First law of Thermodynamics for a control mass undergoing a Cycle and for process (Numerical),Concept of Enthalpy and total energy and differentiation between the two – a thermodynamic property; Compressible and incompressible substances, Specific heats,

Representation of first law of thermodynamics as rate equation; Analysis of non-flow/ flow process for a control mass undergoing constant volume, constant pressure (Derivation only), Constant temperature, adiabatic and polytropic processes (Derivation only).

3. **Second law of thermodynamics-**Limitations of first law of thermodynamics; and how 2nd law is fully able to explain away and thus overcome those shortcomings of Ist law; Thermal Reservoirs, source and sink (Low temperature and high temperatures);Heat Engine, Heat Pump and Refrigerator: definitions, working, efficiency/performance and their real life examples(Derivation only); Various statements of second law of thermodynamics and their equivalence.

Part- B

4. **Gas Power Cycle-** Introduction; Concept and philosophy of Air Standard Cycle along with associated assumptions and advantages; Air Standard Efficiency; Nomenclature of reciprocating piston-cylinder arrangement with basic definitions such as swept volume, clearance volume, compression ratio, mean effective pressure etc; Otto Cycle (or constant volume heat addition cycle) (Derivation only), Diesel cycle (or constant pressure heat addition cycle) and Dual cycle (Mixed or Composite or Limited Pressure cycle) with their representation on P-V and T-S charts (Derivation only).
5. **Centroid, Centre of gravity & moment of Inertia-** Difference betweencentre of gravity and centroid, Determination of position of centroid of plane geometric figures of I, U, H, L, T, C, Circular and Triangular Sections (Numerical only), Centroid of Composite Areas (Numerical only), Area moment of inertia & mass moment of inertia, Polar moment of inertia, Parallel axes Theorem (or transfer formula), Perpendicular axes Theorem, Radius of gyration.

Suggested Readings / Books

1. Nag P.K., Engineering Thermodynamics, Tata McGraw Hill.
2. Yadav R., Thermodynamics and Heat Engines, Central Publishing House, Allahabad
3. Rogers G. and Mayhew Y., Engineering Thermodynamics, Pearson Education.

4. Cengel Y.A. and Boles M.A., Thermodynamics - An Engineering Approach, Tata McGraw Hill.
5. Rao Y.V.C., An Introduction to Thermodynamics, New Age International (P) Limited Publishers.
6. Spalding D. B., Cole E. H., Engineering thermodynamics, ELBS series
7. Bedi D.S., Element of Mechanical Engineering, Khanna Publishers New Delhi
8. Donald R. Askeland, Pradeep P. Phule, Essentials of materials Science and Engineering, Cenage Learning
9. A.K.Tayal Engineering Mechanics, Umesh Publications.

ACCH-101 Engineering Chemistry and Environmental Sciences

L	T	P
3	1	0

Objective/s and Expected outcome:

The objective of the Engineering Chemistry is to acquaint the students with the basic phenomenon/concepts, and resolve their doubts which they face during course of their study in the industrial and engineering fields. Some new topics have been introduced to the syllabus for the development of the right attitudes in the engineering students so that they may be made abreast with the continuous flow of new technology. The students with the knowledge of the basic chemistry will understand and scientifically explain the problems related to chemistry in the industrial/engineering field. The students will be able to understand the new developments and breakthroughs efficiently in engineering. The introduction of the new topics will make the engineering students upgraded with the new technological innovations.

PART A

1. Water and its Treatment:

Introduction; Hardness of water- Types, units and estimation. Boiler feed water- Specification, Scales and sludge formation; Priming & foaming; Boiler Corrosion; Caustic Embrittlement; Treatment of Boiler Feed Water- External and Internal treatment; Different methods of the water softening- Lime soda process, Zeolite process and Ion exchange process; Desalination of water; Water for domestic use- Specification, Disinfection of water.

2. Polymers:

Introduction; Functionality; Types of polymerization; Specific features of polymers-Structure, regularity and irregularity; Tacticity of polymers; Average molecular weights and its determination by different methods; Effect of molecular weight on the properties of polymers; Organic conducting and Biodegradable Polymers (PMMA, Polystyrene, Teflon, Neoprene, Buna-S, Buna-N, Nylon 6, Nylon 6 6, Terylene); Vulcanization of rubber; Applications of polymers.

3. Corrosion and its Prevention:

Introduction; Different types of corrosion - Wet and Dry corrosion; Different types of surface films; Mechanisms of wet corrosion; Galvanic Series; Types of

Electrochemical Corrosion: Galvanic corrosion; Differential aeration corrosion; Pitting corrosion; waterline; stress corrosion; Crevices corrosion; Protective Measures against corrosion- Metallic coatings; Electrochemical Protection; Organic Coatings; Cathodic protection: Sacrificial anodic protection; Impressed current cathodic protection.

PART B

4. Engineering Materials, Nanomaterials and Applications:

Introduction to Engg. Materials; Cementing and Binding meterials; lime; Gypsum; Cement; Ceramics; Lubricants; Adhesives; Properties and Uses; Nanomaterials; Nanoscience and Nanotechnology and Applications.

5. Petroleum and Petrochemicals:

Introduction; Primary Raw Materials for Petrochemicals; First, second & third generation petrochemicals. Crude oil: Classification of crude oil; Physical separation processes; Natural gas: Properties; Applications; Benefits; Production of ethylene.

6. Natural Resources and Ecosystem:

Natural Resources and associated problems, use and over exploitation, case studies of forest resources and water resources. Concept of Ecosystem, Structure, interrelationship, producers, consumers and decomposers, ecological pyramids-biodiversity and importance. Hot spots of biodiversity.

7. Environmental Pollution:

Definition, Causes, effects and control measures of air pollution (Case study), Water pollution (Case study), Soil pollution, Marine pollution, Noise pollution, Thermal pollution, Nuclear hazards. Solid waste Management: Causes, effects and control measure of urban and industrial wastes. Role of an individual in prevention of pollution. Pollution case studies.

Suggested Readings / Books

1. William Kemp, Organic Spectroscopy, Palgrave Foundations, 1991.
2. Shashi Chawla Engg. Chemistry, Dhanpat Rai and Co. New Delhi.
3. Applied Chemistry by Dr. S.K. Bhasin, Ajay Publications.
4. C. P. Poole, Jr., F. J. Owens, Introduction to Nanotechnology, Wiley Interscience, 2003.
5. L.E.Foster, Nanotechnology, Science Innovation & Opportunity, Pearson Education, 2007.
6. M. Lancaster, Green Chemistry an Introductory Text, Royal Society of Chemistry, Cambridge, UK, 1st edition, 2010.
7. Sami Matar, Lewis F. Hatch, Chemistry of Petrochemical Processes, Second Edition, Gulf Publishing company, Houston, Texas, 2000.
8. Jones, Denny, Principles and Prevention of Corrosion, Upper Saddle River, New Jersey: Prentice Hall, 2nd edition, 1996.
9. Mohamed Belgacem, Alessandro Gandini, Monomers, Polymers and Composites from Renewable Resources, ELSEVIER, 2008.
10. Engg. Chemistry by B. Sivansankar, Mc Geaw Hill.
11. Spectroscopy by Pavia, Lampman.
12. Perspectives in Environmental Studies by Kaushik, A.
13. Essentials of Environment Science by Joseph.

ACCH-102 Engineering Chemistry and Environmental Sciences Lab.

L	T	P
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1. Analysis of water

- Determination of Hardness of water by EDTA method.
- Determination of dissolved oxygen in given water sample.
- Determination of Residual Chlorine in given water sample.
- Determination of turbidity of water by Nephelometer.

2. Analysis of Fuels and Lubricants

- Determination of Flash and Fire point by Abbe's Apparatus.
- Determination of Viscosity of given liquid using Redwood viscometer or Ostwald's viscometer.
- Determination of Acid value and Aniline point of oil.
- Determination of Moisture, Volatile and Ash content by proximate analysis.

3. Instrumental analysis

- Determination λ-max by Spectrophotometer and determination of unknown conc. of binary mixture of two liquids.
- Determination of the surface tension by using stalagmometer.
- Determination of the concentration of a solution conductometerically.
- Determination of the strength of a solution pH meterically.
- Distinction between acid, ester, ketone using IR spectrophotometer.
- Determination of bathochromic shifts, hypsochromic and hyperchromic, hypochromic shift of benzene and its derivatives.

4. Chromatography

- Determination of R_f value of amino acid by paper chromatography and identification of the amino acid present.
- Separation of metallic ions by paper chromatography.
- Separation of ions by using complexing agents
- Separation of plant pigments, Chlorophyll and Carotenoids by Column Chromatography.
- Determination of the ion exchange capacity of the given Ion Exchanger.
- Separation of ions by Ion-Exchange method.

5. Synthesis & Green Chemistry experiments

- Preparation of a polymer phenol/urea formaldehyde resin or hexamethylenediamine adipic acid polymer and determination of carbonyl value or acid value.
- Preparation of Aspirin.
- Preparation of ethyl-2-cyano-3-(4-methoxyphenyl) propenoate (Microwave

assisted reaction)

- Base catalyzed aldol condensation by Green Methodology: Acetylation of primary amines using ecofriendly method.

Note: Each student is required to perform two experiments from each of the 5 titles (presented bold) depending on his/her Branch and Aptitude.

(ACME 102) ENGINEERING DRAWING

L	T	P
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Objective and Expected Outcome:

Main objective of the Engineering Drawing is to introduce the students to visual science in the form of technical graphics. General instructions related to Theory of Orthographic Projection of points, lines, planes and solids as per the BIS codes prevalent to drawing practice will be introduced initially. Section of solids, intersection and development of surfaces, isometric projection and orthographic projection of simple solids/blocks will further upgrade the basic understanding and visualization of geometrical objects and to certain extent the machine parts.

PART-A

1. Introduction

Engineering Drawing/Engineering Graphics/Technical Drawing a Visual Science. Types of Engineering Drawing, Introduction to drawing equipment and use of instruments. Symbols and conventions in drawing Practice. Types of lines and their use, BIS codes for lines, Technical lettering as per BIS codes, Introduction to Dimensioning, Concepts of scale in drawing, Types of scales.

2. Theory of Projections

Relevance of projection, Type of projections, Perspective, Orthographic, Axonometric and their basic principles, System of orthographic projection: in reference to quadrants, illustration through simple problems of projection.

3. Projection of Points

Definition of point. Projection of points in quadrants.

4. Projection of Lines

Definition of line. Line Parallel to both H P and V P, Parallel to one and inclined to other, and inclined to both, contained in profile plane. True length and angle orientation of straight line: rotation method and auxiliary plane method. Distance between two nonintersecting lines, and trace of line.

5. Projection of Planes

Definition of planes and their types. Difference between plane and lamina. Projection of lamina Parallel to one and perpendicular to other, Perpendicular to one and inclined to other, Inclined to both reference planes, and Lamina oblique to three reference planes. Application of auxiliary planes, and trace of planes.

PART-B

6. Projection of Solids

Definition of solids, types of solids, and elements of solids. Projection of solids in first or third quadrant, with axis parallel to one and perpendicular to other, axis parallel to one inclined to other, axis inclined to both the principle plane, axis perpendicular to profile plane and parallel to both H P and V P. Visible and invisible details in the projection. Use rotation method to draw the projections.

7. Section of Solids

Definition of Sectioning and its purpose. Procedure of Sectioning, Types of sectional planes. Illustration through examples.

8. Development of Surface

Purpose of development, Parallel line, radial line and triangulation method. Development of prism, cylinder, cone and pyramid surface for both right angled and oblique solids, and development of surface of sphere.

9. Isometric Projection

Classification of pictorial views, Basic Principle of Isometric projection, Difference between isometric projection and isometric drawing. Isometric projection of solids such as cube, prism, pyramid and cylinder, and assignments on isometric projection of simple machine parts.

10. Orthographic Projection

Review of principle of Orthographic Projection, Sketch/drawing of blocks, and of simple machine parts. Orthographic projection from isometric views.

Suggested Readings / Books

1. Narayana K L and Kanaiah P, “Engineering Graphics”, Tata McGraw Hill Publishing Company Limited, New Delhi.
2. Gill P S, “Engineering Graphics and Drafting”, Katria and Sons, Delhi.
3. Bhat N D, “Elementary Engineering Drawing-Plane and solid Geometry”, Chartotar Publishing House, Anand.
4. Luzzadde Warren J, “Fundamentals of Engineering Drawing”, Prentice Hall of India Private Limited, New Delhi.
5. Bertoline G R , Wiebe E N, Miler G L L & Mother J L, “Technical Graphics Communication”, Irwin McGraw Hill, New York.
6. A Text Book of Engg Drawing by R. K. Dhawan, S. Chand and Co. Ltd

ACAM-101 Engineering. Mathematics – I

L	T	P
4	1	0

Objective/s and Expected outcome

"Math and basic science are certainly the foundations of any engineering program. This fact will not change in the foreseeable future" said by Ellis et al. Engineering Mathematics is an essential tool for describing and analyzing engineering processes and systems. Mathematics also enables precise representation and communication of knowledge. Core mathematics courses have broader objectives than just supporting engineering programs. The learning objectives of core mathematics courses can be put into three categories: (1) Content Objectives: Students should learn fundamental mathematical concepts and how to apply them. (2) Skill Objectives: Students should learn critical thinking, modeling/problem solving and effective uses of technology. (3) Communication Objectives: Students should learn how to read mathematics and use it to communicate knowledge. The students are expected to understand the fundamentals of the mathematics to apply while designing technology and creating innovations.

PART – A

Partial Derivatives: Basic Differentiation in single variable; Function of two or more variables; Partial differentiation; Homogeneous functions and Euler's theorem; composite functions; Total derivative; Derivative of an implicit function; Change of variable; Jacobians.

Applications of partial Differentiation: Review of Curve Tracing and conics; A brief introduction of cylinder, cone and standard conicoids;Tangent and normal to a surface; Taylor's and Maclaurin's series for a function of two variables; Maxima and Minima of function of several variables.

PART – B

Multiple Integrals: Basic Integration; Double and triple integral and their evaluation; change of order of integration; change of variable; application of double and triple integrals to find area and volume; a brief introduction to moment of inertia and centre of gravity.

Vector Calculus: Scalar and Vector fields; differentiation of vectors; velocity and acceleration; Vector differential operators: Del, Gradient, Divergence and Curl and their physical interpretations; Formulae involving Del applied to point functions and their products; Line ,surface and volume integrals.

Application of Vector Calculus: Flux, Solenoidal and irrotational vectors; Gauss Divergence theorem, Green's theorem in plane, Stoke's theorem (without proofs) and their applications.

Suggested Readings / Books

1. Thomes, G.B, Finney, R.L. Calculus and Analytic Gemetry, Ninth Edition, Peason Education.

2. Kreyszig, E., Advanced Engineering Mathematics, Eighth edition, John wiley.

3. Peter. V. O" Nil, Advanced Engineering Mathematics, Wordsworth Publishing Company.

4. Jain, R.K and Lyengar, S.R.K., Advanced Engineering Mathematics, Narosa Publishing Company.

5. Grewal, B.S., Higher Engineering Mathematics, Khanna Publishers, New Delhi.

6. Taneja, H.C., Engineering Mathematics, Volume-I & Volume-II, I.K. Publisher.

7. Babu Ram, Advance engineering Mathematics, Pearson Education.

8. Bindra,. J.S., Applied Mathematics, Volume-I, Kataria Publications.

ACPH-101 Engineering Physics

L	T	P
4	1	0

Prerequisite:
Knowledge of intermediate level physics.

Objective/s
The objective of the course is to develop a scientific temper and analytical capability in the engineering graduates through the learning of physical concepts and their application in engineering & technology.

Expected outcome:
Comprehension of some basic physical concepts will enable graduates to think logically the engineering problems that would come across due to rapidly developing new technologies. The student will be able to understand the various concepts effectively, logically explain the physical concepts and apply the concept in solving engineering problem, realize, understand and explain scientifically the new developments and breakthroughs in engineering and technology, relate the developments on Industrial front to the respective physical activity, happening or phenomenon.

PART A

1. Lasers: Spontaneous & Stimulated emissions, Significance of Einstein's Coefficients, Population Inversion, Components of a laser System, Properties of Laser, Ruby Laser, He-Ne Laser, CO2 Laser, Introduction to Holography, Applications of Laser.

2. Fibre Optics: Introduction, Acceptance Angle, Numerical Aperture, Normalized frequency, fibre connectors, splicers and couplers, applications of optical fibres.

3. X-Rays: Continuous & Characteristic X-Rays, X-Ray Diffraction & Bragg's law in Crystals, Bragg's spectrometer, X-ray radiography, Applications.

4. Nanophysics: Nanoscale, Nanomaterials, Unusual properties of nanomaterials, synthesis of nanomaterials- ball milling and sol-gel techniques, applications of nanomaterials.

PART B

5. EM waves & Dielectrics: Physical significance of Gradient, Divergence & Curl, Relationship between Electric Field & Potential, Dielectric polarization, displacement Current, Types of polarization, Maxwell's Equations, Applications of EM Waves.

6. Magnetic Materials: Types of Magnetic materials, Magnetic Anisotropy, Magnetostriction and its application in production of ultrasonics, B-H Curve, Applications of magnetic materials.

7. Superconductivity: Superconductivity, Superconductors as ideal diamagnetic materials, Isotope effect, Meissner Effect, Type I & Type II Superconductors, London Equations,Introduction to BCS theory, Applications.

8. Quantum Theory: Wave-particle duality, Matter waves, Group & Phase velocities, Uncertainty Principle, Non-existence of electron in nucleus, Normalization of wave function, Schrodinger wave equation- time independent & dependent (Qualitative Idea), Particle in one dimensional box.

Suggested Readings / Books:

1. Physics for Scientists & Engineers (Vol. I & II), Serway & Jewett, 9th Edition. Cengage Learning.
2. Engineering Physics, Malik; HK, Singh; AK, Tata McGraw Hill,
3. Concepts of Modern Physics, Beiser; A., Mahajan; S., Choudhary; SR, Tata McGraw Hill.
4. Physics; A calculus based approach (Vol. I & II) Serway; RA & Jewitt; JW, Cengage Learning.Materials Science & Engineering, Callister; WD, John Wiley & Sons.
5. Introduction to Electrodynamics, Griffiths; DJ, Prentice Hall.
6. Optical Fibre system, Technology, Design & Applications, Kao; CK, McGraw Hill.
7. Laser Theory & Applications, Thygrajan; K, Ghatak; AK, Mc Millan India Ltd.

(ACPH-102) Engineering Physics Lab.

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Note: Each student is required to perform any ten practicals.

1. To study the laser beam wave length using diffraction grating aperture.
2. To find divergence of given laser beam.
3. To determine numerical aperture of an optical fibre.
4. To determine attenuation & propagation losses in an optical fibre.
5. To study the voltage regulating characteristics of Zener diode.
6. To study V-I characteristics of PN junction diode.
7. To study variation of magnetic field along axis of circular coil carrying current.
8. To study the dielectric constant and polarizability of dielectric material.
9. To find frequency of AC mains using electric-vibrator.
10. To determine impedance of LCR circuit.
11. To find energy band gap of a semiconductor material.
12. To find the velocity of ultrasound in liquid.

ACFC 101 Fundamentals of Computer Programming and IT

L	T	P
3	0	0

Objective/s and Expected outcome:

To familiarize the students of all branches in engineering with computer organization, operating systems, problem solving and programming in C++. After the students have successfully completed the course, they shall have sufficient knowledge of the basic computer operations and various programming techniques especially in C++.

1. Introduction to Computers

Define a Computer System, Block diagram of a Computer System and its working, associated peripherals, memories, RAM, ROM, secondary storage devices, Computer Software and Hardware, Introduction to the operating system, its functions and types, working knowledge of GUI based operating system

2. Problem Solving & Program Planning

Need for problem solving and planning a program; program design tools - algorithms, flow charts, and pseudocode, illustrative examples.

3. Introduction to C

History, concepts of procedural programming, Structure of C program, character set , Tokens (keywords, identifier, literals, operators, Special Characters, Strings), Data Types- primitive, user defined & derived, preprocessor directives (include , define)

4. Operators, Expressions and formatted input/output

Types of operators, operator precedence & associativity, expressions, printf() , scanf() with type specifiers

5. Control structures

Conditional – (simple if, if else, else if ladder, nested if), jumping-(conditional and unconditional), switch statement, looping statements-while, do while, for, nested loops

6. Pointers

Definition, uses, advantages, declaration and definition, pointer arithmetic

7. Functions

Function prototyping , uses of functions, types of functions, inbuilt library functions (math, character) , getch(), getche(), getchar(), passing arguments to functions, storage class-auto, static, extern, register

8. Arrays and strings

Definition, types, declaration and definition, advantages and disadvantages, implementation of arrays as string, string handling functions, linear search, sorting using array with bubble sort, , passing an array to function, pointer with array

9.Structure and Union

Defining structure, structure with in structure, array of structure, union , pointer to structure, self referential structure

10. File handling

FILE structure , file opening modes, reading writing and searching operations on file, file error handling functions , command line argument.

ACFC 102 Fundamentals of Computer Programming and IT Lab.

L	T	P
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1. Familiarization with the Computer System:

To explain the part of the computer system such as system unit, input devices, output devices connected to the computer.

To explore the outside view of the system unit that includes the panels on front and ports at the rear

To explore the inside view of the system unit that includes the motherboard, processor, expansion slots, various add-on cards, storage devices, power supply, fans.

To understand the booting process that includes switching on the system, execution of POST routine, then bootstrap loader, and loading of the operating system, and getting it ready for use.

2. Linux Commands:

- ls
- mkdir
- cd
- rm
- who
- who am i
- cal
- cat
- pwd
- chmod
- chown
- man
- cp
- date
- echo
- passwd
- ps

3. C-Programming

1. Write a program to find the sum of two numbers
2. Write a program to find the average of three numbers
3. Write a program to swap two numbers
4. Write a program to convert temperature from Celsius to Fahrenheit
5. Write a program to evaluate following algebraic expressions after reading necessary values from the users
    a. (ax+b)/(ax-b)
    b. 2.5 logx-cos30 | x^3 –y^2|
    c. Sqrt(a-b)
6. Write a program to find the sum of geometric series.
7. Write a program to find the roots of a quadratic equation
8. Write a program to greatest among three numbers

9. Write a program , which takes two integer operands and one operator from user to performs the operations and prints the result.

10. Write a program to print the following series using goto statement
- 1+2+3+4+5+6+7+8+9+10
- 1+1/2+1/3+……+1/20
- 1-2+3-4+5-6+……..n

11. Write a program to print n Fibonacci terms using while loop

12. Write a program to check weather a number is prime or not using while loop

13. Write a program to print the sum of digits of a number using do while loop

14. Write a program to find the factorial of a number using for loop

15. Write a program to check whether the no is palindrome or not.

16. Write a program to print all the prime numbers between the range

17. Write a program to print following pattern

```
        *
      * * *
    * * * * *
  * * * * * * *
* * * * * * * * *
```

```
        1
      2   2
    3   3   3
  4   4   4   4
5   5   5   5   5
```

```
        1
      1 2 1
    1 2 3 2 1
  1 2 3 4 3 2 1
1 2 3 4 5 4 3 2 1
```

```
        1
      1   1
    1   1   1
  1   1   1   1
1   1   1   1   1
```

18. Write a program to find the sum of two numbers using functions with
- No argument no return value
- No argument with return value
- Argument without return value
- Argument with return value

19. Write a program to implement inbuilt string handling functions (strlen, strcpy, strcat, strrev, strcmp, strcmpi, strstr)

20. Write a program to check whether a string is palindrome or not without using inbuilt function.

21. Write a program to search an element from a one dimensional array using linear search technique

22. Write a program to sort an array using bubble sort technique.

23. Write a menu driven program for matrices to do the following operations depending on whether the operation requires one or two matrices
- Addition of two matrices
- Subtraction of two matrices
- Finding the sum of upper, lower triangle and diagonal elements
- Transpose of Matrix
- Multiplication of two Matrices

24. Write a program to find the largest element from a given array with the help of user defined function by passing array as an argument.

25. Write a program to count the vowels in a string using pointer.

26. Write a program to swap two values using call by reference technique.
27. Write a program to find the sum of diagonal elements of a matrix using pointer.
28. Write a program to read and display the record of n students using structure.
29. Write a program to write data to a file and then display the vowels only by reading the same file
30. Write a program to copy the content of one file to another using command line argument.
31. Write a program to implement the DOS's (Disk Operating System 's)**type and copy** command using command line argument.

ACHV 101 Human Values & Professional Ethics

L	T	P
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Objective/s and Expected outcome:

To help the students to discriminate between valuable and superficial in the life. To help develop the critical ability to distinguish between essence and form, or between what is of value and what is superficial, in life - this ability is to be developed not for a narrow area or field of study, but for everyday situations in life, covering the widest possible canvas. To help students develop sensitivity and awareness; leading to commitment and courage to act on their own belief. It is not sufficient to develop the discrimination ability, it is important to act on such discrimination in a given situation. Knowingly or unknowingly, our education system has focused on the skill aspects (learning and doing) - it concentrates on providing to its students the skills to do things. In other words, it concentrates on

providing “How to do” things. The aspects of understanding “What to do” or “Why something should be done” is assumed. No significant cogent material on understanding is included as a part of the curriculum. A result of this is the production of graduates who tend to join into a blind race for wealth, position and jobs. Often it leads to misuse of the skills; and confusion and wealth that breeds chaos in family, problems in society, and imbalance in nature. This course is an effort to fulfill our responsibility to provide our students this significant input about understanding. This course encourages students to discover what they consider valuable. Accordingly, they should be able to discriminate between valuable and the superficial in real situations in their life. It has been experimented at IIITH, IITK and UPTU on a large scale with significant results.

PART A

1. **Course Introduction - Need, Basic Guidelines, Content and Process for Value Education:**

   Understanding the need, basic guidelines, content and process for Value Education.

   Self Exploration-what is it? - its content and process; „Natural Acceptance‟ and Experiential Validation- as the mechanism for self exploration. Continuous Happiness and Prosperity- A look at basic Human Aspirations

   Right understanding, Relationship and Physical Facilities- the basic

requirements for fulfillment of aspirations of every human being with their correct priority Understanding Happiness and Prosperity correctly- A critical appraisal of the current scenario Method to fulfill the above human aspirations: understanding and living in **harmony** at various levels

2. **Understanding Harmony in the Human Being - Harmony in Myself!**

Understanding human being as a co-existence of the sentient „I" and the material „Body"

Understanding the needs of Self („I") and „Body" - *Sukh* and *Suvidha*

Understanding the Body as an instrument of „I" (I being the doer, seer and enjoyer)

Understanding the characteristics and activities of „I" and harmony in „I"

Understanding the harmony of I with the Body: *Sanyam* and *Swasthya*; correct appraisal of Physical needs, meaning of Prosperity in detail Programs to ensure *Sanyam* and *Swasthya*

PART B

3. **Understanding Harmony in the Family and Society- Harmony in Human-Human Relationship**

Understanding harmony in the Family- the basic unit of human interaction

Understanding values in human-human relationship; meaning of *Nyaya* and program for its fulfillment to ensure *Ubhay-tripti*; Trust (*Vishwas)* and Respect (*Samman)* as the foundational values of relationship

Understanding the meaning of *Vishwas*; Difference between intention and competence

Understanding the meaning of *Samman*, Difference between respect and differentiation; the other salient values in relationship

Understanding the harmony in the society (society being an extension of family): *Samadhan, Samridhi, Abhay, Sah-astitva* as comprehensive Human Goals Visualizing a universal harmonious order in society- Undivided Society (*Akhand Samaj),* Universal Order (*Sarvabhaum Vyawastha)*- from family to world family!

4. Understanding Harmony in the Nature and Existence - Whole existence as Co-existence

Understanding the harmony in the Nature
Interconnectedness and mutual fulfillment among the four orders of nature-recyclability and self-regulation in nature

Understanding Existence as Co-existence (*Sah-astitva*) of interacting units in all-pervasive space Holistic perception of harmony at all levels of existence.

Recommended Books:

1. R R Gaur, R Sangal, G P Bagaria, 2009, *A Foundation Course in Value Education*.

Suggested Readings / Books:

2. Ivan Illich, 1974, *Energy & Equity,* The Trinity Press, Worcester, and HarperCollins, USA
3. E.F. Schumacher, 1973, *Small is Beautiful: a study of economics as if people mattered*, Blond & Briggs, Britain.
4. A Nagraj, 1998, *Jeevan Vidya ek Parichay,* Divya Path Sansthan, Amarkantak.
5. Sussan George, 1976, *How the Other Half Dies,* Penguin Press. Reprinted 1986, 1991
6. PL Dhar, RR Gaur, 1990, *Science and Humanism*, Commonwealth Purblishers.
7. A.N. Tripathy, 2003, *Human Values*, New Age International Publishers
8. Subhas Palekar, 2000, *How to practice Natural Farming,* Pracheen(Vaidik) Krishi Tantra Shodh, Amravati.
9. Donella H. Meadows, Dennis L. Meadows, Jorgen Randers, William W. Behrens III, 1972, *Limits to Growth - Club of Rome's report*, Universe Books.
10. E G Seebauer & Robert L. Berry, 2000, *Fundamentals of Ethics for Scientists & Engineers ,* Oxford University Press
11. M Govindrajran, S Natrajan & V.S. Senthil Kumar, *Engineering Ethics (including Human Values)*, Eastern Economy Edition, Prentice Hall of India Ltd

12. B P Banerjee, 2005, *Foundations of Ethics and Management,* Excel Books.
13. B L Bajpai, 2004, *Indian Ethos and Modern Management*, New Royal Book Co., Lucknow. Reprinted 2008.

ACMP 101Manufacturing Practice

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PART A

1. Carpentry and Pattern Making: Various types of timber and practice boards,defects in timber, seasoning of wood; tools, wood operation and various joints; exercises involving use of important carpentry tools to practice various operations and making joints.

2. Foundry Shop: Introduction to molding materials; moulds; use of cores; melting furnaces; tools and equipment used in foundry shops; firing of a cupola furnace; exercises involving preparation of small sand moulds and castings.

3. Forging Practice: Introduction to forging tools; equipments and operations; forgability of metals; exercises on simple smithy; forging exercises.

4. Machine Shop: Machines, Grinders etc; cutting tools and operations; exercises involving awareness.

PART B

5. Welding Shop: Introduction to different welding methods; welding equipment; electrodes; welding joints; welding defects; exercises involving use of gas/electric arc welding.

6. Electrical and Electronics Shop: Introduction to electrical wiring; preparation of PCBs involving soldering applied to electrical and electronic applications; exercises preparation of PCBs involving soldering applied to electrical and electronic applications.

7. Sheet Metal: Shop development of surfaces of various objects; sheet metal forming and joining operations, joints, soldering and brazing; exercises involving use of sheet metal forming operations for small joints.

8. Fitting Shop: Introduction of fitting practice and tools used in fitting shop; exercise involving marking, cutting, fitting practice (Right Angles), male-Female mating parts practice, trapping practice.