

Applicable from the Academic Session 2013-14

BACHELOR OF TECHNOLOGY

(B.TECH) DEGREE COURSE

(Common to All Branches)

First Semester Examinations

Code No.	Paper	L	T/P	Credits
ETMA-101	Applied Mathematics-I	3	1	4
ETPH-103	Applied Physics-I	2	1	3
ETME-105	Manufacturing Processes	3	0	3
ETEC-107	Electronic Devices	3	0	3
ETHS-109	Human Values & Professional Ethics-I*	1	1	1
ETCS-111	Fundamentals of Computing	2	0	2
ETCH-113	Applied Chemistry	2	1	3
PRACTICAL/VIVA VOCE				
ETPH-151	Applied Physics Lab-I	-----	2	1
ETEC-153	Electronic Devices Lab	-----	2	1
ETME-155	Workshop Practice	-----	3	2
ETME-157	Engineering Graphics Lab	-----	3	2
ETCS-157	Fundamentals of Computing Lab	-----	2	1
ETCH-161	Applied Chemistry Lab	-----	2	1
ETEN-163	NCC/NSS**	-----	2	1
	Total	16	20	28

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**NUES. The camps/classes will be held either during Weekends/Holidays or Winter Vacations.

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Second Semester Examinations

Code No.	Paper	L	T/P	Credits
ETMA-102	Applied Mathematics-II	3	1	4
ETPH-104	Applied Physics-II	2	1	3
ETEE-106	Electrical Technology	3	0	3
ETCS-108	Introduction to Programming	3	0	3
ETME-110	Engineering Mechanics	2	1	3
ETHS-112	Communication Skills	2	1	3
ETEN-114	Environmental Studies	2	1	3
PRACTICAL/VIVA VOCE				
ETPH-152	Applied Physics Lab-II	-----	2	1
ETCS-154	Programming Lab	-----	2	1
ETEE-156	Electrical Technology Lab	-----	2	1
ETME-158	Engineering Mechanics Lab	-----	2	1
ETEN-160	Environmental Studies Lab	-----	2	1
	Total	17	15	27

APPLIED MATHEMATICS-I**Paper Code : ETMA-101****Paper : Applied Mathematics-I**

L	T	C
3	1	4

INSTRUCTIONS TO PAPER SETTERS:**MAXIMUM MARKS: 75**

1. Question No. 1 should be compulsory and cover the entire syllabus. This question should have objective or short answer type questions. It should be of 25 marks.
2. Apart from Question No. 1, rest of the paper shall consist of four units as per the syllabus. Every unit should have two questions. However, student may be asked to attempt only 1 question from each unit. Each question should be of 12.5 marks

Objective: The objective of the paper is to facilitate the student with the basics of Applied Mathematics that are required for an engineering student.

UNIT- I

Successive differentiation: Leibnitz theorem for n^{th} derivative (without proof). Infinite series: Convergence and divergence of infinite series, positive terms infinite series, necessary condition, comparison test (Limit test), D'Alembert ratio test, Integral Test, Cauchy's root test, Raabe's test and Logarithmic test(without proof). Alternating series, Leibnitz test, conditional and absolutely convergence. Taylor's and Maclaurin's expansion(without proof) of function (e^x , $\log(1+x)$, $\cos x$, $\sin x$) with remainder terms, Taylor's and Maclaurin's series, Error and approximation. [T1], [T2][No. of hrs. 12]

UNIT- II

Asymptotes to Cartesian curves. Radius of curvature and curve tracing for Cartesian, parametric and polar

curves. Integration: integration using reduction formula for $\int_0^{\pi/2} \sin^n \theta d\theta$, $\int_0^{\pi/2} \cos^n \theta d\theta$,

$\int_0^{\pi/2} \sin^n \theta \cos^m \theta d\theta$. Application of integration : Area under the curve, length of the curve, volumes and surface area of solids of revolution about axis only. Gamma and Beta functions. [T1],[T2][No. of hrs. 12]

UNIT- III

Matrices: Orthogonal matrix, Hermitian matrix, Skew-Hermitian matrix and Unitary matrix. Inverse of matrix by Gauss-Jordan Method (without proof). Rank of matrix by echelon and Normal (canonical) form. Linear dependence and linear independence of vectors. Consistency and inconsistency of linear system of homogeneous and non homogeneous equations. Eigen values and Eigen vectors. Properties of Eigen values (without proof). Cayley-Hamilton theorem (without proof). Diagonalization of matrix. Quadratic form, reduction of quadratic form to canonical form. [T1], [T2] [No. of hrs. 12]

UNIT-IV

Ordinary differential equations: First order linear differential equations, Leibnitz and Bernaulli's equation. Exact differential equations, Equations reducible to exact differential equations. Linear differential equation of higher order with constant coefficients, Homogeneous and non homogeneous differential equations reducible to linear differential equations with constant coefficients. Method of variation of parameters. Bessel's and Legendre's equations (without series solutions), Bessel's and Legendre's

functions and their properties. [T1],[T2]

[No. of hrs. 12]

Text:

[T1] B. S. Grewal, "Higher Engineering Mathematics" Khanna Publications.

[T2]. R. K. Jain and S.R.K. Iyengar, "Advanced Engineering Mathematics" Narosa Publications.

References:

[R1] E. kresyzig, "Advance Engineering Mathematics", Wiley publications

[R2] G.Hadley, "Linear Algebra" Narosa Publication

[R3] N.M. Kapoor, "A Text Book of Differential Equations", Pitambar publication.

[R4] Wylie R, "Advance Engineering mathematics", McGraw-Hill

[R5] Schaum's Outline on Linear Algebra, Tata McGraw-Hill

[R6] Polking and Arnold, "Ordinary Differential Equation using MatLab" Pearson.

APPLIED PHYSICS – I**Paper Code: ETPH – 103****L T C****Paper : Applied Physics – I****2 1 3****INSTRUCTIONS TO PAPER SETTERS:****MAXIMUM MARKS: 75**

1. Question No. 1 should be compulsory and cover the entire syllabus. This question should have objective or short answer type questions. It should be of 25 marks.
2. Every unit should have two questions. However, student may be asked to attempt only 1 question from each unit. Each question should be of 12.5 marks.

Objective: The objective of the paper is to facilitate the student with the basics of Applied Physics aspects that are required for his understanding of basic physics.

UNIT I

Interference: Introduction, Interference due to division of wave front: Fresnel's Biprism, Interference due to division of amplitude: wedge shaped film, Newton's rings.

Diffraction: Introduction, Difference between Fresnel and Fraunhofer diffraction, Single slit diffraction, Transmission diffraction grating, Absent spectra. [T1], [T2] **(No. of Hrs. 8)**

UNIT II

Polarization: Introduction, Uniaxial crystals, Double refraction, Nicol prism, Quarter and half wave plates, Theory of production of plane, circularly and elliptically polarized lights, Specific rotation, Laurents half shade polarimeter.

Laser: Spontaneous and stimulated emissions, Einstein's coefficients, Laser and its principle, He-Ne laser.

Fibre optics: Introduction, Single mode fibre, Step index and graded index multimode fibres, Acceptance angle and numerical aperture. [T1], [T2] **(No. of Hrs. 8)**

UNIT III

Theory of Relativity: Introduction, Frame of reference, Galilean transformation, Michelson-Morley experiment, Postulates of special theory of relativity, Lorentz transformations, Length contraction, Time dilation, Mass energy relation

Ultrasonics: Introduction, Production of ultrasonics by magnetostriction and Piezoelectric methods, Applications. [T1], [T2]

(No. of Hrs. 8)**UNIT IV**

Nuclear Physics: Introduction, Radioactivity, Alpha decay, Beta decay, Gamma decay, Q value, Threshold energy, Nuclear reactions, Nuclear fission: Liquid drop model, Nuclear fusion, Particle accelerators: Linear accelerator, Cyclotron, Radiation detectors: Ionization chamber, Geiger Mueller Counter. [T1] (No. of Hrs. 8)

Text Books:

[T1]. Arthur Beiser, 'Concepts of Modern Physics', [McGraw-Hill], 6th Edition 2009

[T2]. A. S.Vasudeva, 'Modern Engineering Physics', S. Chand, 6th Edition, 2013.

Reference Books

[R1]. A. Ghatak 'Optics', TMH, 5th Edition, 2013

[R2]. G. Aruldas 'Engineering Physics' PHI 1st Edition, 2010.

[R3]. Fundamentals of Optics : Jenkins and White , Latest Edition

[R4]. C. Kittel, "Mechanics", Berkeley Physics Course, Vol.- I.

[R5]. Feynman " The Feynman lectures on Physics Pearson Volume 3 Millennium Edition, 2013

[R6]. Uma Mukhrji 'Engineering Physics' Narosa, 3rd Edition, 2010.

[R7]. H.K. Malik & A. K. Singh 'Engineering Physics' [McGraw-Hill], 1st Edition, 2009.

MANUFACTURING PROCESSES

Paper Code: ETME 105

L T C

Paper: Manufacturing Processes

3 0 3

INSTRUCTIONS TO PAPER SETTERS:

MAXIMUM MARKS: 75

1. Question No. 1 should be compulsory and cover the entire syllabus. This question should have objective or short answer type questions. It should be of 25 marks.
2. Every unit should have two questions. However, student may be asked to attempt only 1 question from each unit. Each question should be of 12.5 marks.

Objective: The Objective of the paper is to facilitate the student with the basic Manufacturing processes.

UNIT-I

Introduction: Introduction of Manufacturing processes and their classification, Basic Metals & Alloys : Properties and Applications. Properties of Materials: Strength, elasticity, stiffness, malleability, ductility, brittleness, toughness and hardness. Ferrous Materials: Carbon steels, its classification based on % carbon as low, mild, medium & high carbon steel, its properties & applications. Wrought iron. Cast iron. Alloy steels: stainless steel, tool steel. Elementary introduction to Heat- treatment of carbon steels: annealing, normalizing, quenching & tempering and case-hardening.

Non-Ferrous metals & alloys: Properties and uses of various non-ferrous metals & alloys and its composition such as Cu-alloys: Brass, Bronze, Al-alloys such as Duralumin.

Casting Processes:

Principles of metal casting, Pattern materials, types and allowance, composition and properties of moulding sand, foundry tools, concept of cores and core print, elements of gating system, description and operation of cupola, special casting processes e.g. die-casting; permanent mould casting; centrifugal casting; investment casting; casting defects.(T₁, T₂, R₁, R₂, R₃, R₄, R₅) [No. of Hrs.12]

Unit-II

Smithy and Forging:

Hot working and cold working, Forging tools and equipments, Forging operations, Forging types: Smith forging, Drop forging, Press forging, Machine forging; Forging defects; Extrusion, wire drawing, swaging.

Bench Work and Fitting:

Fitting shop tools, operation: Fitting; sawing; chipping; thread cutting (with taps and dies); Marking and marking tools. [No. of Hrs. 12] (T₁, T₂, R₁, R₂, R₃, R₄, R₅)

UNIT-III

Metal joining: Welding principles, classification of welding techniques, Oxyacetylene Gas welding, equipment and field of application, Arc-welding, metal arc, Carbon arc welding, submerged arc welding and atomic hydrogen welding, TIG and MIG welding, Electric resistance welding: spot;

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seam; flash; butt and percussion welding, Flux: composition; properties and function, Electrodes, Types of joints and edge preparation, Brazing and soldering, welding defects.

[No. of Hrs. 12] (T₁, T₂, R₁, R₂, R₃, R₄, R₅)

UNIT-IV

Sheet Metal Work:

Tools and equipments used in sheet metal work, metals used for sheets, standard specification for sheets, Types of sheet metal operations: shearing, drawing, bending. Other operations like spinning, stretch forming, embossing and coining.

Powder Metallurgy: Introduction of powder metallurgy process: powder production, blending, compaction, sintering.

[No. of Hrs. 12] (T₁, T₂, R₁, R₂, R₃, R₄, R₅)

Text Books:

[T1]. Manufacturing Process by Raghuvanshi.(Dhanpat Rai and Co.)

[T2]. Manufacturing Technology by P.N.Rao (TMH publications)

Reference Books:

[R1]. Workshop Technology by Hazra-Chowdhary (Media Promoters and Publishers Pvt. Ltd.)

[R2]. Production Engineering by R.K.Jain (Khanna Publishers)

[R3]. Workshop Technology by Chapman (Elsevier Butterworth-Heinemann)

[R4]. Fundamentals of Modern Manufacturing by Mikell P. Groover (Wiley India Edition)

[R5]. Manufacturing Processes for Engineering Materials by Kalpakjian and Schmid (Pearson)

ELECTRONIC DEVICES

Paper Code: ETEC-107
Paper : Electronic Devices

L	T	C
3	0	3

INSTRUCTIONS TO PAPER SETTERS:

MAXIMUM MARKS: 75

1. This is the first introductory course in Electronics Engineering to the students of all the branches of engineering during the first year.
2. Question No.1 should be compulsory and cover the entire syllabus. This question should have objective or short answer type questions from each unit. It should be of 25 marks.
3. Every unit should have two questions. However, student may be asked to attempt only 1 question from each unit. Each question should be of 12.5 marks.

Objective: Objective of the paper is to facilitate the student with the basics of electronic aspects that are required for his understanding and applications in their respective field of study. The pre-requisites are, to have a basic understanding of Applied Physics and Mathematics.

UNIT-I

EVALUATION OF ELECTRONICS: INTRODUCTION & APPLICATION OF ELECTRONICS, ENERGY BAND THEORY OF CRYSTALS, ENERGY BAND STRUCTURES IN METALS, SEMICONDUCTORS AND INSULATORS, THEORY OF SEMICONDUCTORS: CLASSIFICATION OF SEMICONDUCTORS, CONDUCTIVITY OF SEMICONDUCTORS, CARRIER CONCENTRATION IN INTRINSIC & EXTRINSIC SEMICONDUCTORS, PROPERTIES OF INTRINSIC AND EXTRINSIC SEMICONDUCTORS, VARIATION IN SEMICONDUCTORS PARAMETERS WITH TEMPERATURE, FERMI-DIRAC FUNCTION, FERMI LEVEL IN A SEMICONDUCTOR HAVING IMPURITIES, BAND STRUCTURE OF OPEN-CIRCUITED P-N JUNCTION, DRIFT AND DIFFUSION CURRENTS, CARRIER LIFE TIME, CONTINUITY EQUATION (ELEMENTARY TREATMENT ONLY)

[T1], [T2], [T3]

[NO. OF HOURS: 12]

UNIT – II

Theory of p-n junction Diode: Diode Current Equation, Diode Resistance, Transition Capacitance, Diffusion Capacitance, (Elementary treatment only), Effect of Temperature on p-n Junction Diode, Switching Characteristics, Piecewise Linear Model, **Special Diodes:** Zener Diode, Varactor Diode, Tunnel Diode, Photodiode, Light Emitting Diodes, Schottky Barrier Diode, **Applications of Diodes:** Half-Wave Diode Rectifier, Full-Wave Rectifier, Clippers and Clampers (Elementary treatment only). [T1], [T2], [T3] **[No. of Hours: 11]**

UNIT – III

Bipolar junction transistor: Introduction of transistor, construction, transistor operations, BJT characteristics, load line, operating point, leakage currents, saturation and cut off mode of operations, Eber-moll's model. [T1], [T2], [T3] **[No. of Hours: 11]**

Unit – IV

Application of BJT: CB, CE, CC configurations, hybrid model for transistor at low frequencies, Introduction to FETs and MOSFETs.

Fundamentals of digital electronics: Digital and analog signals, number systems, Boolean algebra, logic gates with simple applications, logic gates, karnaugh maps. [T1], [T2], [T3] **[No. of Hours: 11]**

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TEXT BOOKS

1. S. Salivahanan, N. Suresh Kr. & A. Vallavaraj, "Electronic Devices & Circuit", Tata McGraw Hill, 2008
2. Millman, Halkias and Jit, "Electronic devices and circuits" McGraw Hill
3. Boylestad & Nashelsky, "Electronic Devices & Circuits", Pearson Education, 10TH Edition.

REFERENCE BOOKS

1. Sedra & Smith, "Micro Electronic Circuits" Oxford University Press, VI Edition
2. Robert T. Paynter, "Introducing Electronic Devices & Circuits", Pearson Education, VII Edition, 2006

HUMAN VALUES & PROFESSIONAL ETHICS

Paper Code: ETHS-109	L	T	C
Paper : Human Values & Professional Ethics	1	1	1

Non-University Examination Scheme (NUES)

Note: There will be no End-Term External University Examination. Marks are to be given on the basis of two internal sessional test of 30 marks each and one final Viva-voce project report Examination of 40 marks.

Course Objectives

This introductory course input is intended

- a. To help the students appreciate the essential complementarity between ‘VALUES’ and ‘SKILLS’ to ensure sustained happiness and prosperity which are the core aspirations of all human beings.
- b. To facilitate the development of a holistic perspective among students towards life, profession and happiness, based on the correct understanding of the Human reality and the rest of the Existence. Such a Holistic perspective forms the basis of value-based living in a natural way.
- c. To highlight plausible implications of such a Holistic understanding in terms of ethical human conduct, trustful and mutually satisfying human behavior and mutually enriching interaction with Nature.

Unit 1: Introduction to Value Education

No. of lectures: 03+1

1. Understanding the need, basic guidelines, content and process for value education.
2. Basic Human Aspirations: Prosperity and happiness
3. Methods to fulfil the human aspirations – understanding and living in harmony at various levels.
4. Practice Session – 1. [T1], [R1], [R4]

Unit 2: Harmony in the Human Being
05+1

No. of lectures:

1. Co-existence of the sentient “I” and the material body – understanding their needs – Happiness & Conveniences.
2. Understanding the Harmony of “I” with the body – Correct appraisal of physical needs and the meaning of prosperity.
3. Programme to ensure harmony of “I” and Body-Mental and Physical health and happiness.
4. Harmony in family and society: Understanding Human-human relationship in terms of mutual trust and respect.

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5. Understanding society and nation as extensions of family and society respectively.

6. Practice Session – 02 [T2], [R1], [R2]

Unit 3: Basics of Professional Ethics

No. of lectures: 04+1

1. **Ethical Human Conduct** – based on acceptance of basic human values.

2. **Humanistic Constitution and universal human order** – skills, sincerity and fidelity.

3. **To identify the scope and characteristics of people** – friendly and eco-friendly production system,

Technologies and management systems.

4. Practice Session – 03. [T1],[R4]

Unit 4: Professional Ethics in practice

No. of lectures: 04+1

1. **Profession and Professionalism** – Professional Accountability, Roles of a professional, Ethics and image of profession.

2. **Engineering Profession and Ethics** - Technology and society, Ethical obligations of Engineering professionals, Roles of Engineers in industry, society, nation and the world.

3. **Professional Responsibilities** – Collegiality, Loyalty, Confidentiality, Conflict of Interest, Whistle Blowing

4. Practice Session – 04 [T1], [T2], [T3], [R3]

Text Books:

[T1] Professional Ethics, R. Subramanian, Oxford University Press.

[T2] Professional Ethics & Human Values: S.B. Srivasthva, SciTech Publications (India) Pvt. Ltd. New Delhi.

[T3] Professional Ethics & Human Values: Prof. D.R. Kiran, TATA Mc Graw Hill Education.

References:

[R1] Success Secrets for Engineering Students: Prof. K.V. SubbaRaju, Ph.D., Published by SMARTstudent.

[R2] Ethics in Engineering Mike W. Martin, Department of Philosophy, Chapman University and Roland Schinzinger, School of Engineering, University of California, Irvine.

[R3] Human Values: A. N. Tripathy (2003, New Age International Publishers)

[R4] Value Education website, <http://www.universalthumanvalues.info>[16]

[R5] Fundamentals of Ethics, Edmond G. Seebauer & Robert L. Barry, Oxford University Press.

[R6] Human Values and Professional Ethics: R. R. Gaur, R. Sangal and G. P. Bagaria, Eecel Books (2010, New Delhi). Also, the Teachers' Manual by the same author.

***PRACTICAL SESSIONS OF 14 HOME ASSIGNMENTS** will be followed by the students pursuing this paper. (Ref: Professional Ethics & Human Values: S.B. Srivastava, SciTech Publications (India) Pvt. Ltd. New Delhi.)

CONTENT OF PRACTICE SESSION

Module 1: Course Introduction – Needs, Basic Guidelines, Content and Process of Value Education

PS-1: Imagine yourself in detail. What are the goals of your life? How do you set your goals in your life? How do you differentiate between right and wrong? What have been your achievements and shortcoming in your life? Observe and analyze them.

Expected Outcome:

The students start exploring themselves; get comfortable to each other and to the teacher and start finding the need and relevance for the course.

PS-2: Now a days there is lot of voice about techno-genie maladies such as energy and natural resource depletion, environmental Pollution, Global Warming, Ozone depletion, Deforestation, etc. – all these scenes are man made problems threatening the survival of life on the earth – what is root cause of these maladies and what is the way out in your opinion?

On the other hand there is rapidly growing danger because of nuclear proliferation, arm race, terrorism, criminalization of politics, large scale corruption, scams, breakdown of relationships, generation gap, depression and suicidal attempts, etc - what do you think the root cause of these threats to human happiness and peace – what could be the way out in your opinion?

Expected Outcome:

The students start finding out that technical education with study of human values can generate more problems than solutions. They also start feeling that lack of understanding of human values is the root cause of all the problems and the sustained solution could emerge only through understanding of human values and value based living. Any solutions brought out through fear, temptation or dogma will not be sustainable.

PS-3: 1. Observe that each one of us has Natural Acceptance, based on which one can verify right or not right for him. Verify this in case of following

- What is naturally acceptable to you in relationship – feeling of respect or disrespect?
 - What is naturally acceptable to you - to nurture or to exploit others? Is your living the same as your natural acceptance or different?
2. Out of three basic requirements for fulfillment of your aspirations, right understanding, relationship and physical facilities, observe how the problems in your family are related to each. Also observe how much time and efforts you devote for each in your daily routine.

Expected Outcome:

1. The students are able to see that verification on the basis of natural acceptance and experiential validation through living is the only way to verify the right or wrong, and referring to any external source life text or instrument or any other person cannot enable them to verify with authenticity, it will only develop assumptions.
2. The students are able to see that their practice in living is not in harmony with their natural acceptance at most of the time, and all they need to do is to refer to their natural acceptance to remove this disharmony.
3. The students are able to see that lack of right understanding leading to lack of relationship is the major cause of the problems in their family and the lack of physical facilities in most of the cases; while they have given higher priority to earning of physical facilities in their life ignoring relationship and not being aware that right understanding is the most important requirement for any human being.

Module 2: Understanding harmony in human being – Harmony in myself!

PS-4: Prepare the list of your desires. Observe whether the desires are related with self “I” or body. If it appears to be related with the both, see which part of it is related to self “I” and which part is related to body.

Expected Outcome:

The students are able to see that they can enlist their desires and the desires are not vague, also they are able to relate their desires to “I” and “body” distinctly. If, any desire appears to be related with both, they are able to see that feeling is related to “I” while the physical facility is related to the body. They are also able to see that “I” and “body” are two realities, and most of their desires are related to “I” and not with the “Body”; while their efforts are mostly connected on the fulfillment of the need of the body assuming that it will meet the needs of “I” too.

PS-5:

1. {A}. Observe that any physical facilities you use, follows the given sequence with time; Necessary and tasteful – unnecessary & tasteful – unnecessary & tasteless.
 {B}. In contrast, observe that any feelings in you are either naturally acceptable or not acceptable at all. If, naturally acceptable, you want it continuously and if not acceptable, you do not want it at any moment.
2. List Down all your activities. Observe whether the activity is of “I” or of “body” or with the participation both “I” and “body”.
3. Observe the activities with “I”. Identify the object of your attention for different moments (over a period say 5 to 10 minute) and draw a line diagram connecting these points. Try to observe the link between any two nodes.

Expected Outcome:

1. The students are able to see that all physical facilities they use are required for limited time in a limited quantity. Also they are able to see that cause of feeling, they want continuity of the naturally acceptable feelings and they do not want feelings which are not naturally acceptable eve for a single moment.
2. The students are able to see that activities like understanding, desires, thoughts and selection are the activities of “I” only; the activities like breathing, palpitation of different parts of the body are fully the activities of the body. With the acceptance of “I”, while activities they do with their sense organs like hearing through ears, seeing through eyes, sensing through touch, tasting through tongue and smelling through nose or the activities they do with their work organs like hands, legs, etc. are such activities that require the participation of both “I” and “body”
3. The students become aware of their activities of “I” and start finding their focus of attention at different moments. Also they are able see that most of their desires are coming from outsides (through preconditioning or sensation) and are not based on their natural acceptance.

- PS-6:**
1. Chalk out the program to ensure that you are responsible to your body – for the nurturing, protection and right utilization of the body.
 2. Find out the plants and shrubs growing in and your campus. Find out their use for curing different diseases.

Expected Outcome:

The students are able to list down activities related to a proper upkeep of the body and practice them in their daily routine. They are also able to appreciate the plants wildly growing in and around the campus which can be beneficial in curing the different diseases.

Module 3: Understanding harmony in the family and society - Harmony in Human – Human relationship

PS-7: Form small groups in the class and in that group initiate the dialogue and ask the eight questions related to trust. The eight questions are-

S.No.	Intention (Natural Acceptance)	S.No.	Competence
1.a.	Do I want to make myself happy?	1.b.	Am I liable to make myself always Happy?
2.a.	Do I want to make the other happy?	2.b.	Am I liable to make the other always happy?
3.a.	Does the other want to make him happy?	3.b.	Is the other able to make him always happy?
4.a.	Does the other want to make me happy? What is answer?	4.b.	Is the other able to make me always happy? What is answer?

Let each student answer the question for himself and everyone else. Discuss the difference between intention and competence.

Expected Outcome:

The students are able to see that the first four questions are related to our natural acceptance i.e. intention and the next four to our competence. They are able to note that the intention is always correct, only competence is lacking. We generally evaluate ourselves on the basis of our intention and other on the basis of their competence. We seldom look at our competence and other's intention as a result we conclude that I am a good person and other is a bad person.

PS-8:

1. Observe that on how many occasions you are respecting your related ones (by doing the right evaluation) and on how many occasion you are disrespecting by way of under evaluation, over evaluation or otherwise evaluation.
2. Also observe whether your feeling of respect is based on treating the other as yourself or on differentiations based on body, physical facilities or beliefs.

Expected Outcome:

The students are able to see that respect is right evaluation and only right evaluation leads to fulfilment of relationship. Many present problems in the society are an outcome of differentiation (lack of understanding of respect) like gender biasness, generation gap, caste conflicts, class struggle, and domination through poor play, communal violence, and clash of isms and so on so forth.

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All these problems can be solved by realizing that the other is like me as he has the same natural acceptance, potential and program to ensure a happy and prosperous life for him and for others though he may have different body, physical facilities or beliefs.

PS-9:

1. Write a note in the form of a story, poem, skit, essay, narration, dialogue, to educate a child. Evaluate it in a group.
2. Develop three chapters to introduce “social science”, its needs, scope and content in the primary education of children.

Expected Outcome:

The students are able to use their creativity for educating children. The students are able to see that they can play a role in providing value education for children. They are able to put in simple words the issues that are essential to understand for children and comprehensible to them. The students are able to develop an outline of holistic model for social science and compare it with the existing model.

Module 4: Understanding harmony in the nature and existence – Whole existence as Co – existence -

PS-10: Prepare the list of units (things) around you. Classify them into four orders. Observe and explain the mutual fulfilment of each unit with other orders.

Expected Outcome:

The students are able to differentiate between the characteristics and activities of different orders and study the mutual fulfilment among them. They are also able to see that human beings are not fulfilling to their orders today and need to take appropriate steps to ensure right participation (in term of nurturing, protection and right utilization) in the nature.

PS-11:

1. Make a chart for the whole existence. List down different courses of studies and relate them to different or levels in the existence.
2. Choose any one subject being taught today. Evaluate and suggest suitable modifications to make it appropriate and holistic.

Expected Outcome:

The students are confident that they can understand the whole existence; nothing is a mystery in this existence. They are also able to see the interconnectedness in the nature, and point out how

different courses of study relate to the different units and levels. Also they are liable to make out how these courses can be made appropriate and holistic.

Module 5: Implication of the above Holistic Understanding of Harmony at all Levels of Existence.

PS-12: Choose any two current problem of different kind in the society and suggest how they can be solved on the basis of the natural acceptance of human values. Suggest the steps you will take in present conditions.

Expected Outcome:

The students are liable to present sustainable solutions to the problem in society and nature. They are also able to see that these solutions are practicable and draw road maps to achieve them.

PS-13:

1. Suggest ways in which you can use your knowledge of engineering / technology / management for universal human order from your family to world family.
2. Suggest one format of humanistic constitution at the level of nation from your side.

Expected Outcome:

The students are able to grasp the right utilization of their knowledge in their streams of technology / engineering / management to ensure mutually enriching and recyclable production systems.

PS-14: The course is going to be over now. Evaluate your state before and after the course in terms of-

- Thoughts
- Behavior
- Work and
- Realization

Do you have any plan to participate in the transition of the society after graduating from the institute? Write a brief note on it.

Expected Outcome:

The students are able to sincerely evaluate the course and share with their friends. They are also able to suggest measures to make the course more effective and relevant. They are also able to make use of their understanding in the course for happy and prosperous society.

FUNDAMENTALS OF COMPUTING

Paper Code: ETCS-111

L T C

Paper: Fundamentals of Computing

2 0 2

INSTRUCTIONS TO PAPER SETTERS:

Maximum Marks : 75

1. Question No. 1 should be compulsory and cover the entire syllabus. This question should have objective or short answer type questions. It should be of 25 marks.

2. Apart from Question No. 1, rest of the paper shall consist of four units as per the syllabus. Every unit should have two questions. However, student may be asked to attempt only 1 question from each unit. Each question should be 10 marks

Objective: The objective of the paper is to facilitate the student with applied working knowledge of computers. This is the first course of computing and does not assume any pre-requisite.

UNIT I

Five Component Model of a Computer, System and Application software (introduction) storage devices , primary (RAM, ROM, PROM, EPROM, cache) Memory and secondary (magnetic tape, hard disk, Compact disks) memory , peripheral devices , printers [T1], [T2] **(8 Hours)**

UNIT II

Operating Systems: DOS Internal, External commands, Windows (2000 and NT) , Overview of architecture of Windows , tools and system utilities including registry , partitioning of hard disk , Overview of Linux architecture , File system , file and permissions , concept of user and group , installation of rpm and deb based packages [T1], [T2]. **(8 Hours)**

UNIT III

Basics of programming through flow chart , Networking Basics - Uses of a network and Common types of networks , Network topologies and protocols , Network media and hardware , Overview of Database Management System[T1][T2], [R1]. **(8 Hours)**

UNIT IV

Libre / Open Office Writer : Editing and Reviewing, Drawing, Tables, Graphs, Templates

Libre / Open Office Calc : Worksheet Management , Formulas, Functions, Charts

Libre / Open Office Impress: designing powerful power-point presentation [R2][R3] **(8 Hours)**

Text:

[T1] Peter Norton, Introduction to computers, Sixth Edition Tata McGraw Hill (2007).

[T2] Andrews Jean, A+Guide to Managing & Maintaining Your PC, Cengage Publication 6/e

References:

[R1] Anita Goel, Computer Fundamentals, Pearson Education.

[R2] Joiner Associates Staff, Flowcharts: Plain & Simple: Learning & Application Guide , Oriel Inc

[R3] <http://www.openoffice.org/why/>

[R4] <http://www.libreoffice.org/get-help/documentation/>

Applicable from the Academic Session 2013-14.

Applied Chemistry

Paper Code: ETCH – 113
Paper : Applied Chemistry

L	T	C
2	1	3

INSTRUCTIONS TO PAPER SETTER:

MAXIMUM MARKS: 75

1. Question No. 1 should be compulsory and cover the entire syllabus. This question should have objective or short answer type questions. It should be of 25 marks.

2. Each unit should have two questions. However, student may be asked to attempt only 1 question from each unit. Each question should be of 12.5 marks.

Objective: The objective of the paper is to facilitate the student with the basics of Applied Chemistry aspects that are required for his understanding of basic chemistry

UNIT I: FUELS

Definition, Classification & Calorific value of fuels (gross and net), Dulong's formula (**Numericals**), Determination of calorific value of fuels using bomb's calorimeter (**Numericals**), Determination of calorific value of fuels using Boy's Gas Calorimeter (**Numericals**), Cracking – Thermal & catalytic cracking, Octane & Cetane numbers with their significance. High & Low temperature carbonization, Manufacture of coke (Otto – Hoffmann oven) Proximate and ultimate analysis of Coal (**Numericals**) Combustion of fuels (**Numericals**). [T1,T2] **[No. of hrs. 08]**

UNIT II: THE PHASE RULE & CATALYSIS

Definition of various terms, Gibb's Phase rule & its derivation, Application of phase rule to One component system- The water system, Application of phase rule to Two component system- The Lead-Silver system (Pattinson's process).

Catalyst and its characteristics, Types of catalysts, Concept of promoters, inhibitors and poisons. Theories of catalysis: Intermediate compound formation theory, adsorption or contact theory. Application of catalysts for industrially important processes Enzyme catalysis: Characteristics, Kinetics & Mechanism of enzyme catalysed reaction (Michaelis-Menten equation), Acid-Base catalysis: Types, Kinetics & Mechanism, Catalysis by metals salts (Wilkinson's Catalyst), Auto-catalysis, Heterogeneous catalysis (Langmuir-Hinshelwood mechanism. [T1,T2] **[No. of hrs. 08]**

UNIT III: WATER

Introduction and specifications of water , Hardness and its determination by EDTA method (**Numericals**), Alkalinity and its determination (**Numericals**), Reverse Osmosis, Electrodialysis, Disinfection by break-point chlorination. Boiler feed water, boiler problems– scale, sludge, priming & foaming: causes & prevention, Boiler problems– caustic embrittlement & corrosion: causes & prevention, Water Softening by Internal Treatment: carbonate & phosphate conditioning, colloidal conditioning & calgon treatment Water Softening by External Treatment: Lime-Soda Process (**Numericals**) Zeolite & Ion-Exchange Process. [T1,T2] **[No. of hrs. 08]**

UNIT IV: CORROSION & ITS CONTROL

Causes, effects & consequences; Chemical or Dry corrosion & its mechanism (Pilling-Bedworth Rule) Electrochemical or Wet Corrosion & Its mechanism, Rusting of Iron Passivity, Galvanic series, Galvanic Corrosion, Soil Corrosion Pitting Corrosion, Concentration Cell or Differential Aeration Corrosion, Stress Corrosion. Factors Influencing Corrosion: Nature of metal and nature of corroding environment; Protective measures: Galvanization, Tinning Cathodic Protection, Sacrificial Anodic protection, Electroplating, Electroless plating, Prevention of Corrosion by Material selection & Design. [T1,T2] [No. of hrs. 08]

Text Books:

- [T1] P. C. Jain & Monika Jain, *Engineering Chemistry*, Latest edition, Dhanpat Rai Publishing Co., 2002.
- [T2] P. Mathew, *Advance Chemistry*, 1 & 2 Combined Editions, Cambridge University Press, 2003.

Reference Books:

- [R1] P. W. Atkins and J. De Paula, *Atkins' Physical Chemistry*, Oxford, 2010.
- [R2] T. Engel and P. Reid, *Physical Chemistry*, Pearson Education, 2013.
- [R3] K. Qanungo, *Engineering Chemistry*, PHI Learning Private Limited, New Delhi, 2009.
- [R4] O. G. Palanna, *Engineering Chemistry*, Tata McGraw Hill Education Private Limited, 2012.
- [R5] D. A. Jones, *Principles and Prevention of Corrosion*, Prentice Hall, 2nd Edition, 1996.
- [R6] H. K. Chopra and A. Parmar, *Engineering Chemistry- A Text Book*, Narosa Publishing House, 2012.
- [R7] S. Chawla, *Engineering Chemistry-All India Edition*, Dhanpat Rai & Co., 2003.
- [R8] R. Gadi, S. Rattan and S. Mohapatra, *Environmental Studies*, S.K. Kataria & Sons, 2nd Edition 2009.

APPLIED PHYSICS LAB – I

Paper Code: ETPH-151
Paper : Applied Physics Lab – I

P C
2 1

LIST OF EXPERIMENTS

1. To determine the wavelength of sodium light by Newton's Rings.
2. To determine the wavelength of sodium light by Fresnel's biprism.
3. To determine the wavelength of sodium light using diffraction grating.
4. To determine the refractive index of a prism using spectrometer.
5. To determine the dispersive power of prism using spectrometer and mercury source.
6. To determine the specific rotation of cane sugar solution with the help of half shade polarimeter.
7. To find the wavelength of He-Ne laser using transmission diffraction grating.
8. To determine the numeral aperture (NA) of an optical fibre.
9. To plot a graph between the distance of the knife-edge from the center of the gravity and the time period of bar pendulum. From the graph, find
 - (a) The acceleration due to gravity
 - (b) The radius of gyration and the moment of inertia of the bar about an axis.
10. To determine the velocity of ultrasound waves using an ultrasonic spectrometer in a given liquid (Kerosene Oil).
11. To verify inverse square law.
12. To determine Planck's constant.

Text Books:

[T1] C. L. Arora 'B. Sc. Practical Physics' S. Chand

Note: Any 8-10 experiments out of the list may be chosen. Proper error – analysis must be carried out with all the experiments.

Electronic Devices

Paper Code: ETEC-153
Paper: Electronic Devices

P	C
2	1

LIST OF EXPERIMENTS

1. Introduction to C.R.O, Function Generator& Bread Board Kit & to generate different types of waveform with the help of Function Generator & to calculate their frequency, amplitude AC & DC voltage.
2. Identification & testing of Active & passive components
3. To plot V-I characteristics of a semiconductor diode & Calculate Static & Dynamic Resistance
4. To Study the Reverse characteristics of Zener diode
5. To Study the Rectifier circuit.
 - a) Half Wave Rectifier
 - b) Centre Tapped Rectifier.
 - c) Bridge Rectifier.
6. To Study the output waveforms of different Filter Ckts of Rectifier.
7. To Plot Input & Output characteristics CB transistor.
8. To Plot Input & Output characteristics of CE transistor.
9. Realization of basic gates.
10. Implementation of Boolean functions (two or three variables).
11. Few experiments mentioned above to be performed on P-spice.
12. To develop a working model of any electronic circuit.

Note:- Any 8-10 Experiments out of the list may be chosen.

WORKSHOP PRACTICE

Paper Code: ETME-155
Paper: Workshop Practice

P C
3 2

LIST OF EXPERIMENTS***Sheet Metal Shop***

1. To study the tools and machineries used in sheet metal shop.
2. To make a tray using sheet metal tools.
3. To make a Funnel using sheet metal tools.
4. To make a cylindrical mug in sheet metal shop.

Foundry Shop

5. To make a mould in Foundry Shop.

Carpentry Shop

6. To make a half lap T-joint in Carpentry Shop.
7. To make a half cross lap joint in Carpentry Shop.
8. To make a pattern using Carpentry Tools.

Welding Shop

9. To study arc and gas welding equipments and tools.
10. To make Lap Joint, T-Joint and Butt Joint in Welding shop.

Fitting Shop

11. To make V-Section and T-Slot in fitting shop.

Machine Shop

12. To study basic operations on lathe, shaper, milling, drilling and grinding machines..
13. To perform step turning, knurling and threading operations on lathe.
14. To prepare a simple job on shaper.

Note:- Any 8-10 Experiments out of the list may be chosen.

ENGINEERING GRAPHICS**Paper Code: ETME-157****P C****Paper: Engineering Graphics Lab****3 2****LIST OF EXPERIMENTS****UNIT - I**

General: Importance, Significance and scope of engineering drawing, Lettering, Dimensioning, Scales, Sense of proportioning, Different types of projections, Orthographic Projection, B.I.S. Specifications,

Projections of Point and Lines: Introduction of planes of projection, Reference and auxiliary planes, projections of points and Lines in different quadrants, traces, inclinations, and true lengths of the lines, projections on Auxiliary planes, shortest distance, intersecting and non-intersecting lines.

(T₁, T₂, R₁, R₂, R₃)**Unit - II**

Planes other than the Reference Planes: Introduction of other planes (perpendicular and oblique), their traces, inclinations etc., Projections of points and lines lying in the planes, conversion of oblique plane into auxiliary Plane and solution of related problems.

Projections of Plane Figures: Different cases of plane figures (of different shapes) making different angles with one or both reference planes and lines lying in the plane figures making different given angles (with one of both reference planes). Obtaining true shape of the plane figure by projection.

(T₁, T₂, R₁, R₂, R₃)**Unit - III**

Projection of Solids: Simple cases when solid are placed in different positions, Axis faces and lines lying in the faces of the solid making given angles.

(T₁, T₂, R₁, R₂, R₃)**Unit-IV****Isometric Projection of plain surface and bodies.**(T₁, T₂, R₁, R₂, R₃)**Text Books:**

[T1] Engineering drawing by N.D.Bhatt (Charotar Publications).

[T2] Engineering Drawing by S.C.Sharma & Navin Kumar (Galgotia Publications)

Reference Books:

[R1] Engineering Drawing by Venugopalan, (New Age International).

[R2] Engineering Drawing by P.S.Gill (S.K. Kataria & Sons)

[R3] Engineering Graphics by K.C.John (PHI)

Note:- Any 8-10 Experiments out of the list may be chosen.

FUNDAMENTAL OF COMPUTING LAB**Paper Code: ETCS 157****P C****Paper: Fundamental of Computing Lab****2 1****LIST OF EXPERIMENTS**

For program development an IDE e.g. CodeBlock^[a], Eclipse CDT^[b], Netbeans^[c] is recommended

1. Dismantling a PC Part -1
2. Dismantling a PC Part -2
3. Internal and External commands of DOS
4. System utilities of windows including regedit
5. Installation of any rpm or debianlinux distribution with emphasis on drive partitioning
6. Installation of rpm and deb based packages
7. Understanding of File system of Linux
8. Creating user and group (through CLI)
9. Understanding and working knowledge of .Libre / Open Office Writer
: Editing and Reviewing, Drawing, Tables, Graphs, Templates
10. Understanding and working knowledge of Libre / Open Office Calc
11. Understanding and working knowledge Libre / Open Office Impress
12. Understanding of flow chart development through Dia *
13. Two Mini Projects based on the skills learned in experiments 1-12
 - [Dia] <http://projects.gnome.org/dia/>

Note:- Any 8-10 Experiments out of the list may be chosen.

APPLIED CHEMISTRY LAB**Paper Code –ETCH-161****P C****Paper : Applied Chemistry Lab****2 1****LIST OF EXPERIMENTS**

1. Determination of alkalinity of water sample.
2. Determination of hardness of water sample by EDTA method.
3. Determine the percentage composition of sodium hydroxide in the given mixture of sodium hydroxide and sodium chloride.
4. Determine the amount of oxalic acid and Sulphuric acid in one litre of solution, given standard sodium hydroxide and Potassium Permanganate.
5. Determine the amount of copper in the copper ore solution, provided hypo-solution (Iodometric Titration).
6. Determine the amount of chloride ions present in water using silver nitrate (Mohr's Precipitation Method).
7. Determine the strength of MgSO₄ solution by Complexometric titration.
8. Determine the surface tension of a liquid using drop number method.
9. Determine the viscosity of a given liquid (density to be determined).
10. Determine the cell constant of conductivity cell and titration of strong acid/strong base conductometrically.
11. To determine (a) λ max of the solution of KMnO₄. (b) Verify Beer's law and find out the concentration of unknown solution by spectrophotometer.
12. Determination of the concentration of iron in water sample by using spectrophotometer.
13. Determination of the concentration of Iron (III) by complexometric titration.
14. Proximate analysis of coal.
15. Determination of eutectic point and congruent melting point for a two component system by method of cooling curve.

(At least 8 to 10 experiments are to be performed)

Suggested Books:

1. [A. I. Vogel](#), [G. H. Jeffery](#), *Vogel's Text Book of Quantitative Chemical Analysis*, Published by Longman Scientific & Technical, 5th Edition, 1989.
2. S. Chawla, *Essentials of Experimental Engineering Chemistry*, Dhanpat Rai & Co., 3rd Edition, 2008.
3. S. Rattan, *Experiments in Applied Chemistry*, Published by S.K.Kataria & Sons, 2nd Edition, 2003.
4. O. P. Pandey, D. N. Bajpai and S. Giri, *Practical Chemistry*, Published by S. Chand, 2005.
5. M. S. Kaurav, *Engineering Chemistry with Laboratory Experiments*, Published by PHI Learning Private Limited, 2011.
6. S. K. Bhasin and Sudha Rani, *Laboratory Manual on Engineering Chemistry*, Published by Dhanpat Rai Publishing Company, 2006.

Note:- Any 8-10 Experiments out of the list may be chosen.

APPLIED MATHEMATICS-II**Paper Code : ETMA-102**

L	T	C
3	1	4

Paper : APPLIED MATHEMATICS-II**INSTRUCTIONS TO PAPER SETTERS:****Maximum Marks: 75**

1. Question No. 1 should be compulsory and cover the entire syllabus. This question should have objective or short answer type questions. It should be of 25 marks.
2. Apart from Question No. 1, rest of the paper shall consist of four units as per the syllabus. Every unit should have two questions. However, student may be asked to attempt only 1 question from each unit. Each question should be 12.5 marks.

Objective: The objective of the paper is to facilitate the student with the basics of Applied Mathematics that are required for an engineering student.

Unit –I

Partial differentiation and its Applications: Partial derivatives of first and second order. Euler's theorem for homogeneous functions (without proof). Derivatives of Implicit Functions, total derivatives. Change of variables. Jacobian. Taylor's theorem for function of two variables (without proof). Error and approximation. Extreme values of function of several variables (maxima, minima, saddle points). Lagrange method of undetermined multipliers. Partial differential equations: Formulation, solution of first order equations, Lagrange's equations, Charpit's method. [T2]

[No. of 12hrs.]**Unit-II**

Laplace Transformation: Definition, Laplace transformation of basic functions, existence condition for Laplace transformation, Properties of Laplace transformation (Linearity, scaling and shifting). Unit step function, Impulse Function, Periodic Functions. Laplace transformation of derivatives, Laplace transformation of integrals, differentiation of transforms, Integration of transforms, Convolution theorem, inverse Laplace transformation. Solution of ordinary Differential equations. [T1, T2]

[No. of 12hrs.]**Unit-III**

Complex Function: Definition, Derivatives, Analytic function, Cauchy's Riemann equation (without proof). Conformal and bilinear mappings, Complex Integration: Complex Line integration, Cauchy's integral theorem and integral formula (without proof). Zeros and Singularities, Taylor's and Laurent's series (without proof). Residues, Residue theorem (without proof). Evaluation of real definite integrals: Integration around the unit circle, Integration around a small semi circle and integration around rectangular contours. [T1, T2]

[No. of 12hrs.]**Unit-IV**

Multiple integrals: Double integrals, Change of order of integration, Triple integrals. Vector Calculus: Scalar and vector functions, Gradient, Divergence and curl. Directional derivatives, Line Integrals. Surface integrals, volume integrals. Green's theorem, Stoke's theorem and Gauss divergence theorem (without proof). [T1, T2]

[No. of 12hrs.]**Text:**

[T1]. E. Kresyzig, "Advance Engineering Mathematics", Wiley publications

[T2]. Michael Greenberg, "Advance Engineering mathematics", Pearson.

References:

[R1] R.K. Jain and S.R.K. Iyengar, "Advanced Engineering Mathematics" Narosa Publications

[R2] B. S. Grewal, "Higher Engineering Mathematics" Khanna Publications.

[R3] S. Ponnusamy, "Foundation of Complex Analysis" Narosa Publication

[R4] G.B. Thomas and R. N. Finny "Calculus and Analytic Geometry" Addison Wesley/ Narosa

[R5] Wylie R, "Advance Engineering mathematics", McGraw-Hill

[R6] M. Spiegel, "Schaum's Outline on Laplace Transform, Tata McGraw-Hill

Applicable from the Academic Session 2013-14.

APPLIED PHYSICS – II**Paper Code: ETPH-104****L T C****Paper : APPLIED PHYSICS – II****2 1 3****INSTRUCTIONS TO PAPER SETTERS:****MAXIMUM MARKS: 75**

1. Question No. 1 should be compulsory and cover the entire syllabus. This question should have objective or short answer type questions. It should be of 25 marks.
2. Every unit should have two questions. However, student may be asked to attempt only 1 question from each unit. Each question should be of 12.5 marks.

Objective: The objective of the paper is to facilitate the student with the basics of Applied Physics aspects that are required for his understanding of basic physics.

UNIT I

Electromagnetic Theory : Gradient, Divergence, Curl, Gauss' law, Ampere's Law, Continuity equation, Maxwell's equations (differential and integral forms), Significance of Maxwell's equations, Poynting Theorem, Electromagnetic wave propagation in dielectrics and conductors. [T1], [T2] **(No. of Hrs. 8)**

UNIT II

Statistical Physics: Black body radiation, Planck's radiation formula, Wien's and Rayleigh-Jeans Laws, Distribution laws: Qualitative features of Maxwell-Boltzmann, Bose-Einstein and Fermi-Dirac statistics & their comparison (without derivation).

Quantum Mechanics: Postulates of Quantum mechanics, de-Broglie hypothesis, Davisson Germer experiment, Wave function and its physical significance, Wave Packet, Phase and group velocities, Uncertainty principle, Schrodinger equation for free particle, Time dependent Schrodinger equation, Particle in a box (1-D). [T1], [T2] **(No. of Hrs. 8)**

UNIT III

Crystal Structure: Types of solids, Unit cell, Types of crystals, Translation vectors, Lattice planes, Miller indices, Simple crystal structures, Interplaner spacing, Crystal structure analysis: Bragg's law, Laue method, Point defects: Schottky and Frankel defects. [T1], [T2] **(No. of Hrs. 8)**

UNIT IV

Band Theory of Solids: Introduction, Kronig-Penney model: E-k diagram, Effective mass of an electron, Intrinsic semiconductors: Electron concentration in conduction band, Hole concentration in valence band, Extrinsic semiconductor: p-type and n-type semiconductors, Fermi level, Hall Effect: Hall voltage and Hall coefficient. [T1], [T2] **(No. of Hrs. 8)**

Text Books:

- [T1]. Arthur Beiser 'Concepts of Modern Physics', [McGraw-Hill], 6th Edition 2009.
 [T2]. A. S.Vasudeva, 'Modern Engineering Physics', S. Chand, 6th Edition, 2013.

Reference Books

- [R1]. Richard Wolfson 'Essential University Physics' Pearson, 1st edition, 2009.
 [R2]. H.K. Malik & A. K. Singh 'Engineering Physics' [McGraw-Hill], 1st Edition, 2009.
 [R3]. C. Kittel, 'Mechanics', Berkeley Physics Course, Vol.- I. Latest Edition.
 [R4]. Irving Kaplan 'Nuclear Physics' Latest Edition.
 [R5]. John R. Taylor, Chris D. Zafirator and Michael A. Dubson, 'Modern Physics For Scientists and Engineers', PHI, 2nd Edition.
 [R6]. D.J. Griffith, 'Introduction to Electrodynamics', Prentice Hall, Latest Edition.

ELECTRICAL TECHNOLOGY

Paper Code: ETEE-106
Paper : Electrical Technology

L	T	C
3	0	3

INSTRUCTIONS TO PAPER SETTERS:**Maximum Marks: 75**

1. This is first introductory course in electrical technology to the students of all the branches of engineering in first year.
2. Question No. 1 should be compulsory and cover the entire syllabus. This question should have objective or short answer type questions. It should be of 25 marks.
3. Apart from question no. 1, rest of the paper shall consist of four units as per the syllabus. Every unit should have two questions. However, student may be asked to attempt only 1 question from each unit. Each question should be of 12.5 marks.

Objective: To provide exposure to the students in respects of the basics of different aspects of electrical engineering with emphasis on constructional, measurement and applications of various types of instruments and equipments.

UNIT – I DC Circuits

Introduction of Circuit parameters and energy sources (Dependent and Independent), Mesh and Nodal Analysis, Superposition, Thevenin's, Norton's, Reciprocity, Maximum Power Transfer and Millman's Theorems, Star-Delta Transformation and their Applications to the Analysis of DC circuits. [T1],[T2]
[No. of Hrs. 11]

UNIT – II A.C.Circuits

A.C. Fundamentals, Phasor representation, Steady State Response of Series and Parallel R-L, R-C and R-L-C circuits using j-notation, Series and Parallel resonance of RLC Circuits, Quality factor, Bandwidth, Complex Power, Introduction to balanced 3-phase circuits with Star- Delta Connections. [T1],[T2]
[No. of Hrs. 14]

UNIT – III Measuring Instruments

Basics of measuring instruments and their types ,Working principles and applications of moving coil, moving iron (ammeter & voltmeter) and Extension of their ranges, dynamometer- type Wattmeter , induction-type Energy Meter , Two-wattmeter method for the measurement of power in three phase circuits, Introduction to digital voltmeter, digital Multimeter and Electronic Energy Meter. [T1],[T2],[R2]
[No. of Hrs. 11]

UNIT – IV Transformer and Rotating Machines

Fundamentals of Magnetic Circuits, Hysteresis and Eddy current losses, working principle, equivalent circuit, efficiency and voltage regulation of single phase transformer and its applications. Introduction to DC and Induction motors (both three phase and single phase), Stepper Motor and Permanent Magnet Brushless DC Motor. [T1],[T2],[R2]
[No. of Hrs. 12]

Text Books:

- [T1] S.N Singh, "Basic Electrical Engineering" PHI India Ed 2012
 [T2] Chakrabarti, Chanda,Nath "Basic Electrical Engineering" TMH India", Ed 2012.

Reference Books:

- [R1] William Hayt "Engineering Circuit Analysis" TMH India Ed 2012
 [R2] Giorgio Rizzoni "Principles and Application of Electrical Engineering" Fifth Edition TMH India.

INTRODUCTION TO PROGRAMMING

Paper Code: ETCS-108

L T C

Paper: Introduction to Programming

3 0 3

INSTRUCTIONS TO PAPER SETTERS:

Maximum Marks : 75

1. Question No. 1 should be compulsory and cover the entire syllabus. This question should have objective or short answer type questions. It should be of 25 marks.

2. Apart from Question No. 1, rest of the paper shall consist of four units as per the syllabus. Every unit should have two questions. However, student may be asked to attempt only 1 question from each unit. Each question should be 10 marks

Objective: The objective of the paper is to facilitate the student with the basics of programming aspects, using C as the primary language. This course focuses on the programming constructs which are used in other languages as well. This is the first course on programming and does not assume any prerequisite.

UNIT I

Concept of algorithms, Flow Charts, Overview of the compiler (preferably GCC) , Assembler, linker and loader , Structure of a simple Hello World Program in C ,Overview of compilation and execution process in an IDE (preferably Code Block)[T1], [T2], [R4][R5]. **[No. of hrs 8]**

UNIT II

Programming using C: Preprocessor Directive, C primitive input output using get char and put char , simple I/O Function calls from library , data type in C including enumeration , arithmetic, relational and logical operations, conditional executing using if, else, switch and break .Concept of loops , for, while and do-while , Storage Classes: Auto, Register, Static and Extern[T1], [T2], [R7] **[No. of hrs 8]**

UNIT III

Arrays (one and two dimensional), 2-d arrays used in matrix computation. Concept of Sub-programming, functions. Parameter transmission schemes i.e. call by value and call by reference, Pointers, relationship between array and pointer, Argument passing using pointers, Array of pointer, passing arrays as arguments [T2], [R1], [R7] **[No. of hrs 8]**

UNIT IV

Structure and unions , Strings and C string library, File Handling in C Using File Pointers,fopen(), fclose(),Input and Output using file pointers, Character Input and Output with Files , String Input / Output Functions , Formatted Input / Output Functions,Block Input / Output Functions, Sequential Vs Random Access Files , Positioning the File Pointer[T1], [T2],[R2], [R7]. **[No. of hrs 8]**

Text Books:

[T1] Herbert Schildt, "C: The Complete Reference", OsbourneMcgraw Hill, 4th Edition, 2002.

[T2] Forouzan Behrouz A. "Computer Science: A Structured Programming Approach Using C, Cengage Learning 2/e

Reference Books:

[R1] Kernighan & Ritchie, "C Programming Language", The (Ansi C version), PHI, 2/e

[R2] K.R Venugopal, "Mastering C ", TMH

Applicable from the Academic Session 2013-14.

- [R3] R.S. Salaria "Application Programming in C " Khanna Publishers4/e
- [R4] Yashwant Kanetkar “ Test your C Skills ” , BPB Publications
- [R5] <http://www.codeblocks.org/>
- [R6] <http://gcc.gnu.org/>
- [R7] Programming in ANSI C, E. Balagurusamy; Mc Graw Hill, 6th Edition.

ENGINEERING MECHANICS

Paper Code: ETME 110
Paper: Engineering Mechanics

L	T	C
2	1	3

INSTRUCTIONS TO PAPER SETTERS:

MAXIMUM MARKS: 75

1. Question No. 1 should be compulsory and cover the entire syllabus. This question should have objective or short answer type questions. It should be of 25 marks.
2. Every unit should have two questions. However, student may be asked to attempt only 1 question from each unit. Each question should be of 12.5 marks.

Objective: The objective of the paper is to give the basic principles of mechanics applied in different disciplines of engineering.

UNIT- I

Force system: Free body diagram, Parallel force system, concurrent force system, Equilibrium equations and applications in different force systems.

Friction: Static and Kinetic friction, laws of dry friction, co-efficient of friction, angle of friction, angle of repose, cone of friction, Belt drive- derivation of equation $T_1/T_2 = e^{\mu\theta}$ and its application, M.A, V.R and Efficiency of Screw Jack, Application of friction in pivot and collar bearing..

[No. of Hrs. 08] (T1, T2, R1,

R2, R4, R5)

UNIT- II

Structure: Plane truss, perfect and imperfect truss, assumption in the truss analysis, analysis of perfect plane trusses by the method of joints, method of section, graphical method.

Distributed Force: Determination of center of gravity, center of mass and centroid by direct integration and by the method of composite bodies, mass moment of inertia and area moment of inertia by direct integration and composite bodies method, radius of gyration, parallel axis theorem, Pappus theorems, polar moment of inertia.

[No. of Hrs.08]

(T1, T2, R1, R2, R3, R4, R5)

Unit-III

Kinematics of Particles: Rectilinear motion, plane curvilinear motion-rectangular coordinates, normal and tangential component.

Kinetics of Particles: Equation of motion, rectilinear motion and curvilinear motion, work energy equation, conservation of energy, impulse and momentum, conservation of momentum, impact of bodies, co-efficient of restitution, loss of energy during impact.**[No. of Hrs. 08](T1, T2, R1, R2, R3, R4, R5)**

Unit-IV

Kinematics of Rigid Bodies: Concept of rigid body, type of rigid body motion, absolute motion, introduction to relative velocity, instantaneous center of velocity, Velocity polygons for four bar mechanism and single slider mechanism.

Kinetics of Rigid Bodies: Equation of motion, translatory motion and fixed axis rotation, application of work energy principles to rigid bodies conservation of energy.

Shear force and bending Moment Diagram.

[No. of Hrs. 08](T1, T2, R1, R2, R3, R4, R5)

Text Books:

T1. Engg Mechanics by A.K.Tayal (Umesh Publications).

T2. Engg Mechanics by Basudeb Bhattacharya (Oxford university Press)

Reference Books:

- R1. Engg Mechanics by Irving H. Shames (Pearson publications).
- R2. Engg Mechanics by U.C.Jindal (Galgotia Publications).
- R3. Engg Mechanics by Beer & Johnston(TMH).
- R4. Engg Mechanics by K.L.Kumar (TMH).
- R5. Engg Mechanics by Sadhu Singh (Khanna Publishers).

COMMUNICATION SKILLS

Paper Code: ETHS – 112
Paper: Communication Skills

L	T	C
2	1	3

INSTRUCTIONS TO PAPER SETTERS:

MAXMIUM MARKS: 75

1.Question No. 1 should be compulsory and cover the entire syllabus. This question should have objective or short answer type questions. It should be of 25 marks.

2.Every unit should have two questions. However, student may be asked to attempt only 1 question from each unit. Each question should be of 12.5 marks.

Objective: To enhance the language and communication competence of professional students with emphasis on English for Specific Purposes (ESP) through communication skills related activities.

UNIT-I

I. **Basic Remedial Grammar** (Errors in Parts of Speech, Tenses, Verbs and Modal; Reported Speech; Active and Passive Voice; Conditional clauses; Question Tags and Short Responses)
 [T1],[R2],[R3] **[No. of hrs 06]**

UNIT-II

II. **Vocabulary and usage** (Synonyms and Antonyms; Suffixes and Prefixes; Homophones and Homonyms; One-word substitution; Prepositions; Phrasal verbs and Idioms, Indianism)
 [T1],[R2],[R3] **[No. of hrs 06]**

UNIT-III

(A)

- I. Types of writing (Expository, Descriptive, Narrative, Analytical and Argumentative)
- II. Definition, description and explanation of scientific objects, instruments and processes etc.
- III. Interpretation and use of charts, graphs and tables in technical writing.[T1],[R1]

(B)

- I. Paragraph writing
- II. Precis writing
- III. Comprehension [T1],[R2],[R3]

[No. of hrs 10]

UNIT-IV

- I. Reading different types of texts (speed and purpose)[T1]
 - II. Reading five essays [T2]
 - III. E.M. FORSTER, *What I Believe* (Pg-123)
 - IV. JAMES BRYCE, *Some Hints on Public Speaking* (Pg-135)
 - V. L.A. HILL, *Principles of Good Writing* (Pg-150)
 - VI. A.P.J. ABDUL KALAM, *Work Brings Solace* (Pg-207)
 - VII. SALIM ALI, *Man and Nature in India: The Ecological Balance* (Pg-213)
- [No. of hrs 10]**

TEXT BOOKS

[T1] Technical Communication: Principles and practice (OUP), (Meenakshi Raman and Sangeeta Sharma)
 OXFORD UNIVERSITY PRESS

Applicable from the Academic Session 2013-14.

- [T2] Communication Skills for Engineers, Murli Krishna, Pearson.
- [T3] Wren and Martin: High School English Grammar and Composition; S. Chand
- [T4] Exploration of Ideas; An Anthology of Prose: Orient Blackswan.

REFERENCE BOOKS:

- [R1] Professional Communication: Aruna Koneru, MCGRAW HILLS EDUCATION PVT. LTD
- [R2] Wren and Martin: High School English Grammar and Composition; S. Chand
- [R3] Advanced English Grammar and Composition: Gurudas Mukherjee & Inidbar Mukherjee; (ANE BOOKS PVT. LTD.)

ENVIRONMENTAL STUDIES**Paper Code: ETEN-114**

L	T	C
2	1	3

Paper : Environmental Studies**Instructions to Paper Setter:****Maximum Marks: 75**

1. Question No. 1 should be compulsory and cover the entire syllabus. This question should have objective or short answer type questions. It should be of 25 marks.

2. Each unit should have two questions. However, student may be asked to attempt only 1 question from each unit. Each question should be of 12.5 marks.

Objective: *The objective of this course is to make students environment conscious. They will be exposed through the fundamental concepts of environment and ecosystem so that they can appreciate the importance of individual and collective efforts to preserve and protect our environment. This course must raise various questions in student's mind that how our environment is inter dependent on various factors and how human being must care for their natural surroundings.*

UNIT I: Environmental Studies: Ecosystems, Bio-diversity and its Conservation**(i) The Multidisciplinary Nature of Environmental Studies-**

Definition, scope and importance of Environmental Studies. Biotic and a biotic component of environment, need for environmental awareness.

(ii) Ecosystems

Concept of an ecosystem, structure and function of an ecosystem, producers, consumers and decomposers, energy flow in the ecosystem, ecological succession, food chains, food webs and ecological pyramids.

Introduction, types, characteristic features, structures and function of the following ecosystem:

- (a) Forest ecosystem
- (b) Grassland ecosystem
- (c) Desert ecosystem
- (d) Aquatic ecosystem (ponds, streams, lakes, rivers, oceans, estuaries).

(iii) Bio-diversity and its Conservation

Introduction to biodiversity —definition: genetic, species and ecosystem diversity, Bio-geographical 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, rare endangered and threatened species(RET) endemic species of India, method of biodiversity conservation: *In-situ* and *ex-situ* conservation.[T1], [R3] **[No. of hrs. 08]**

UNITII: Natural Resources: problems and prospects

- (i) Renewable and Non-renewable Natural Resources
Concept and definition of Natural Resources and need for their management

Applicable from the Academic Session 2013-14.

- *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 over-utilization of surface and ground water, floods, drought, conflicts over water, dams-benefits and problems, Water conservation, rain water harvesting, watershed management.
- *Mineral resources:* Uses are exploitation, environmental effects of extracting and using mineral resources, case studies.
- *Food resources:* World food problems, changes causes by agriculture and over-grazing, 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, Urban problems related to energy, case studies.
- *Land resources:* Land as a resource, land degradation, man induced landslides, soil erosion and desertification. [T1], [R3] [No. of hrs. 08]

UNIT III: Environmental Chemistry and Pollution Control

(i) *Chemistry of Environment*

(a) *Green Technology*

Principles of Green technology, Zero Waste Technology, Green Chemistry & Its basic principles, Atom Economy, Green Methodologies. clean development mechanisms (CDM), concept of environmental impact assessment,

(b) *Eco-Friendly polymers*

Environmental degradation of polymers, Biodegradable, Photo-biodegradable polymers, Hydrolysis & Hydrobiodegradable, Biopolymers & Bioplastics: polylactic acid, polyhydroxybutyrate, polycaprolactone,. Concept of bioremediation.

(ii) *Environmental Pollution*

Definition, types, causes, effects and control measures of (a) Air pollution, (b) Water pollution, (c) Soil pollution, (d) Marine pollution, (e) Noise pollution, (f) Thermal pollution, (g) Nuclear hazards. Pollution case studies. Solid waste and its management: causes, effects and control measures of urban and industrial waste.

Chemical toxicology-Terms related to toxicity, impact of chemicals (Hg, As, Cd, Cr, Pb) on environment. [T1], [R3] [No. of hrs. 08]

UNIT IV: Disaster Management, Social Issues, Human Population and the Environment

(i) *Disaster Management*

Disaster management: floods, earthquake, cyclone and land-slides, nuclear accidents and holocaust, case studies.

(ii) *Social Issues, Human Population and the Environment*

Sustainable development, Climate change, global warming, acid rain, ozone layer depletion, Environmental ethics: Issues and possible solutions, Consumerism and waste products, , Wasteland reclamation. Population growth, problems of urbanisation.

Environment Protection Act, 1986; Air (Prevention and Control of Pollution) Act, 1981; Water (Prevention and Control of Pollution) Act, 1974; Wildlife Protection Act, 1972; Forest Conservation Act, 1980; Environmental management system standards-ISO 14000 series.[T1]

[No. of hrs. 08]

Text Books:

- [T1] E. Barucha, *Textbook of Environmental Studies for Undergraduate Courses*, Universities Press (India) Pvt. Ltd., 2005.
- [T2] S. Chawla, *A Textbook of Environmental Studies*, McGraw Hill Education Private Limited, 2012

References Books:

- [R1] G. T. Miller, *Environmental Science*, Thomas Learning, 2012
- [R2] W. Cunningham and M. A. Cunningham, *Principles of Environment Science: Enquiry and Applications*, Tata McGraw Hill Publication, N. Delhi, 2003.
- [R3] R. Rajagopalan, *Environmental Studies: From Crisis to Cure*, 2nd Edition, Oxford University Press, 2011.
- [R4] A.K. De, *Environmental Chemistry*, New Age Int. Publ. 2012,,
- [R5] A. Kaushik and C.P. Kaushik, *Perspectives in Environment Studies*, 4th Edition, New Age International Publishers,2013
- [R6] Environmental Engineering by Gerard Kiely, Tata McGraw-Hill Publishing Company Ltd., New Delhi, 2010.

APPLIED PHYSICS LAB – II

Paper Code: ETPH-152

P C

Paper: Applied Physics Lab – II

2 1

LIST OF EXPERIMENTS

1. To determine the e/m ratio of an electron by J.J. Thomson method.
2. To measure the frequency of a sine-wave voltage obtained from signal generator and to obtain lissajous pattern on the CRO screen by feeding two sine wave signals from two signal generators.
3. To determine the frequency of A.C. mains by using Sonometer .
4. To determine the frequency of electrically maintained tuning fork by Melde's method.
5. Computer simulation (simple application of Monte Carlo): Brownian motion, charging & discharging of a capacitor.
6. To study the charging and discharging of a capacitor and to find out the time constant.
7. To study the Hall effect.
8. To verify Stefan's law.
9. To determine the energy band gap of a semiconductor by four probe method/or by measuring the variation of reverse saturation current with temperature.
10. To study the I-V characteristics of Zener diode.
11. To find the thermal conductivity of a poor conductor by Lee's disk method.
12. To study the thermo emf using thermocouple and resistance using Pt. Resistance thermometer.

Suggested Books:

[T1] C. L. Arora 'B. Sc. Practical Physics' S. Chand, Latest edition.

Note: Any 8-10 experiments out of the list may be chosen. Proper error – analysis must be carried out with all the experiments.

ELECTRICAL TECHNOLOGY LAB

Paper Code: ETEE 156

L P C

Paper: Electrical Technology Lab

0 2 1

LIST OF EXPERIMENTS

To Design the circuit for a given load and selection of its various Components and instruments from the safety point of view

OR

To study different types of symbols and standard currently being used in electrical engineering.

1. Study and applications of CRO for measurement of voltage, frequency and phase of signals.
2. Connection of lamp by
(1)Single Switch Method.(2) Two-way Switch Method.
OR
Performance comparison of of fluorescent Tube & CFL Lamp.
3. To Verify Thevenin's & Norton's Theorem
OR
To Verify Superposition &Reciprocity Theorem.
OR
To Verify Maximum Power Transfer Theorem.
4. To Measure Power & Power Factor in a Single-Phase A.C Circuit using Three Ammeters or three Voltmeters.
5. To Measure Power & Power Factor in a Balanced Three Phase Circuit using Two Single Phase Wattcmeters.
6. To study of Resonance in a series R-L-C or Parallel R-L-C Circuits.
7. To perform open circuit and short circuit test on 1-phase transformer.
8. Starting, Reversing and speed control of DC shunt Motor
9. Starting, Reversing and speed control of 3-phase Induction Motor
- 10.To Study different types of Storage Batteries & its charging system.
- 11..To Study different types of earthing methods including earth leakage circuit breaker (GFCI)

Note:- Any 8-10 Experiments out of the list may be chosen.

ENGINEERING MECHANICS LAB**Paper Code: ETME-158****P C****Paper: Engineering Mechanics Lab****2 1****LIST OF EXPERIMENTS:**

1. To verify the law of Force Polygon
2. To verify the law of Moments using Parallel Force apparatus. (simply supported type)
3. To determine the co-efficient of friction between wood and various surface (like Leather, Wood, Aluminum) on an inclined plane.
4. To find the forces in the members of Jib Crane.
5. To determine the mechanical advantage, Velocity ratio and efficiency of a screw jack.
6. To determine the mechanical advantage, Velocity ratio and Mechanical efficiency of the Wheel and Axle
7. To determine the MA, VR, η of Worm Wheel (2-start)
8. Verification of force transmitted by members of given truss.
9. To verify the law of moments using Bell crank lever
10. To find CG and moment of Inertia of an irregular body using Computation method.

Note:- Any 8-10 Experiments out of the list may be chosen.

PROGRAMMING LAB

Paper Code	: ETCS 154	P	C
Paper	: Programming Lab	2	1

LIST OF EXPERIMENTS

For program development an IDE e.g. CodeBlock^[a], Eclipse CDT^[b], Netbeans^[c] is recommended

1. Write a program to find divisor or factorial of a given number.
2. Write a program to find sum of a geometric series
3. Write a recursive program for tower of Hanoi problem
4. Write a recursive program to print the first m Fibonacci number
5. Write a menu driven program for matrices to do the following operation depending on whether the operation requires one or two matrices

Addition of two matrices

Subtraction of two matrices

Finding upper and lower triangular matrices

Transpose of a matrix

Product of two matrices.

6. Write a program to copy one file to other, use command line arguments.
7. An array of record contains information of managers and workers of a company. Print all the data of managers and workers in separate files.
8. Write a program to perform the following operators on Strings without using String functions
 - To find the Length of String.
 - To concatenate two string.
 - To find Reverse of a string.
 - To Copy one sting to another string.
9. Write a Program to store records of an student in student file. The data must be stored using Binary File. Read the record stored in "Student.txt" file in Binary code. Edit the record stored in Binary File. Append a record in the Student file.
10. Write a programmed to count the no of Lowercase, Uppercase numbers and special Characters presents in the contents of File.

11. Two Mini Projects based on the skills learned in experiments 1-10 [These mini projects may be done in a group not exceeding group size of 4]

[a] <http://www.codeblocks.org/>

[b] <http://www.eclipse.org/cdt/>

[c] <https://netbeans.org/features/cpp/>

Note:- Any 8-10 Experiments out of the list may be chosen.

ENVIRONMENTAL STUDIES LAB

Paper Code –ETEN-160

P C

Paper : Environmental Studies Lab

2 1

LIST OF EXPERIMENTS

1. Determination of pH, conductivity and turbidity in drinking water sample.
2. Determination of pH and conductivity of soil/sludge samples.
3. Determination of moisture content of soil sample.
4. Determination of Total Dissolved Solids (TDS) of water sample.
5. Determination of dissolved oxygen (DO) in the water sample.
6. Determination of Biological oxygen demand (BOD) in the water sample.
7. Determination of Chemical oxygen demand (COD) in the water sample.
8. Determination of Residual Chlorine in the water sample.
9. Determination of ammonia in the water sample.
10. Determination of carbon dioxide in the water sample.
11. Determination of nitrate ions or sulphate ions in water using spectrophotometer.
12. Determination of the molecular weight of polystyrene sample using viscometer method.
13. Base catalyzed aldol condensation by Green Methodology.
14. Acetylation of primary amines using eco-friendly method.
15. To determine the concentration of particulate matter in the ambient air using High Volume Sampler.

P.S.: For better understanding of various aspects of environment visits to local areas, depending upon easy access and importance may be planned to any nearby river, forest, grassland, hills and students should write a report based on their observations.

Suggested Books:

1. [A. I. Vogel, G. H. Jeffery](#), *Vogel's Text Book of Quantitative Chemical Analysis*, Published by Longman Scientific & Technical, 5th Edition, 1989.
2. dst.gov.in/green-chem.pdf (monograph of green chemistry laboratory experiments).
3. S. Chawla, *Essentials of Experimental Engineering Chemistry*, Dhanpat Rai & Co., 3rd Edition, 2008.
4. S. Rattan, *Experiments in Applied Chemistry*, Published by S.K.Kataria & Sons, 2nd Edition, 2003.
5. W. Cunningham and M. A. Cunningham, *Principles of Environment Science: Enquiry and Applications*, Tata McGraw Hill Publication, N. Delhi, 2003.
6. A. Kaushik and C. P. Kaushik, *Perspectives in Environment Studies*, 4th Edition, New Age International Publishers, 2013.

Note:- Any 8-10 Experiments out of the list may be chosen.