SHAHEED BHAGAT SINGH STATE TECHNICAL CAMPUS, FEROZEPUR

B. TECH. 1ST YEAR SCHEME (2015 & ONWARDS)

Physics Group **B. Tech First Semester** **Contact Hours: 32**

Course Code	Course Name	Load Allocation			Marks Distribution			Credits
		L	T	P	Internal	External	Total	
BTPH101A	Engineering Physics	3	1	-	40	60	100	4
BTAM101A	Engineering Mathematics-I	4	1	-	40	60	100	5
BTHU101A	Communicative English	3	-	-	40	60	100	3
BTEE101A	Basic Electrical and Electronics Engineering	3	1	-	40	60	100	4
HVPE101A	Human Values and Professional Ethics	3	-	-	40	60	100	2
BTPH102A	Engineering Physics Laboratory	-	-	2	30	20	50	1
BTHU102A	Communicative English Laboratory	-	-	2	30	20	50	1
BTEE102A	Basic Electrical and Electronics Engineering Laboratory	-	-	2	30	20	50	1
BTMP101A	Manufacturing Practice	-	-	6	60	40	100	3
Total	5 Theory Courses + 4 Laboratory Courses	17	3	12	350	400	750	24

Chemistry Group **B. Tech First Semester** **Contact Hours: 34**

Course Code	Course Name	Load Allocation			Marks Distribution			Credits
		L	T	P	Internal	Externa	Total	
BTCH101A	Engineering Chemistry	3	1	-	40	60	100	4
BTAM101A	Engineering Mathematics-I	4	1	-	40	60	100	5
BTME101A	Elements of Mechanical Engineering	4	1	-	40	60	100	4
BTCS101A	Fundamentals of Computer Programming and IT	3	-	-	40	60	100	3
EVSC101A	Environmental Science	2	-	-	40	60	100	2
BTCH102A	Engineering Chemistry Laboratory	-	-	2	30	20	50	1
BTME102A	Engineering Drawing	1	-	6	40	60	100	4
BTCS102A	Fundamentals of Computer Programming and IT Laboratory	-	-	4	30	20	50	2
BTME103A	Engineering Computer Graphics Laboratory	-	-	2	30	20	50	1
Total	6 Theory Courses + 3 Laboratory Courses	17	3	14	320	380	750	26

Physics Group **B. Tech. Second Semester** **Contact Hours: 32**

Course Code	Course Name	Load Allocation			Marks Distribution			Credits
		L	T	P	Internal	External	Total	
BTPH101A	Engineering Physics	3	1	-	40	60	100	4
BTAM102A	Engineering Mathematics-II	4	1	-	40	60	100	5
BTHU101A	Communicative English	3	-	-	40	60	100	3
BTEE101A	Basic Electrical and Electronics Engineering	3	1	-	40	60	100	4
HVPE101A	Human Values and Professional Ethics	3	-	-	40	60	100	2
BTPH102A	Engineering Physics Laboratory	-	-	2	30	20	50	1
BTHU102A	Communicative English Laboratory	-	-	2	30	20	50	1
BTEE102A	Basic Electrical and Electronics Engineering Laboratory	-	-	2	30	20	50	1
BTMP101A	Manufacturing Practice	-	-	6	60	40	100	3
Total	5 Theory Courses + 4 Laboratory Courses	17	3	12	350	400	750	24

Chemistry Group **B. Tech. Second Semester** **Contact Hours: 34**

Course Code	Course Name	Load Allocation			Marks Distribution			Credits
		L	T	P	Internal	External	Total	
BTCH101A	Engineering Chemistry`	3	1	-	40	60	100	4
BTAM102A	Engineering Mathematics-II	4	1	-	40	60	100	5
BTME101A	Elements of Mechanical Engineering	4	1	-	40	60	100	4
BTCS101A	Fundamentals of Computer Programming and IT	3	-	-	40	60	100	3
EVSC101A	Environmental Science	2	-	-	40	60	100	2
BTCH102A	Engineering Chemistry Laboratory	-	-	2	30	20	50	1
BTME102A	Engineering Drawing	1	-	6	40	60	100	4
BTCS102A	Fundamentals of Computer Programming and IT Laboratory	-	-	4	30	20	50	2
BTME103A	Engineering Computer Graphics Laboratory	-	-	2	30	20	50	1
Total	6 Theory Courses + 3 Laboratory Courses	17	3	14	320	380	750	26

BTPH 101 A
Engineering Physics

OBJECTIVES AND EXPECTED OUTCOMES

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. 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; apply the concept in solving the 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.

The syllabus and course layout for Engineering Physics Theory (BTPH-101A) and Laboratory (BTPH-102A) of first year of all B. Tech. programmes conform to outcome based teaching learning process. Following Course Outcomes (a-d) have been identified for this course and syllabus has been structured in such a way that each of the units meets one or more of these outcomes. Student outcomes describe what students are expected to know and be able to achieve at the end of the course. These relate to the skills, knowledge, and proficiency that students acquire as they undergo the course. The mapping of instructional objectives to the student outcomes has also been done.

INSTRUCTIONAL OBJECTIVES

1. To understand the general scientific concepts required for technology.
2. To apply the Physics concepts in solving engineering problems.
3. To educate scientifically the new developments in engineering and technology.
4. To emphasize the significance of newer technologies through Physics principles.

COURSE OUTCOMES

(1) Augmenting the students into theoretical concepts required for various engineering courses.
(2) Knowledge of various physical processes and their applications.
(3) An ability to identify, formulate, and solve engineering problems.
(4) Understanding of general properties of materials and their applications.

COURSE CONTENT

PART A

1. **Electromagnetic Waves & Dielectrics:** Physical significance of Gradient, Divergence & Curl, Dielectric polarization, Types of polarization(qualitative only), Maxwell's Equations, Equation of EM waves in free space, velocity of EM waves, Poynting vector, Electromagnetic Spectrum (Basic ideas of different region). (5)
2. **Magnetic Materials & Superconductivity:** Basic ideas of Dia, Para, Ferro & Ferri, Ferrites, Magnetic Anisotropy, Magnetostriction and its applications in production of Ultrasonic waves, Superconductivity, Superconductors as ideal diamagnetic materials, Meissner Effect, Type I & Type II superconductors, London Equations, Introduction to BCS theory. (5)

3. **Elements of crystallography:** Unit cell, Basis, Space lattice, Crystal Systems, Miller Indices of Planes & Directions in cubic system, Continuous & Characteristic X-Rays, X-Ray Diffraction & Bragg's law in crystals, Bragg's spectrometer, X-ray radiography. (5)
4. **Lasers:** Spontaneous & Stimulated emissions, Einstein's Coefficients, Population Inversion, Pumping Mechanisms, Components of a laser System, Three & four level laser systems; Ruby, He-Ne, CO2 and semiconductor Lasers, Introduction to Holography. (5)

PART B

5. **Fibre Optics:** Introduction, Acceptance Angle, Numerical Aperture, Definition and significance of Normalized frequency, Modes of propagation, material dispersion & pulse broadening in optical fibres, fibre connectors, splices and couplers, applications of optical fibres. (5)
6. **Special Theory of Relativity:** Concept of Ether, Michelson Morley Experiment, Einstein's postulates, Lorentz transformation equations; length, time and simultaneity in relativity, addition of velocity, variation of mass with velocity, Mass-Energy and Energy-momentum relations. (5)
7. **Quantum Theory:** Need and origin of quantum concept, Wave-particle duality, Matter waves, Definition of Group & Phase velocities, Significance & normalization of wave function, Schrodinger wave equation: time independent & dependent, Eigen functions & Eigen values, particle in a box (one dimension only). (5)
8. **Nanophysics:** Nanoscale, surface to volume ratio, electron confinement, nanoparticles (1D, 2D, 3D), Nanomaterials, Unusual properties of nanomaterials, synthesis of nanomaterials - ball milling and sol-gel techniques, introduction to Carbon nanotubes, applications of nanomaterials. (5)

MAPPING

S. No.	B. Tech. (Common Courses): Physics (BTPH-101A)				
1	Course Outcomes	(1)	(2)	(3)	(4)
2	Mapping of course contents with course outcomes	Units 6 & 7	Units 4 & 5	Units 1 & 3	Units 2 & 8
3	Category	Applied Sciences			

Suggested Readings / Books:

1. Physics for Scientists & Engineers (Vol. I & II), Serway & Jewett, 6th Edition., Cengage Learning.
2. Engineering Physics, Malik; HK, Singh; AK, Tata McGraw Hill.
3. Materials Science & Engg., Raghvan V.,Prentice Hall of India.
4. Concepts of Modern Physics, Beiser; A., Mahajan; S., Choudhary; SR, Tata McGraw Hill.
5. Solid State Physics, Dan Wei, Cengage Learning.
6. Introduction to Solids, Azaroff LV, Tata Mc Graw Hill.
7. Physics; A calculus based approach (Vol. I & II) Serway; RA & Jewitt; JW, Cengage Learning.Materials Science & Engineering, Callister; WD, John Wiley & Sons.

BTPH 102 A
Engineering Physics Laboratory

INSTRUCTIONAL OBJECTIVES

1. Proficiency in making experimental measurements of different Physical variables.
2. Develop the skills in arranging and handling different measuring instruments and standard scientific Methods of data analysis.

3. Get familiarized with the techniques of experimental errors analysis and thus plan for measurements with minimum possible errors.

COURSE OUTCOMES

(1) An ability to apply knowledge of Physical processes & Materials Physics.
(2) An ability to design and conduct experiments, as well as to analyze and interpret data.
(3) An ability to design a system, component, or process to meet desired specific needs within the framework of sustainability.
(4) An ability to identify, formulate, and solve engineering problems.

COURSE CONTENT

1. To study the magnetic field of a circular coil carrying current.
2. To find out polarizability of a dielectric substance.
3. To study the laser beam characteristics like; wave length using diffraction grating aperture & divergence.
4. To study laser interference using Michelson's Interferometer.
5. Study of diffraction using laser beam and thus to determine the grating element.
6. To determine numerical aperture of an optical fibre.
7. To determine attenuation & propagation losses in optical fibres.
8. To find out the frequency of AC mains using electric-vibrator.
9. To find the refractive index of a material using spectrometer.
10. To find the refractive index of a liquid.
11. To study B-H curve using CRO.
12. To find the velocity of ultrasound in liquid.
13. To determine the grain size of a material using optical microscope.

Note: Each student is required to perform at least ten experiments

MAPPING

S.No.	B. Tech. (Common Courses): Physics (BTPH-102A)				
1	Course Outcomes	(1)	(2)	(3)	(4)
2	Mapping of course contents with course outcomes	Experiment No.: 9, 10, 12 & 13	Experiment No.: 1 & 7	Experiment No.: 6, 8 & 11	Experiment No.: 2, 3, 4 & 5
3	Category	Applied Sciences			

Suggested Readings/ Books:

1. Practical Physics, C.L. Arora, S. Chand & Co.
2. Practical Physics, R.S. Sirohi, Wiley Eastern.

BTAM 101 A
Engineering Mathematics-I

OBJECTIVES AND EXPECTED OUTCOMES

Mathematics and basic sciences 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.

COURSE OUTCOMES

CO's No.	After undergoing this course, students must be able to:
CO1	To understand the basic concept of Curve tracing & Curvature and able to use it for tracing of standard curves and finding curvatures of in different curves.
CO2	To understand the basic concept of Rectification of standard curves; Areas bounded by these curves; and also the concept of centre of gravity and moment of inertia.
CO3	To understand the basic concept of partial differential equations and also able to use its applications in different fields of engineering
CO4	To understand the concept of double and triple integral and will learn how to evaluate them and use in practical problem.
CO5	To understand the basic concept of **Vector Calculus** like differentiation of vectors, Vector differential operators (Del, Gradient, Divergence and Curl) and will able to draw their physical interpretations and their uses in engineering's problems.

COURSE CONTENT

PART A

1. **Differential Calculus:** Curve tracing: Tracing of Standard Curves such as cycloid, asteroid, folium of Descarte, cardiode, helix; Curvature of Cartesian Parametric and Polar curves. (6)

2. **Integral Calculus:** Rectification of standard curves; Areas bounded by standard curves; Applications of integral calculus to find centre of gravity and moment of inertia. (6)
3. **Partial Derivatives:** 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. (6)
4. **Applications of Partial Differentiation:** Tangent and normal to a surface; Taylor's and Maclaurin's series for a function of two variables; Errors and approximations; Maxima and minima of function of several variables; Lagrange's method of undetermined multipliers. (6)
5. **Multiple Integrals**: Double and triple integral and their evaluation, change of order of integration, change of variable, Application of double and triple integration to find areas and volumes. (6)
6. **Vector Calculus:** Scalar and vector fields, differentiation of vectors, velocity and acceleration. Vector differential operators: Del, Gradient, Divergence and Curl, their physical interpretations. Formulae involving Del applied to point functions and their products. Line, surface and volume integrals. (8)
7. **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. (4)

Suggested Readings / Books:

1. Thomes, G.B, Finney, R.L., Calculus and Analytic Geometry, Ninth Edition, Pearson 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 Iyengar, 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.

BTHU 101A
Communicative English

OBJECTIVES AND EXPECTED OUTCOMES

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, emails; reports, summaries and various forms of descriptive and argumentative essays.

Learning and Teaching Activities:

Introduction to Communication

Meaning of Communication and its process, Types, Channels of Communication, Communication in an organization, Barriers to Communication.

COURSE OUTCOMES

1. Understand factual and implied meaning of written text.
2. Use productively the vocabulary learnt in the lessons in appropriate context.
3. Practice a prescribed set of grammar items in suitable context
4. Explain Ideas and building up of arguments in convincing manner
5. Produce effectively different forms of business writing such as letter, memorandum, email, report writing etc.

COURSE CONTENT

PART A (Reading)

The prescribed reading textbook for students will be S. P. Dhanavel English and Communication Skills for Students of Science and Engineering (with audio CD), Orient Blackswan. They will go through the reading texts themselves with the help of a dictionary or word power as given at the end. As they progress from one reading to another they should learn to read fast with greater degree of understanding of both concrete and abstract topics. While taking up the textbook lessons in the classroom, the teacher shall ensure that students can do the following:

i. Identify the significant points and conclusions as given in the text.
ii. Handle large texts (even outside the prescribed book) with overall comprehension of the links between arguments and the finer distinction between stated and implied meanings.
iii. Generally read the stance or the point of view of the writer and present it in the form of a summary.
iv. Use the vocabulary learnt in the lessons (especially given in word power) productively in various writing tasks as suggested at the end of each lesson.

v. Profitably use the grammatical items as discussed at the end of each lesson while producing language for communication.

Besides the textbook, the teacher must insist that students extend their reading by taking up additional texts of their own choice.

PART B (Writing)

In addition to the various exercises given at the end of each lesson of Dhanavel_s book, the teacher shall use Anne Laws Writing Skills, Orient Blackswan to teach the language and conventions of writing. The students must learn the language that expresses various cognitive functions that are frequently used in writing. With the help of the teacher who will give them adequate practice, the students should be able to:

i. Convey information on concrete or abstract topics with clarity and precision.
ii. Write about objects or events with appropriate detail in both descriptive and narrative form.
iii. Explain ideas and build up arguments with adequate support in a convincing manner.
iv. Use language with some degree of flexibility in consideration to the reader.
v. Produce effectively such forms of professional writing as business letter, emails, notes, memos, reports summaries etc.

While teaching, the teacher must inculcate in students the habit of revising their writing. The teacher can also use and recommend the relevant sections of the following books for developing writing skills in students.

MAPPING

S.NO.	**B. Tech. (Common Courses): Communicative English**					
1	**Course Outcomes**	**1**	**2**	**3**	**4**	**5**
2	**Mapping of course contents with course outcomes**	**Part A (Reading)**	**Part A (Reading) and Part B (Writing)**	**Part A (Reading) and Part B (Writing)**	**Part B (Writing)**	**Part B (Writing)**

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).

BTHU-102A
Communicative English Laboratory

OBJECTIVES AND EXPECTED OUTCOMES

The syllabus and course layout for Communication Skills Laboratory (BTHU 102A) of first year all B.Tech program conform to the outcome based teaching learning process. Following course outcomes (1-5) have been identified for this course and syllabus has been structured in such a way that each of the units meets one or more of these outcomes. The outcomes describe what students are expected to know and be able to achieve at the end of the course. These relate to the skills, knowledge and proficiency that students acquire as they undergo the course. The mapping of course outcomes has been done.

COURSE OUTCOMES

1. Practice /Acquire Standard English sounds and pronunciation.
2. Develop a knack for structured public talk and group discussion.
3. Demonstrate fluency in speech without much hesitation in acceptable accent.
4. Receive and understand spoken material accurately.
5. Develop ready access to topical vocabulary and idiomatic expressions of colloquial speech.

COURSE CONTENT

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. For this purpose, a set of twin books ***K. Sadanand and S. Punitha Spoken English Part I and II, A Foundation Course (with audio CD), Orient Blackswan***, is prescribed for use. 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.

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:

- role play

- question-answer
- discussion
- presentation of papers
- seminars

MAPPING

S. NO.	**B Tech. (Common Courses): Communication Skills Laboratory**					
1	**Course Outcomes**	**1**	**2**	**3**	**4**	**5**
2	**Mapping of course contents with course outcomes**	**Listening Skills & Speaking Skills**	**Speaking Skills**	**Speaking Skills**	**Listening Skills**	**Speaking Skills**

BTEE 101 A
Basic Electrical and Electronics Engineering

OBJECTIVES AND EXPECTED OUTCOMES

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.

COURSE OUTCOMES

CO's No.	After undergoing this course, students must be able to:
CO1	understand with the basic concepts of AC, DC and Magnetic Circuits.
CO2	understand the concept of Transformer and rotating electrical machines.
CO3	understand the concept of rectifier, transistors and digital electronic devices.
CO4	analyze basic concept of transducer and semiconductor devices.

COURSE CONTENT

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). DC Transients for RL and RC series circuits.(7)

2. Alternating Current (AC) Fundamentals: Generation of alternating electro-motive force EMF, Concept of 3-phase EMF Generation, 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.

(7)

3. **Magnetic Circuits and Transformer:** Comparison between magnetic and electric circuits, Magnetic effects of electric current, Current carrying conductor in magnetic field, Law of Electromagnetic Induction and its law, Self Inductance, Mutual Inductance, Coupling Coefficient between two magnetically coupled circuits. Single Phase Transformer: Construction, Working principle, Efficiency, Voltage regulation and applications. (7)
4. **Rotating Electrical Machines:** D.C. machines (motors and generators), Three phase Induction motor, Synchronous machines (motors and generators): construction, working principle, classification and applications. (7)

PART B (Electronics Engineering)

5. **Transducers:** Introduction, working and application of LVDT, Strain Gauge and Thermistor. Introduction and application of Digital Multimeter. (7)
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, Principle of operation and characteristic Field Effect Transistor, Regulated Power Supply. (7)
7. **Digital Electronics:** Binary, Octal and Hexadecimal number System & its arithmetic operations, Logic gates, Introduction of R-S, J-K, D and T Flip Flops & its truth tables. (6)

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.

BTEE 102 A
Basic Electrical and Electronics Engineering Laboratory

COURSE OUTCOMES

CO1. The students will be able to verify ohm's law and Kirchoff's laws practically.
CO2. To understand the working of d.c. & a.c. circuits, transformer, motors, thermocouples, LVDT and measuring instruments practically.
CO3. To understand working of PN junction, gates and transistors practically.

COURSE CONTENT

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
    a. DC motor
    b. 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.

HVPE 101A
Human Values & Professional Ethics

OBJECTIVES AND EXPECTED OUTCOMES

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.

COURSE OUTCOMES

CO No.	After undergoing this course, students must be able to:
1	Understand the fundamental issues relating to the happiness and real success in both personal and professional life.
2	Analyze their own belief to remove confusion and complexes in order to bring self-confidence, clarity and conviction.
3	Develop right understanding about oneself and rest of the existence for sustained human happiness and prosperity.
4	Refer to natural acceptance in order to understand harmony at all the levels of existence i.e. self, family, society and nature.
5	Visualize an appropriate implementation of the knowledge in their respective streams to ensure mutually enriching and sustainable systems

COURSE CONTENT

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 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.*

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 fulfilment to ensure Ubhay-tripti; Trust(Vishwas) and Respect (Samman) as the foundation 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 as 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!

PART B

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

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

5. Implications of the above Holistic Understanding of Harmony on Professional Ethics

- Competence in professional ethics:
  - Ability to utilize the professional competence for augmenting universal human order
  - Ability to identify the scope and characteristics of people-friendly and eco-friendly production systems
  - Ability to identify and develop appropriate technologies and management patterns for above production systems.
- Case studies of typical holistic technologies, management models and production systems.

Suggested Readings / Books:

1. R R Gaur, R Sangal, G P Bagaria, 2009, *A Foundation Course in Value Education*.
2. Ivan Illich, 1974, *Energy & Equity,* The Trinity Press, Worcester, and Harper Collins, 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.

BTMP 101 A
Manufacturing Practice

COURSE OUTCOMES

1. Student will be able to use the techniques, skills and modern engineering tools necessary for engineering practice and ability to function effectively in team or group and to identify, formulate and solve engineering problems.
2. Student will be able to get the fundamentals of wood working has to know about timber, defects in timber, seasoning of wood and other carpentry materials, wood working tools, carpentry operations and the method of making common types of joints.
3. Student will be able to get the knowledge of moulding materials, use of cores, melting furnace, tools and equipment used in foundry shops and also able to prepare small sand moulds and casting.
4. Student will be able to demonstrate a good basic understanding of machine shop practices, cutting tools and will be able to set up machines, grinders and operate lathe, vertical milling machine and machining tools.
5. Students will be able to Weld in (flat, horizontal, vertical, and overhead positions) using the basic welding processes and also able to know about various welding joints/defects.
6. Students will be able to get the knowledge of sheet metal forming and joining operations, joints, soldering and brazing processes.
7. Student will be able to get the knowledge of electrical wiring, preparation of PCBs involving soldering applied to electrical/electronic applications in electrical shop. Student will be able to get the knowledge of fitting practice and tools used in fitting shop.

COURSE CONTENT

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), maleFemale mating parts practice, trapping practice.

Suggested Readings/ Books:

1. Raghuwanshi, B.S. ; A course in Workshop technology, Vol 1 & II, Dhanpat Rai & Sons, New Delhi.
2. Jain, R.K.; Production Technology, Khanna Publishers, New Delhi.
3. Singh, S, ; Manufacturing Practice, S.K. Kataria & Sons, New Delhi.

BTCH 101 A
Engineering Chemistry

OBJECTIVES AND EXPECTED OUTCOMES

The objective of the Engineering Chemistry is to acquaint the student with the basic phenomenon/concepts of chemistry, the student face during course of their study in the industry and Engineering field. Some new topics have been introduced to the syllabus for the development of the right attitudes by the engineering students to cope up with the continuous flow of new technology. The student with the knowledge of the basic chemistry, will understand and explain scientifically the various chemistry related problems in the industry/engineering field. The student will able to understand the new developments and breakthroughs efficiently in engineering and technology. The introduction of the new topics will make the engineering student upgraded with the new technologies.

COURSE OUTCOMES

1. Basic Understanding of water, its treatment, Corrosion of metals, their types & Control measurements to minimize corrosion.
2. Ability to explain various types of spectroscopy, basic understanding of equipments to be used & their applications.
3. Ability to explain NMR spectroscopy, interpretation of NMR spectra with respect to small molecules.
4. Knowledge of Introductory overview of Green chemistry, twelve principles of Green chemistry, their explanation & basic understanding of concept of Nano chemistry including their future perspectives.
5. Basic understanding of Petrochemicals, various processes involved in their separation & classification of Crude-oil.
6. Basic understanding of Polymers, polymerization, its types & basic introduction of polymer reinforced composites.

COURSE CONTENT

PART A

1. Spectroscopy and its Applications: An introduction UV/Visible Spectroscopy: Selection rules; Line widths and intensity of spectral lines; Principle and instrumentation; Electronic Transitions; Chromophores & auxochromes; Factors affecting λMax & intensity of spectral lines: conjugation & alkyl substituents polarity of solvents; Franck-Condon principle; Applications. IR Spectroscopy: Principle and instrumentation; Vibrational frequency; Fundamental modes of vibrations and types; Anharmonicity (elementary idea); Factors affecting vibrational frequency. (8)

2. **NMR Spectroscopy:** Principle and instrumentation (Flow diagram), Chemical shift (Basic theory and factors affecting chemical shift), spin-spin splitting(elementary idea), applications(PMR only) (4)

3. **Water and its Treatment:** Boiler feed water its treatment: Specifications of water, Scales and sludge formation; Priming & foaming; Different methods of the water purifications and softening; Desalination of water; Water for domestic use ; Disinfection of water. (4)

Green Chemistry and its Applications: Introductory overview - Definition and concepts of Green chemistry; Emergence of Green chemistry; Twelve principles of Green Chemistry with emphasis on the use of alternative feedstock (bio-fuels); Use of innocuous reagents in natural processes; Alternative solvents; Design of the safer chemicals; Designing alternative reaction methodology. Microwave and ultrasonic radiation in Green synthesis - Minimizing energy consumption. (4)

PART B

5. **Corrosion and its Prevention:** Introduction; Different types of corrosion - Wet and Dry corrosion; Different types of surface films; Mechanisms of wet corrosion; Galvanic corrosion; Galvanic Series; Concentration cell corrosion and differential aeration corrosion; Soil and microbial corrosions; waterline, stress corrosions; Various methods of corrosion control. (5)

6. **Polymers and Reinforced Composites:** Introduction; Functionality; Types of polymerization; Specific features of polymers; Structures - regularity and irregularity; Tacticity of polymers; Average molecular weights and size; Determination of molecular weight by number average method; Effect of molecular weight on the properties of polymers; Introduction to polymer reinforced composite. (5)

7. **Nanochemistry:** Introduction; Materials self-assembly; Moloecular vs. materials self-assembly; Self-assembling materials; Two dimensional assemblies; Mesoscale self assembly; Coercing colloids; Nanocrystals; Superamolecular structures; Nanoscale materials; Future perspectives. (5)

8. **Petrochemicals:** Introduction; First, second & third generation petrochemicals; Primary Raw Materials for Petrochemicals. Natural gas: Natural gas treatment processes; Natural gas liquids; Properties of natural gas; Crude oil: Composition of crude oil- Hydrocarbon compounds; Non-hydrocarbon compounds; Metallic Compounds, Crude oil classification; Physical separation processes; Conversion processes; Production of ethylene and propylene. (5)

MAPPING

S. No.	B. Tech. (Common Course): Chemistry (BTCH-101A)						
1	Course Outcomes	(1)	(2)	(3)	(4)	(5)	(6)
2	Mapping of course contents with course outcomes	Water and its treatment, Corrosion and its prevention	Spectroscopy and its applications	NMR spectro-scopy	Green Chemistry, Nano-chemistry	Petro-chemicals	Polymers and Reinforced Composites
3	Category	Applied Sciences					

Suggested Readings / Books:

1. William Kemp, Organic Spectroscopy, Palgrave Foundations, 1991.
2. D. A. Skoog, F. J. Holler and A. N. Timothy, Principle of Instrumental Analysis, 5th Edition., Saunders College Publishing, Philadelphia, 1998.
3. G. W. Castellan, Physical Chemistry, Narosa, 3rd Edition, 1995, reprint 2004.
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, 2 nd edition, 1996.
9. Nicholas J Turro, Modern Molecular Photochemistry, University Science Books, Sausalito, California 2010.
10. Mohamed Belgacem, Alessandro Gandini, Monomers, Polymers and Composites from Renewable Resources, ELSEVIER, 2008.

BTCH 102 A
Engineering Chemistry Laboratory

COURSE OUTCOMES

1. Ability to analyze the total hardness of water with the help of titration.
2. Ability to analyze the quality of oil & coal by determining its components.
3. Basic understanding to prepare polymers in the laboratory.
4. Basic understanding of the concept of chromatography & will be able to separate the mixture of compounds by Thin-layer chromatography.
5. Ability to take safety measures against fire hazards by knowing properties of flammable liquids.

COURSE CONTENT

1. Analysis of Effluents

Determination of water by EDTA method.
Determination of H2O by dissolved oxygen analyzer.
Determination of turbidity by Nephelometer.
Determination of Residual Chlorine.

2. Analysis of Fuels and Lubricants

Determination of Moisture, Volatile and ash content by proximate analysis. Determination of Flash & Fire point by Abee‟s Apparatus Determination of the viscosity.
Determination of Acid Value and Aniline point of oil Determination of refractive index for oils.

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 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 Rf value of amino acid by TLC 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)-propionate (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.

MAPPING

S. No.	B. Tech. (Common Course): Chemistry Lab (BTCH-102A)					
1	Course Outcomes	(1)	(2)	(3)	(4)	(5)
2	Mapping of course contents with course outcomes	Determination of the total hardness of water using EDTA method.	Determination the acid value of an oil and components of coal	Preparation of phenol formaldehyde & urea formaldehyde resins.	Determination of R_f value of components in mixture by TLC.	Determination of flash point & fire point & viscosity of liquids.
3	Category	Applied Sciences				

Suggested Readings / Books:

1. Vogel A-I, Quantitative Inorganic Analysis, Oxford ELBS.
2. Vogel A-I, Quantitative Organic Analysis, Oxford ELBS.
3. dst.gov.in/green-chem.pdf (monograph of green chemistry laboratory experiments).

BTME 101A
Elements of Mechanical Engineering

OBJECTIVES AND EXPECTED OUTCOMES

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.

COURSE OUTCOMES

1. Students become familiar with the fundamentals of mechanical and thermal properties of materials.
2. A fundamental understanding of Laws of thermodynamics and their application to wide range of systems.
3. Familiarity with efficiencies of Heat Engines and other Engineering Devices.
4. Students have acquired the knowledge of suitable engineering materials in different applications.

COURSE CONTENT

PART-A

1. Basic Concepts of Thermodynamics (08)

Definition of thermodynamic: Need to study thermodynamics; Application areas of thermodynamic; Difference between Microscopic (or, Statistical) thermodynamics and Macroscopic(or, Classical) thermodynamics; Brief concept of continuum.

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; State postulate; Thermodynamic equilibrium (which includes Thermal, Mechanical and Chemical equilibrium etc.); 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 property diagrams; Cyclic process.

Thermodynamic Cycle: definition and its concept; Energy and its forms (microscopic and macroscopic); Physical insight to internal energy; Energy transfer across system boundary i.e. transient energies (heat and work).

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 (12)

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 (i.e., a change in state of a control mass) ; Concept of Enthalpy and total energy and differentiation between the two - a thermodynamic property; Compressible and incompressible substances, Specific heats, Difference between Internal Energy and Enthalpy of compressible and incompressible substances; Representation of first law of thermodynamics as rate equation; Analysis of non-flow/ flow process for a control mass undergoing constant volume, constant pressure, constant temperature, adiabatic and polytropic processes; Free Expansion Process and its examples, its representation on Property diagram; Review of concepts of control volume; Expressions of first law of thermodynamics for a control volume (i.e. open system) ; Steady State Steady Flow process and its examples; First law analysis of Steady State Flow process e.g. isochoric, isobaric, isothermal, isentropic and polytropic process; Throttling process and its applications; Flow energy or inertial energy of flowing fluids or, Energy transport by mass; Application of Steady State Flow Energy Equation to various engineering devices.

3. Second Law of Thermodynamics (16)

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. Justification as to why the actual efficiency of Heat Pump and Refrigerator shall also be $\leq$ 100% though on the face of it seems to be more than 100%; Various statements of Second Law of Thermodynamics and their equivalence; Philosophy of Carnot cycle and its consequences viz. how each of the individual four processes constituting the cycle contribute in optimizing the output and efficiency of the cycle; Carnot Engine, Carnot Refrigerator and Carnot Heat Pump: definitions, working, efficiency/performance and Limitations of the cycle; Carnot theorem for heat engines, refrigerators and heat pumps; derivation of Carnot efficiency/COP (which seems to be more than 100%); Thermodynamic Temperature Scale; Clausius theorem and Inequality; Philosophy and concept of entropy; Entropy changes during various processes; Temperature - Entropy Chart and representation of various processes on it; Principle of Increase of Entropy; Applications of Entropy Principle; Quality of Energy viz. high and low grade energies; Degradation of Energy; Third Law of Thermodynamics.

PART-B

4. Gas Power Cycles (12)

Introduction; Concept and philosophy of Air Standard Cycle alongwith 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), 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, their Air-standard (thermal) Efficiencies; Brayton Cycle, Comparison of Otto, Diesel and Dual cycle under some defined similar parametric conditions; Introduction to heat engines; Merits of I.C. Engines and their important applications, Classification and constructional features of I.C. Engines; working of two stroke and four stroke Petrol and Diesel engines and their comparison.

5. Engineering Materials (05)

Materials and Civilization, Materials and Engineering, Classification of Engineering Materials, Mechanical Properties of Materials: elasticity, plasticity, strength, ductility, brittleness, malleability, toughness, resilience, hardness, machinability, formability, weldability. Properties, Composition, and Industrial Applications of materials: metals (ferrous- cast iron, tool steels, stainless steels and non ferrous- Aluminum, brass, bronze), polymers (natural and synthetic , thermoplastic and thermosetting), ceramics (glass, optical fibre glass, cements), composites (fibre reinforced, metal matrix), smart materials (piezoelectric, shape memory, thermochromic, photochromic, magnetorheological), Conductors, Semiconductors and insulators, Organic and Inorganic materials. Selection of materials for engineering applications.

6. Centroid, Centre of Gravity and Moment of Inertia: (08)

Difference between centre of gravity and centroid. Determination of position of centroid of plane geometric figures of I, U, H, L, T, C, Circular and Triangular Sections. Centroid of Composite Areas. Determination of position of Centre of Gravity (CG) of regular solids viz. Right Circular Cone, Solid Hemisphere, thin Hollow Hemisphere. Area moment of inertia & mass moment of inertia, Polar moment of inertia, Parallel axes Theorem (or transfer formula), Perpendicular axes Theorem, Radius of gyration, determination of area Moment of Inertia of I, U, H, L, T, C, Circular and Triangular Sections along various axes. Mass moment of Inertia of Circular Ring, Disc, Cylinder, Sphere and Cone about their axis of symmetry and other axes.

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.

BTCS 101A
Fundamentals of Computer Programming and IT

OBJECTIVES AND EXPECTED OUTCOMES

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++.

COURSE OUTCOMES

1. To understand the fundamental hardware components that make up a computer's hardware as well as software that helps the computer to perform tasks.
2. To accomplish the basics of word, spreadsheet, presentations and exposure of INTERNET technology and its applications.
3. To create flowcharts, write syntactically correct pseudo code/ algorithm to solve small programming problems.
4. To choose significant data types, decision structures, control structure and functions in creation of C++ program.
5. To solve programming problems using object oriented programming concepts and write programs that include files for input/output.

PART A (Fundamentals of Computer and IT) (25%)

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. (2)
2. **Working Knowledge of Computer System**
   Introduction to the operating system, its functions and types, working knowledge of GUI based operating system, introduction to word processors and its features, creating, editing, printing and saving documents, spell check, mail merge, creating power point presentations, creating spreadsheets and simple graphs, evolution of Internet and its applications and services. (3)
3. **Problem Solving & Program Planning**
   Need for problem solving and planning a program; program design tools - algorithms, flow charts, and pseudocode; illustrative examples. (2)

PART B (Basics of Programming Using C++) (75%)

4. **Overview of C++ Language**
   Introduction to C++ language, structure of a C++ program, concepts of compiling and linking, IDE and its features; Basic terminology - Character set, tokens, identifiers, keywords, fundamental data types, literal and symbolic constants, declaring variables, initializing variables, type modifiers. (3)
   Beginning with C++ program Input/output using extraction (>>) and insertion (<<) operators, writing simple C++ programs, comments in C++, Stages of program execution. (4)
7. **Control Structures;** Decision making statements: if, nested if, if - else. Else if ladder, switch, Loops and iteration: while loop, for loop, do - while loop, nesting of loops, break

statement, continue statement, go to statement, use of control structures through illustrative programming examples. (4)

8. **Functions** Advantages of using functions, structure of a function, declaring and defining functions, return statement, formal and actual arguments, const argument, default arguments, concept of reference variable, call by value, call by reference, library functions, recursion, storage classes. Use of functions through illustrative programming examples.(4)
9. **Arrays and Strings** Declaration of arrays, initialization of array, accessing elements of array, I/O of arrays, passing arrays as arguments to a function, multidimensional arrays. String as array of characters, initializing string variables, I / O of strings, string manipulation functions (strlen, strcat, strcpy, strcmp), passing strings to a function. Use of arrays and strings through illustrative programming examples. (4)
10. **Concepts of Object Oriented Programming** Introduction to Classes, Objects, Data abstraction, Data encapsulation, inheritance and polymorphis. (2)
11. **Classes and Objects** Defining classes and declaring objects, public and private keywords, constructors and destructors, defining member functions inside and outside of a class, accessing members of a class, friend function. Use of classes and objects through illustrative programming examples. (4)
12. **Basics of File Handling** Opening, reading, and writing of files, error handling during files operation. (2)

Suggested Readings/ Books:

1. E. Balagurusamy, Object-Oriented Programming with C++, Tata McGraw Hill.
2. P. K. Sinha and Priti Sinha, Computer Fundamentals, BPB Publications.
3. Lafore R., Object Oriented Programming in C++, Waite Group.
4. Bjarne Stroustrup, The C++ Programming Language, Addison Wesley.
5. Lippman F. B, C++ Primer, Addison Wesley.
6. R. S. Salaria, Computer Concepts and Programming in C++, Salaria Publishing House.
7. Gurvinder Singh, Krishan Saluja, Fundamentals of Computer Programming & IT, Kalyani Publishers.
8. R. S. Salaria, Fundamentals of Computers, Salaria Publishing House.

BTCS102 A
Fundamentals of Computer Programming and IT

COURSE OUTCOMES

1. To familiarize and understand various components of computer system's to perform different tasks.
2. To understand window explorer and working with control panel.
3. To understand the working of the internet that include the use of protocols. domains, IP addresses.
4. To understand and apply various tools line MS word , MS Excel and MS PowerPoint.
5. To understand and solve various C++ programs using oops concepts criteria.

COURSE CONTENT

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.
To introduce the graphical user interface (desktop) of Windows Operating System

- to explain the various elements of the desktop such as taskbar, icons (My Computer, Recycle Bin, etc.), short cuts, notification area.
- to configure the desktop that include selecting the wall paper, selecting the screen saver with or without password protection, selecting the screen resolution and color quality.

2. **Navigating with Window Explorer:**
   To navigate with the drives
   To create new folders
   To move folders from one drive to another drive
   To move files from one folder to another folder
   To search files and folders
   To share files and folders
   To view and/or change the attributes of the files and folders
3. **Working with Control Panel:**
   To work with date and time
   To create new user accounts
   To install new hardware and configuring existing hardware
   To install new software or remove existing installed software
   To configure network connections
   To manage security profile
4. **Miscellaneous Features:**
   To work at the command prompt
   To open an application, folder, document or internet resource from the Run command
   To initialize storage media (formatting)
   To understand the menace of viruses
   To understand the working of virus guards and antivirus software
5. **Exploring the Internet:**
   To understand the working of the internet that include the use of protocols, domains, IP addresses, URLs, web browsers, web servers, mail-servers, etc.
   To create email-account, sending mails, receiving mails, sending files as attachments, etc.
   To login to a remote computer
   To search information using search engines
6. **Microsoft Word:**
   To familiarize with parts of Word window
   To create and save a document
   To set page settings, create headers and footers
   To edit a document and resave it
   To use copy, cut and paste features
   To use various formatting features such as bold face, italicize, underline, subscript, superscript, line spacing, etc.
   To use spelling and grammar checking feature
   To preview print a document

7. Microsoft Word continued:

To create a table with specified rows and columns
To enter data in a table
To select a table, a row, a column or a cell
To insert new row and/or a column
To delete a row and/or a column
To split and merge a row, column or a cell
To understand the mail-merge and to use mail merge feature of MS-Word

8. Microsoft Excel:

To familiarize with parts of Excel window
To create and save a workbook with single and/or multiple worksheets
To edit and format text as well numbers
To apply operations on range of cells using built-in formulae
To preview and print a worksheet

9. Microsoft Excel continued:

To insert new row and/or column in a worksheet
To delete a row and/or column in a worksheet
To create a variety of charts
To import and export data to or from worksheet

10. Microsoft PowerPoint:

To familiarize with parts of PowerPoint window
To create and save a new presentation
To apply design templates to a presentation
To insert, edit and delete a slide
To use different views of slides
To use slide show from beginning or from the current slide
To preview and print a presentation

11. Microsoft PowerPoint continued:

To check spellings in a presentation
To add clip art and pictures in a slide
To add chart, diagram and table in a slide
To set animation for a selected slide and/or for entire presentation
To create slide master and title master
To create a custom show

12. Write a program to find the nature of the roots as well as value of the roots. However, in case of imaginary roots, find the real part and imaginary part separately.

13. Write a program, which takes two integer operands and one operator form user, performs the operation and then prints the result. (Consider the operators +,-,*, /,% and use switch statement).For example, the input should be in the form: 5 + 3 the output should comes Result = 8.

14. Fibonacci sequence is defined as follows: the first and second terms in the sequence are 0 and 1. Subsequent terms are found by adding the preceding two terms in the sequence. Write a program to generate the first n terms of the sequence. For example, for n = 8, the output should be 0 1 1 2 3 5 8 13.

15. Write a program to print all the prime numbers between m and n, where the value of m and n is supplied by the user.

16. The number such as 1991, is a palindrome because it is same number when read forward or backward. Write a program to check whether the given number is palindrome or not.

17. A positive integer number IJK is said to be well-ordered if I<J< 3 < 8. Number 365 is not well-ordered because 6 is larger than 5. Write a program that will find and display all

possible three digit well-ordered numbers. The program should also display the total number of three digit well-ordered numbers found.

18. Write a function to computer the highest common factor of integer numbers m and n. Use this function to find the highest common factor of integer numbers a and b.

19. Given the marks (out of 100) obtained by each student in a test of a class with n students. Write a program to obtain the following information: (a) minimum and maximum marks score (b) average score of the class, and (c) number of students whose score is greater than class's average score.

20. Write a program to multiply matrix Am×n by Bp×q, given that n = p.

21. Write a program to sort a list of n integer numbers in descending order using bubble sort method.

22. Create a class named Student with the appropriate data members and member functions to generate output comprising student's admission no., name, marks in five subjects and the %age of marks obtained. Write a program to use the Student class.

23. Create a class named Complex Number with the appropriate data members and constructors. Include member functions (defined inside the class) to perform the following operations:

(a) Inputting a complex number
(b) Outputting a complex number
(c) Arithmetic operations on two complex numbers Write an appropriate program to demonstrate use of the Complex Number class.

24. Create a class named Height with feet and inches as its data members. Also include appropriate constructors (and destructor, if required). Include member functions (defined outside the class) to perform the following operations:

(a) Inputting a height of a person
(b) Displaying a height of a person
(c) To get height in inches
(d) To compare two heights Write an appropriate program to demonstrate use of the Height class.

Note: Students are required to prepare a file containing lab exercises based on programming only, where as the oral examination will be from the entire syllabus.

EVSC 101A
Environmental Science

OBJECTIVES AND EXPECTED OUTCOMES

The syllabus and course layout for Environment Science course (EVSC-101A) of first year of all B. Tech. programs conform to outcome based teaching learning process. Following Course Outcomes (1 -5) have been identified for this course and syllabus has been structured in such a way that each of the units meets one or more of these outcomes. Student outcomes describe what students are expected to know and be able to achieve at the end of the course. These relate to the skills, knowledge and proficiency that students acquire as they undergo the course. The mapping of instructional objectives to the student outcomes has also been done.

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

1. Measure environmental variables and interpret results.
2. Evaluate local, regional and global environmental topics related to resource use and management.
3. Propose solutions to environmental problems related to resource use and management
4. Interpret the results of scientific studies of environmental problems.
   Describe threats to global biodiversity, their implications and potential solution.

COURSE OUTCOMES

1. Basic understanding of concept of Multidisciplinary nature of Environmental Science & basic problems of exploitation & environmental effects of using Natural Resources.
2. Ability to identify threats to Bio-diversity and their potential solutions.
3. Ability to get overview of various Ecosystems, their structure & functions.
4. Awareness about causes, effects & control measures of various types of environmental Pollution.
5. Basic understanding of relationship among Social-issues, human population & environment.

COURSE CONTENT

Part A

1. **Introduction:** Definition and scope and importance of multidisciplinary nature of environment. Need for public awareness. (2)
2. **Natural Resources:** Natural Resources and associated problems, use and over exploitation, case studies of forest resources and water resources. (4)
3. **Ecosystems:** Concept of Ecosystem, Structure, interrelationship, producers, consumers and decomposers, ecological pyramids-biodiversity and importance. Hot spots of biodiversity (4)
4. **Environmental Pollution:** Definition, Causes, effects and control measures of air pollution, Water pollution, 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. Disaster Management : Floods, earthquake, cyclone and landslides. (5)

PART B

5. Social Issues and the Environment From Unsustainable to Sustainable development, Urban problems related to energy, Water conservation, rain water harvesting, watershed management. Resettlement and rehabilitation of people; its problems and concerns. Case

studies. Environmental ethics: Issues and possible solutions. Climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust. Case studies. Wasteland reclamation. Consumerism and waste products. Environment Protection Act. Air (Prevention and Control of Pollution) Act. Water (Prevention and control of pollution) Act. Wildlife Protection Act, Forest Conservation Act, Issues involved in enforcement of environmental legislation Public awareness. (5)

6. Human Population and the Environment, Population growth, variation among nations. Population explosion - Family Welfare Programme. Environment and human health, Human Rights, Value Education, HIV/AIDS. Women and child Welfare. Role of Information Technology in Environment and human health. Case studies. (4)

MAPPING

S.No.	B. Tech. (Common Course): Environment Science (EVSC-101A)					
1	Course Outcomes	(1)	(2)	(3)	(4)	(5)
2	Mapping of Course contents with course outcomes	The multi-Disciplinary nature of Environment studies & Natural resources	Bio-Diversity and its conservation	Ecosystem	Environmental pollution	Social-issues & the Environment, Human population and Environment
3	Category	Applied Sciences				

Suggested Readings / Books:

1. Agarwal, K. C. 2001 Environment Biology, Nidi Publ. Ltd. Bikaner.
2. Jadhav, H & Bhosale, V.M. 1995. Environment Protection and Laws. Himalaya Pub House, Delhi 284p.
3. Rao M. N. & Datta A. K. 1987. Waste Water Treatment. Oxford & IBH Publ. Co. Pvt. Ltd.
   345p.
4. Principle of Environment Science by Cunninghan, W.P.
5. Essentials of Environment Science by Joseph.
6. Environment Pollution Control Engineering by Rao, C.S.
7. Perspectives in Environmental Studies by Kaushik, A.
8. Elements of Environment Science & Engineering by Meenakshi.
9. Elements of Environment Engineering by Duggal.

BTME 102 A
Engineering Drawing

OBJECTIVES AND EXPECTED OUTCOMES

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. Computer graphics will enable the students to strengthen the understanding through hands on training on any CAD software wherein they will be introduced to a number of assignments as mentioned in the said course.

COURSE OUTCOMES

1. Students have acquired the knowledge of drawing national and international standards and practice being followed and letter writing skills on the drawing sheet manually.
2. Students will be able to visualize geometrical objects and to certain extent the 3-D machine parts by reading 2-D multi view orthographic projections and vice versa.
3. Students will be able to understand general instructions related to Theory of Orthographic Projection of points, lines, planes and solids as per the BIS codes prevalent to drawing practice. 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 objects.
4. Students will be able to understand true shapes and apparent shapes of objects in the orthographic views.
5. Students will be able to understand different types of scales and their classification.

COURSE CONTENT

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. Basic Definition of geometrical objects: Points, lines, planes and solids.

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 and octants, illustration through simple problems of projection.

3. Projection of Points

Projection of points in quadrants and octants. Projection of point on Auxiliary planes.

4. Projection of Lines

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**
   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.
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 and auxiliary plane method to draw the projections.

PART B

7. **Section of Solids**
   Definition of Sectioning and its purpose. Procedure of Sectioning, Types of sectional planes. Illustration through examples.
8. **Intersection of Surfaces/Solids**
   Purpose of intersection of surfaces, Intersection between the two cylinder, two prisms, prism and pyramid, pyramid and pyramid, cylinder and prism, cone and cylinder, sphere and cylinder etc., use of cutting plane and line method.
9. **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.
10. **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.
11. **Orthographic Projection**
    Review of principle of Orthographic Projection, Sketch/drawing of blocks, and of simple machine parts.

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.

BTME 103 A
Engineering Computer Graphics Laboratory

OBJECTIVES AND EXPECTED OUTCOMES

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, int ersection 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.

COURSE OUTCOMES

CO No.	After undergoing this course, students must be able to:
1	Visualize Science in the form of technical graphics, geometrical objects and to certain extent the machine parts.
2	Draw 2D sketches of machine parts using computer graphics software.

COURSE CONTENT

Lab Work I: Involves hands-on practice sessions related to 2-D computer sketching.
Exercise 1: Study and draw 2-D sketching entities like lines, rectangle, parallelogram polygon, circle etc., under SKETCH ENTITY MENU.
Exercise 2: (a) Rectangular array (b) Circular array
Exercise 3: Sketch of Metal grate
Exercise 4: Slotted Base Exercise
5: Link
Exercise 6: Base Plate (Extruding the sketch)
Exercise 7: Bush (Revolve)
Exercise 8: Handle (Revolve)
Exercise 9: Flange coupling parts
Exercise 10: Bell Crank Lever

Lab Work-II: Using the geometric shape and size data learnt in Lab Work I, extrude or revolve the sketch to obtain 3-D drawing. Study and practice various options available for 3-D drawing.
Exercise 1: Bracket Lever
Exercise 2: Hand Wheel
Exercise 3: Hexagonal Nut and Bolt
Exercise 4: Keys
Exercise 5: Body of Solid Journal Bearing
Exercise 6: Shaft
Exercise 7: Cup of Screw Jack
Exercise 8: Screw Jack Body
Exercise 9: V-Block
Exercise 10: Gland

BTAM 102A
Applied Mathematics-II

OBJECTIVES AND EXPECTED OUTCOMES

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.

COURSE OUTCOMES

CO No.	After undergoing this course, students must be able to:
CO1	To understand the basic concepts of Ordinary Differential Equations of different types and different orders and will learn how to solve them by various methods. They will able to apply these Ordinary Differential Equations in different field like electric R-L-C circuits, Deflection of beams, Simple harmonic motion, and Simple population model etc.
CO2	To understand the basics concepts of **linear Algebra** and must also able to learn to apply these concepts in finding Eigen values, Eigen vectors, solution of linear algebraic equations etc.
CO3	To understand the basics concepts of convergence and divergence of a series and checking of convergence and divergence of given series by various methods.
CO4	To understand the basics concepts of complex numbers and elementary functions of complex variable. They must also be able to understand De-Moivre's theorem and its use in many applications.

COURSE CONTENT

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. (7)
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. (7)
3. **Applications of Ordinary Differential Equations**
   Applications to electric R-L-C circuits, Deflection of beams, Simple harmonic motion, Simple population model. (7)

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. (7)
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 (7)
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.