SCHEME & SYLLABUS OF B.Tech 1ST & 2ND SEMESTER
(Common for all B.Tech Disciplines)

Batch -2015 onwards
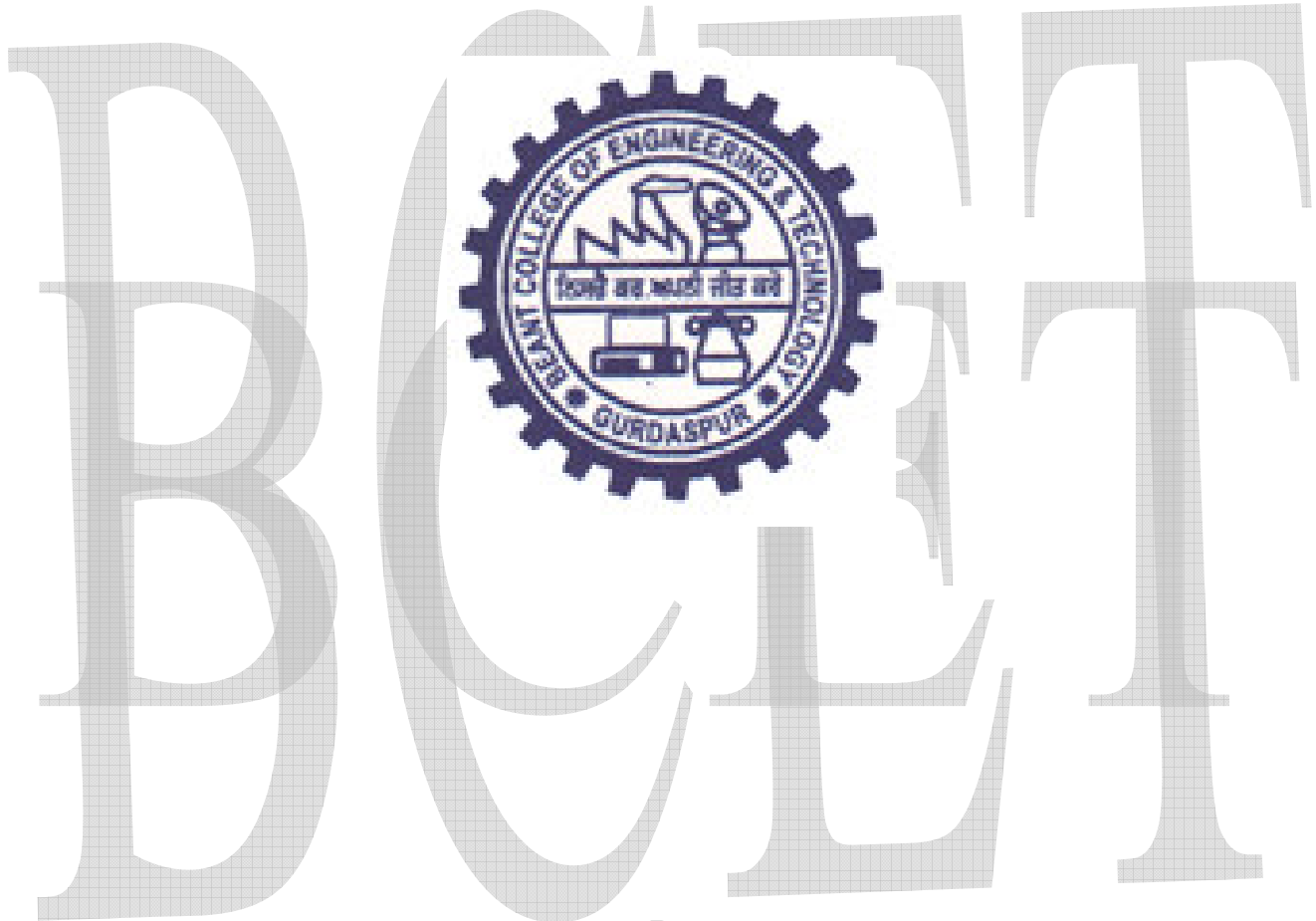
By
Department of Academics
BEANT COLLEGE OF ENGINEERING & TECHNOLOGY
GURDASPUR

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Chemistry Group (B.Tech 1st Semester)

Course code	Course name	L	T	P	Internal	External	Total	credits
BT AC-101	Engineering Chemistry	3	1	0	40	60	100	4
BTAM-101	Engineering Mathematics-I	4	1	0	40	60	100	5
BTCS-101	Fundamentals of Computer Programming & Information Technology (FCPIT)	3	0	0	40	60	100	3
BTME-101	Elements of Mechanical Engineering	3	1	0	40	60	100	4
EVSC-101	Environmental Science	2	0	0	40	60	100	2
BT AC-102	Engineering Chemistry Lab	0	0	2	30	20	50	1
BTME-102	Engineering Drawing	1	0	4	40	60	100	3
BTCS-102	Fundamentals of Computer Programming & Information Technology Lab	0	0	2	30	20	50	1
BTME-103	Engineering Computer Graphics Lab	0	0	2	30	20	50	1
Total		**16**	**3**	**10**			**750**	**24**

Physics Group (B.Tech 1st Semester)

Course code	Course name	L	T	P	Internal	External	Total	Credits
BTPH-101	Engineering Physics	3	1	0	40	60	100	4
BTAM-101*	Engineering Mathematics-I							
BTBM-101**	Basic Mathematics	4	1	0	40	60	100	5
BTBB-101***	Basic Biology							
BTEC-101	Basic Electrical & Electronic Engineering	4	1	0	40	60	100	5
BTHU-101	Communicative English	3	0	0	40	60	100	3
BTIM-101	Introduction to Management & Human Values	2	0	0	40	60	100	2
BTPH-102	Engineering Physics Lab	0	0	2	30	20	50	1
BTHU-102	Communicative English Lab	0	0	2	30	20	50	1
BTEC-102	Basic Electrical & Electronic Engineering Lab	0	0	2	30	20	50	1
BTMP-101	Manufacturing Practice	0	0	6	60	40	100	3
Total		**16**	**3**	**12**			**750**	**25**

* **Students of B.Tech (Bio-Tech) will study the following course instead of BTAM-101 in 1st semester:**
1.** **Students having Bio background will study BTBM-101 (Basic Mathematics).**
2.*** **Students having mathematics background will study BTBB-101 (Basic Biology).**

Chemistry Group 2nd Semester

Course code	Course name	L	T	P	Internal	External	Total	Credits
BTPH-101	Engineering Physics	3	1	0	40	60	100	4
BTAM-102	Engineering Mathematics-II	4	1	0	40	60	100	5
BTEC-101	Basic Electrical & Electronic Engineering	4	1	0	40	60	100	5
BTHU-101	Communicative English	3	0	0	40	60	100	3
BTIM-101	Introduction to Management & Human Values	2	0	0	40	60	100	2
BTPH-102	Engineering Physics Lab	0	0	2	30	20	50	1
BTHU-102	Communicative English Lab	0	0	2	30	20	50	1
BTEC-102	Basic Electrical & Electronic Engineering Lab	0	0	2	30	20	50	1
BTMP-101	Manufacturing Practice	0	0	6	60	40	100	3
BTGF-200	General Fitness	-	-	-	-	-	100	1
Total		**16**	**3**	**12**			**850**	**26**

Physics Group 2nd Semester

Course code	Course name	L	T	P	Internal	External	Total	credits
BT AC-101	Engineering Chemistry	3	1	0	40	60	100	4
BTAM-102	Engineering Mathematics-II	4	1	0	40	60	100	5
BTCS-101	Fundamentals of Computer Programming & Information Technology (FCPIT)	3	0	0	40	60	100	3
BTME-101	Elements of Mechanical Engineering	3	1	0	40	60	100	4
EVSC-101	Environmental Science	2	0	0	40	60	100	2
BTAC-102	Engineering Chemistry Lab	0	0	2	30	20	50	1
BTME-102	Engineering Drawing	1	0	4	40	60	100	3
BTCS-102	Fundamentals of Computer Programming & Information Technology Lab	0	0	2	30	20	50	1
BTME-103	Engineering Computer Graphics Lab	0	0	2	30	20	50	1
BTGF-200	General Fitness	-	-	-	-	-	100	1
Total		**16**	**3**	**10**			**850**	**25**

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BTAC 101: Engineering Chemistry

L T P
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Internal Marks: 40

External Marks: 60

Total Marks: 100

Objective and Expected outcome:

The objective of the Engineering Chemistry is to acquaint the student with the basic phenomenon/ concepts of chemistry, the student face during course of the study in the industry and Engineering field. 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 be able to understand the new developments and break through efficiently in engineering and technology.

1. **Spectroscopy and its applications:** An introduction; Beer- Lambert Experimental techniques for analysis, Intensities and line widths Selection Rules, Infra red spectroscopy , UV/Visible Spectroscopy, Franck-Condon principle, NMR Spectroscopy ,Mass spectrometry, Structure elucidation of compounds using 1R,UV /Visib1e ,NMR spectroscopy and Mass Spectrometry.

   (8)

2. **Water and its treatment:** Boiler feed water, Specification, Scales and Sludge formation, Priming and Foaming, Different methods of the water purification and softening, Desalination of water, Water for domestic use, specification, disinfection of water.
   (5)

3. **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)

4. **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)

5. **Polymers and Reinforced Composites:** Introduction; Functionality; Types of polymerization; Specific features 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, Structure ,synthesis and applications of some polymers and bio-polymers. Polyvinyl chloride, Cellulose acetate Nylon 6,6 ,11,Urea formaldehyde resin (5)

6. **Sources of energy:** 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, Laws of photochemistry, Quantum yield,

primary and secondary photochemical reactions,Jablonski diagram, Semiconductor photochemistry, Photovoltaic cells, Introduction to optical sensors, Introduction to supra-molecular photochemistry. (10)

Suggested Readings / Books

l. William Kemp, Organic Spectroscopy, Palgrave Foundations, 1991.
2. D.A. Skoog, F.J. Holler and A.N. Timothy, Principle of Instrumental Ana1ysis,5th Edition., Saunders College Publishing, Philadelphia, 1998.
3. G.W.Castellen, Physical Chemistry, Narosa, 3rd Edition,1995, reprint 2004.
4. M. Lancaster, Green Chemistry an Introductory Text, Royal Society of Chemistry, Cambridge, UK. 1st edition,2010.
5. Sami Matar, Lewis F. Hatch, Chemistry of Petrochemical Processes, Second Edition, Gulf Publishing compony, Houstan, Texas, 2000.

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BTAM-101 Engineering Mathematics-I

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Internal Marks: 40
External Marks: 60
Total Marks: 100

Objective/s and Expected outcome

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

1. Differential Calculus:
Curve tracing: Tracing of Standard Cartesian; Parametric and Polar curves (Astroids, Cycloids, Folium Tubes Cardiods, Lemniscate, 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

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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 Gemetry, Ninth Edition,Peason Education.
2.Kreyszig, E., Advanced Engineering Mathematics, Eighth edition, John wiley.
3.Jain, R.K and Lyengar, S.R.K., Advanced Engineering Mathematics, Narosa Publishing Company.
4.Grewal, B.S., Higher Engineering Mathematics, Khanna Publishers,New Delhi.
5. B. V. Ramana, Higher Engineering mathematics,Tata Mcgraw Hills, New Delhi.

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BTCS 101 Fundamentals of Computer Programming and IT

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Internal Marks: 40

External Marks: 60

Total Marks: 100

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

PART A (Fundamentals of Computer and IT) (15%)

1. Introduction to Computers
Define a Computer System, Block diagram of a Computer System and its working, Memories, Computer Software and Hardware, Introduction to the operating system.

2. Problem Solving & Program Planning
Need for problem solving and planning a program; program design tools – algorithms, flow charts, and pseudo code; illustrative examples.

PART B (Basics of Programming Using C++) (85%)

3. 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.

4. Operators and expressions
Operators in C++, precedence and associativity of operators, expressions and their evaluation, type conversions.

5. Beginning with C++ program
Input/output using extraction (>>) and insertion (<<) operators, writing simple C++ programs, comments in C++, stages of program execution.

6. 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.

7. Functions
Advantages of using functions, structure of a function, declaring and defining functions, return statement, formal and actual arguments, default arguments, concept of reference variable, call by value, call by

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reference, library functions, recursion, storage classes. Use of functions through illustrative programming examples.

8. 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.

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.

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BTME-101: Elements of Mechanical Engineering

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Internal Marks: 40

External Marks: 60

Total Marks: 100

Objectives and Expected Outcome:
This course is designed to provide all B.Tech. students with an overview of Mechanical Engineering. The students will learn elements of Mechanical Engineering thermodynamics, mechanics, engineering materials and manufacturing processes. Upon completion of the course, the students should be able to understand the importance of Mechanical Engineering in everyday life and manufacturing of various products in each field.

1. Engineering Thermodynamics

Review of basics of thermodynamics. Sign conventions for energy transfer across system boundary. First law analysis for a control mass undergoing constant pressure, constant volume, constant temperature, adiabatic and polytropic processes in non-flow systems. Free expansion process and its representation on property diagram. Steady flow energy equation and its application to various engineering devices without numerical problems. Throttling process and its applications. High and low grade energies. Second law analysis of heat engine, refrigerator and heat pump. Carnot cycle for these systems. Concept of entropy and representation of various processes on T-S coordinates. Principle of increase of entropy. Entropy change during various processes. Introduction to third law of thermodynamics.

2. Engineering Mechanics

Concept of rigid and elastic body, constraint types and constraint reactions, equilibrium equations for a co-planner force system, equilibrium in the presence of sliding friction forces, difference between machine and mechanism, introduction to various machine elements like permanent and temporary joints, shaft, bearing, gear, clutch, spring, flywheel and machine frame. Concept of centre of mass and radius of gyration for simple bodies, determination of moment of inertia of disk.

3. Engineering Materials

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, magneto rheological), Conductors, Semiconductors and insulators, Organic and Inorganic materials. Selection of materials for engineering applications.

4. Manufacturing Processes

Manufacturing processes and their classification, Welding - Types of welding, Introduction to gas welding, arc welding and soldering; Machine tools-Classification of machine tools, Introduction to lathe,

milling, drilling, shaping and grinding machine; Metal forming-Classification of metal forming processes, introduction to forging, rolling, punching and blanking; Metal Casting-Classification of casting processes, tools and equipments for moulding, types of patterns, moulding sands.

Suggested Books
1. Kumar D.S., Elements of Mechanical Engineering, Kataria and Publications, Ludhiana.
2. Yadav R., Thermodynamics and Heat Engines, Central Publishing House, Allahabad.
3. Rao P. N., Manufacturing Technology, Foundry, Forming & Welding, Tata McGraw Hill.
4. Sharma P.C., A Text Book of Production Technology, S. Chand & Company Ltd., New Delhi.
5. Bedi D.S., Element of Mechanical Engineering, Khanna Publishers, New Delhi.
6. Tayal A.K., Engineering Mechanics, Umesh Publications.
7.Donald R. Askeland, Pradeep P. Phule, Essentials of Materials Science & Engg., Cenage Learning.

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EVSC101: Environmental Science

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Internal Marks: 40

External Marks: 60

Total Marks: 100

Objective/s and Expected outcome:
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
5. Describe threats to global biodiversity, their implications and potential solutions.

Part -A

1. Introduction:
Definition and scope and importance of multidisciplinary nature of environment. Need for public awareness.   (2)

2. Natural Resources:
Introduction and types of natural Resources and associated problems, use and over exploitation of resources.   (3)

3. Ecosystem and Biodiversity:
Concept and types of Ecosystem, Structure and functions of ecosystem, producers, consumers and decomposers, ecological pyramids, Introduction to biodiversity, levels of biodiversity, values of biodiversity, importance (uses) of biodiversity, Hot spots of biodiversity, Threats to biodiversity, Conservation of biodiversity (*in situ* and *ex situ* techniques).   (4)

4. Environmental Pollution:
Introduction, definition, sources, effects and control measures of Air pollution, Water pollution, Soil pollution, Marine pollution, Noise pollution, Thermal pollution. Nuclear hazards.Solid waste Management: Types, sources, causes and effects of solid wastes, Methods of solid waste disposal.   (4)

5. Disaster Management :
Introduction ,characteristics and types of Disasters, Causes, effects and control measures of Floods, earthquake, cyclone and landslides.   (2)

Part-B

6. Global Environment Issues:
Concept of sustainable development,Water conservation, rain water harvesting, watershed management,

` Resettlement and rehabilitation, Climate change, Global warming (Green house effect) , Acid rain ,Ozone layer depletion, Wasteland reclamation. (3)

7. Legislation for Environmental Protection :
Air (Prevention and Control of Pollution) Act, Water (Prevention and Control of pollution) Act, Environment Protection Act, Wildlife Protection Act , Forest Conservation Act, their objectives and salient features. (2)

8. Environment and Human Population:
Population growth, Population explosion, Environment and human health, Human Rights, Value Education, Environmental ethics, Role of Information Technology in Environment and human health. (4)

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BTAC-102: Engineering Chemistry Lab

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Internal Marks: 30

External Marks: 20

Total Marks: 50

1.   Determination of viscosity of a heavy oil by means of Redwood Viscometer (No. 1 and No.2)

2.   Preparation of Urea Formaldehyde resin.

3.   Determination of Acid Value of oil.

4.   To determine the flash point and fire point of a given sample of lubricating of using closed cup apparatus.

5.   Determination of residual chlorine in a water sample.

6.   To determine Rf value of given amino acids by TLC and to identify the amino acids presents in mixture.

7.   To determine the surface tension of the given liquid at room temperature by stalagmometer.

8.   To determine the total hardness of the given water sample by EDTA method
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9.   Base catalysed aldol condensation by green Methodology

10. (a) Determination of λ_{max} by spectrophotometer and verification of Lambert Beer's law.
     (b) Determination of conc. of a solution by spectrophotometer.

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BTME-102: Engineering Drawing

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Internal Marks: 40

External Marks: 60

Total Marks: 100

Objective and Expected Outcome:

Main objective of Engineering Drawing is to introduce the students to visual science in the form of technical drawing. General instructions related to theory of projection of points, lines, planes and BIS codes will be introduced. Section of solids 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. The expected outcome of the subject is to ascertain that the students are able to draw and read the drawings of industrial products required in various sections of industry like production department, inspection and quality control department etc.

1. Introduction Engineering drawing and its types:

Introduction to lettering(single stroke), types of lines and their uses. Introduction to dimensioning including symbols and conventions in drawing practice. Concepts of scale in drawing. Types of scales: Plain scale and Diagonal scale.

2. Theory of Projections:

Type of projections, Perspective, Orthographic, Axonometric and their basic principles. Introduction to quadrants and octants for projections, Concept of 1st and 3rd angle Projections.

3. Projection of Points and Lines Projection of points:

Projection of Lines: Parallel to both H P and V P, Parallel to one and inclined to other, inclined to both H P and V P, contained in profile plane. True length and true angle of straight line by rotation method and trapezoidal method. Traces of line.

4. 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, Traces of planes.

5. Projection and Section 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 planes, axis perpendicular to profile plane and parallel to both H P and V P. Visible and invisible details in the projection. Definition of sectioning and its purpose. Procedure of sectioning with illustration through simple examples.

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6. Development of Surfaces:

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

7. Isometric Projections:

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.

8. Orthographic Projections:

Review of principle of orthographic projections, Sketch/drawing of blocks and simple machine parts. Concept of missing line.

Suggested Books

1. Gill P S, "Engineering Graphics and Drafting", Katria and Sons, Delhi.

2. Bhat N D, "Elementary Engineering Drawing-Plane and solid Geometry", Chartotar Publishing House, Anand.

3. John K C, "Engineering Graphics for Degree", PHI Learning Private Limited, New Delhi.

4. Johle D A, "Engineering Drawing", Tata McGraw Hill Education Private Limited, New Delhi.

5. Agrawal B, Agrawal C M, "Engineering Drawing", Tata McGraw Hill Publishing Company Limited, New Delhi.

BTCS-102: FCPIT Laboratory

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Internal Marks: 30
External Marks: 20
Total Marks: 50

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 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. 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
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 inset 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

4. 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

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To apply operations on range of cells using built-in formulae
To preview and print a worksheet
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

To Write following C++ Programs
1. WAP to find average of n numbers.
2. WAP to find greatest of three numbers.
3. WAP to find roots of a quadratic equation
4. WAP to find HCF of two numbers.
5. WAP to find whether the given number is prime or non-prime.
6. WAP to print n numbers in Fibonacci series
7. WAP to find the factorial of a number.
8. WAP to find the factorial of a number using recursion.
9. WAP to add two matrices

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BTME-103: Engineering Computer Graphics Laboratory

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Internal Marks: 30
External Marks: 20

Total Marks: 50

Objective and Expected outcome:
Main objective of the Engineering Computer Graphics Laboratory is to introduce the students to the visual science in the form of technical graphics. General instructions related to drafting software, drawing and Orthographic Projection of points, lines, arcs, circles etc. will be introduced initially. Modification of existing drawings will be introduced through modifying commands. Dimensioning of drawing and use of different layers to enhance clarity of drawing will be introduced. Students should be able to convert 2D drawings into 3D drawings and further modify these drawings. Section of solids and generation of simple solids/blocks will further upgrade the basic understanding and visualization of geometrical objects and to certain extent the machine parts.

1. Study of drafting software.
2. Exercise based upon simple entities like lines, circle, arc, polygon, ellipse etc.
3. Exercise based upon commands like polyline, spline, ray, reference line etc.
4. Exercise based upon modifying commands like extend, trim, scale, copy, move etc.
5. Exercise based upon modifying commands like hatching, fillet, chamfer, array etc.
6. Exercise based upon dimensioning in 2D entities and layers.
7. Exercise based upon 3D standard entities such as cube, cylinder, cone etc.
8. Exercise based upon extrude, revolve, union and subtraction to generate simple 3D objects like Bush, V- Block etc.
9. Exercise based upon sectioning and solids.

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BTPH 101- Engineering Physics

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Internal Marks: 40

External Marks: 60

Total Marks: 100

Objective/s and Expected outcome: 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.

1. **EM waves & Dielectrics:**
   Physical significance of Gradient, Divergence & Curl, Relationship between Electric Field & Potential, Dielectric polarization, displacement Current, Types of polarization, Maxwell‟s Equations, Equation of EM waves in free space, velocity of EM waves, Poynting vector, Electromagnetic Spectrum (Basic ideas of different regions). (6)

2. **Magnetic Materials & Superconductivity:**
   Basic ideas of Dia, Para, Ferro & Ferri, Ferrites, Magnetic Anisotropy, Magnetostriction its applications in production of Ultrasonic waves, Superconductivity, Superconductors as ideal diamagnetic materials, Signatures of Superconducting state, Meissner Effect, Type I & Type II superconductors, London Equations, Introduction to BCS theory. (6)

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. (6)

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, CO_2 and semiconductor Lasers, Introduction to Holography. ` (6)

5. **Fibre Optics:**
   Introduction, Acceptance Angle, Numerical Aperture, Normalized frequency, Modes of propagation, material dispersion & pulse broadening in optical fibres, fibre connectors, splices and couplers, applications of optical fibres. (6)

6. **Quantum Theory:**
   Need and origin of quantum concept, Wave-particle duality, Matter waves, Group & Phase velocities,

` Uncertainty Principle, Significance & normalization of wave function, Schrodinger wave equation: time independent & dependent, Eigen functions & Eigen values, particle in a box.

(6)

Suggested Readings / Books:
1. Engineering Physics, Malik; HK, Singh; AK, Tata McGraw Hill,
2. Materials Science & Engg., Raghvan V.,Prentice Hall of India.
3. Concepts of Modern Physics, Beiser; A., Mahajan; S., Choudhary; SR, Tata McGraw Hill.
4. Introduction to Solids, Azaroff LV, Tata Mc Graw Hill.
5. Learning.Materials Science & Engineering, Callister; WD, John Wiley & Sons.
6. Introduction to Electrodynamics, Griffiths; DJ, Prentice Hall.
7. Lasers & Optical engineering, Dass; P, Narosa Publishers.
8. Optical Fibre system, Technology, Design & Applications, Kao; CK, McGraw Hill.
9. Laser Theory & Applications, Thygrajan; K, Ghatak; AK, Mc Millan India Ltd

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BTAM-102 Engineering Mathematics-II

L T P
4 1 0

Internal Marks: 40
External Marks: 60
Total Marks: 100

Objective/s and Expected outcome:
The learning objectives of core mathematics courses can be put into three categories:
Content Objectives: Students should learn fundamental mathematical concepts and how to apply them.
Skill Objectives: Students should learn critical thinking, modeling/problem solving and effective uses of technology. Communication Objectives: Students should learn how to read mathematics and use it to communicate knowledge. The students are expected to understand the fundamentals of the mathematics to apply while designing technology and creating innovations.

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. Leibnitz'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)

4. Linear Algebra:
Rank of a matrix ,Elementary transformations, 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,orthogonality,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,

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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 Wiley.
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

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BTBB-101 BASIC BIOLOGY

L T P
4 1 0

Internal Marks: 40

External Marks: 60

Total Marks: 100

1. Evolution:
Modern concepts of organic evolution, evidences of organic evolution. Darwinism and neo – Darwinism, Lamarckism, Neo-Lamarckism, sources of variation, mutation, recombination, gene flow - genetic drift, migration, natural selection. Origin and concepts of species.

2. Cell and Molecular Biology:
Discovery of cell, cell as a contained unit, pro and eukaryotic cells and its ultra-structure. Cell division: amitosis, mitosis and meiosis. The cell: cell wall, cell membrane and cell organelles (Plastids, mitochondria, endoplasmic reticulum, Golgi bodies, ribosomes, lysosomes, vacuoles and centrioles) DNA and RNA, DNA as genetic material, RNA as genetic material, replication, transcription, genetic code, translation, splicing, gene expression and regulation, protein synthesis, DNA repair.

3. Genetics:
Chromosomes: structure and types, linkage and crossing over, recombination of chromosomes, mutation, chromosomal aberration, Mendelian inheritance, chromosomal theory of inheritance, deviation from Mendelian ratio (gene interaction, incomplete dominance, co-dominance, complimentary gene, multiple allelism), sex determination in humans, chromosomal disorders in humans.

4. Microbiology and Immunology:
Introduction to microbial diversity, history of medical microbiology, discovery of antibiotics, pasteurization, microscopes. Fungi, bacteria, virus, protozoa, algae – beneficial and harmful. Parasites and pathogens. Structure of microbes and diseases caused by them. Basic concepts of immunology

5. Biochemistry:
Structure and function of carbohydrates, lipids, proteins. Disaccharide, starch, glycogen, fats, cholesterol, amino acids, peptides. Primary, Secondary and Tertiary structure of proteins. Enzymes, structured and mechanism of enzyme catalysis, specificity of enzymes, co factors an co-enzymes.

6. Physiology: Plant and Human:
Plant Physiology: Reproduction, Movement of water, food, nutrients, gases and minerals. Respiration,photosynthesis (light and dark reactions), Factors affecting photosynthesis, electron transport chain (ETC), glycolysis, Kreb's cycle, pentose phosphate pathway, hormones and growth regulators, Photo-periodism and vernalization. Human Physiology: Reproduction Digestion and absorption, breathing and respiration. Hormones; types of hormones and its functions.

7. Biotechnology and its applications:
Recombinant DNA technology, applications in health, agriculture and industries; genetically modified organisms; bio-safety issues, insulin and Bt cotton, transgenic plants and microbes, plant tissue culture

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and its application; plant growth regulators; Microbes in food processing; industrial production of microbial products, Sewage treatment, waste management and energy generation.

Suggested Reading and Books:

1. Trueman's Elementary Biology, Vol 2, 27th Edition by K.N.Bhatia, M.P. Tyagi
2. Concepts In Biology Enger, Ross & Bailey 11th 2005 Tata McGraw Hill.
3. Biotechnology: Expanding Horizons by B. D. Singh Kalyani Publishers, 2012

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BTBM-101   Basic Mathematics

L T P
4 1 0

Internal Marks: 40

External Marks: 60

Total Marks: 100

1. **Algebra**: AP, GP, HP, Theory of equations, Bionomial Theorem, Logarithmic & Exponential series.   (6)

2. **Trigonometry**: Basic trigonometric formulae, Simple trigonometrical equations.   (6)

3. **Co-ordinate Geometry**: Straight lines, Circle, Conics (ellipse, hyperbola and parabola), Pair of straight lines.   (6)

4. **Matrices**: Matrix, Determinants, Adjoints, Matrix operations, Inverse of a matrix and Properties of determinants.   (6)

5. **Calculus**: Concepts of Limit, Continuity, Derivative, Evaluation of Derivatives.   (6)

6. **Integral Calculus**: Introductions of Indefinite and Definite Integrals, Integration of trigonometrical Functions, Integration by substitution and Integration by part. Properties of definite integrals.   (6)

7. **Complex Numbers**: Introduction to complex numbers, Conjugate, Modulus, Inverse of a complex number.   (6)

Suggested Readings/Books:
- Differential Calculus by Shanti Narain
- Integral Calculus by Shanti Narain
- Mathematics by R.D. Sharma , Dhanpat Rai Publications,New Delhi

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BTEC 101 Basic Electrical and Electronics Engineering

L T P
4 1 0

Internal Marks: 40
External Marks: 60
Total Marks: 100

Objective/s and Expected outcome:

This course gives a basic knowledge of circuits, electrical machines, transducers & semiconductor devices with which a building of innovative technology can be created. The course is mandatory for all the branches for understanding the basic concepts of Electrical and Electronics Engineering as the students of all branches have to deal with the applications of Electrical and Electronics Engineering. The students are expected to learn and understand the applications of electric and electronics concepts for laying foundations of today's and tomorrow's technology.

Part A (Electrical Engineering)

DC & AC Circuits:
 Difference between DC & AC Quantities, Instantaneous Value, RMS Value, Average Value, Form Factor of sinusoidally varying ac; Introduction to Resistor, Inductor & Capacitor and their behaviour on DC & AC. Kirchoff‟s Laws, Analysis of DC Circuits by Nodal & Mesh Analysis. Analysis of AC Circuits; Series RL,RC & RLC Circuits subjected to sinusoidal input,Concept of Impedance and its representation in Rectangular and polar forms, Resonance in series and parallel circuits. Introduction to 3 phase systems, Star & Delta Connections(Introduction only).   (10)

Magnetic Circuits and Transformer:
 Laws of Electromagnetic Induction.Concept of Self Induced & Mutually Induced EMFs, Force on a Current Carrying Conductor placed in Magnetic Field. Single Phase Transformer: Construction, Working principle, EMF Equation, Types of Losses,Concept of losses occuring at open circuit and short circuit conditions (introduction only), Efficiency.   (7)

Rotating Electrical Machines:
Construction & Principle of operation of 3 phase Induction motor. Classification of 3 Phase Induction Motors & their Applications.Construction of 3 phase Synchronous machines, Principle of Operation of 3 phase Synchronous Motor & Generator.Construction of DC Machines, Principle of operation of D.C. motor & generator.Types of DC Motors and their applications. Introduction to Stepper motor.   (8)

Part B (Electronics Engineering)

Transducers:
Construction, working & applications of LVDT, Strain Gauge and Thermistor. Introduction to Digital

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Multimeter.   (6)

Semiconductor Devices:

Principle of operation characteristic and application of PN Junction Diode, Zener Diode, Rectifiers, Principle of operation & characteristic of Bipolar Junction Transistor, Principle of operation & characteristic of Field Effect Transistor, Regulated Power Supply.   (9)

Digital Electronics:

Binary, Octal and Hexadecimal number System and their arithmetic operations, Logic gates, Introduction of R-S, J-K, D and T Flip Flops and their truth tables.   (8)

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BTHU -101 Communicative English

L T P
3 0 0

Internal Marks: 40

External Marks: 60

 Total Marks: 100

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

1. Reading:
Reading texts of varied complexity; speed reading for global and detailed meaning; processing factual and implied meanings   (8)

2. Vocabulary:
Building up and expansion of vocabulary; active use of the prescribed expressions in the appropriate context
                                                                                                                                                          (8)

3. Grammar:
Revising and practicing a prescribed set of grammar items; using grammar actively while processing or producing language   (10)

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
                                                                                                                                                        (10)

 Learning and Teaching Activities:
 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.

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.

Suggested Readings/ Books

1. Vandana R Singh, The Written Word, Oxford University Press, New Delhi KK Ramchandran, et al Business Communication, Macmillan, New Delhi

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

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

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BTIM-101 Introduction to Management & Human Values

L T P
2 0 0

Internal Marks: 40

External Marks: 60

Total Marks: 100

Objective/s and Expected outcome:

This course presents a thorough and systematic coverage of management theory and practice. The course aims at providing fundamental knowledge and exposure of the concepts, theories and practices in the field of management. It focuses on the basic roles, skills and functions of management, with special attention to managerial responsibility for effective and efficient achievement of goals. 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 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

1. Nature of Management:

Definition, function, process and significance of management, management vs administration, management science or art, universality of management, management as a profession, professionalization of management, management by objectives   .   .   (5)

2. School of Management Thought:

Contribution of Henry Fayol, F.W Taylor, Elton Mayo, Peter F, Druckers, Dogulas Megregor.   (5)

3. Function of Management:

Planning, meaning, characteristics, significance, steps in planning, types of plans. Organizing:- definition, nature, process, significance, departmentation. Directing:- leadership, styles of leadership, theories of leadership. Motivation:- definition, types, significance, motivation theories- Maslow's Hierarchy of Human Needs,Herzberg Two Factor Theory of Motivation. Controlling :- meaning, characteristic, control process, essentials of effective control, importance.   (7)

4. Designing Organisation Structure:

Concept ,Importance and characterstics of organisation,Types of Organisation structures,Span of Control.
(5)

5. Need, Basic Guidelines, Content and Process for Value Education :

Understanding the need 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

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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.**

(5)

6. Understanding Harmony in the Human Being -

Understanding human being as a co-existence of the sentient „I‟ and the material „Body‟
Understanding the needs of Self („I‟) and „Body‟ - Sukh and Suvidha
Understanding the Body as an instrument of „I‟ (I being the doer, seer and enjoyer)
Understanding the characteristics and activities of „I‟ and harmony in „I‟
Understanding the harmony of I with the Body: Sanyam and Swasthya; correct appraisal of Physical needs, meaning of Prosperity in detail
Programs to ensure Sanyam and Swasthya   (5)

Books Recommended
1. Koontz. Hand Weihrich H, "Essentials of Management", 5th Ed., Tata McGraw-Hills, New Delhi (1998)
2. Prasad L M, "Principles and practices of Management", 5th Ed., Sultan Chand and Sons, New Delhi (1999)
3. Stoner J A F, Freeman R E and Gilbert D R, "Management", 6th Ed., Prentice Hall of India, New Delhi (2002)
4. Singh R N, "Management Thought and Thinkers", 2nd Ed., Sultan Chand and Sons, New Delhi (1999)
5. R R Gaur, R Sangal, G P Bagaria, A Foundation Course in Value Education(2009)
6. Ivan Illich, Energy & Equity, The Trinity Press, Worcester, and HarperCollins, USA(1974)
7. E.F. Schumacher,, Small is Beautiful: a study of economics as if people mattered, Blond & Briggs, Britain(1973).

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Engineering Physics Lab (BTPH-102)

L T P
0 0 2

Internal Marks: 30

External Marks: 20

Total Marks: 50

List of Experiments

1. To find the frequency of A.C. supply using an electrical vibrator.

2. To study the verification of magnetic field with distance along the axis of a circular coil carrying current by plotting a graph.

3. To determine the wavelength of sodium light using a plane diffraction grating with clamping arrangement.

4. To measure the attenuation in a single mode optical fibre.

5. To determine the numerical aperture of an optical fibre.

6. To study laser interference using Michelson's Interferometer.

7. To study the double slit interference by He-Ne Laser.

8. To find the refractive index of material using spectrometer.

9. To study B-H curve using CRO.

10. To find the velocity of ultrasound in liquid using ultrasonic interferometer.

11. To study hall effect using semiconductor crystal.

12. To study the diffraction using laser beam and thus to determine the grating element.

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BTHU -102 Communication English Laboratory

L T P
0 0 2

Internal Marks: 30

External Marks: 20

Total Marks: 50

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

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

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

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

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

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

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BTEC 102 Basic Electrical and Electronics Engineering Laboratory

L T P
0 0 2

Internal Marks: 30
External Marks: 20
Total Marks: 50

List of Experiments:

1. To measure power and power factor in a single- phase AC circuit.

2. To verify the voltage and current relations in three phase star & delta connected systems.

3. 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.

4. To measure the minimum operating voltage, current drawn, power consumed, and the power factor of a fluorescent tube light.

5. To study the working of LVDT and to plot its characteristics.

6. To verify the rating of compact fluorescent lamp (CFL).

7. To obtain the characteristics of a P-N junction diode.

8. To verify the truth table of logic gates.

9. To obtain the characteristics of a transistor under common emitter (CE) configuration.

10. **T**o study various parts of (i)Transformer (ii) DC Motor (iii) 3 Phase Induction Motor

11. To perform open- and short circuit tests on a single phase transformer and find iron loss & Cu loss.

12. To start and reverse the direction of rotation of a DC motor.

13. To start and reverse the direction of rotation of 3 phase induction motor.

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BTMP-101: Manufacturing Practice

L T P
0 0 6

Internal Marks: 60
External Marks: 40
Total Marks: 100

1. Practice in Carpentry Shop
Types of timbers, 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 joint**

2. Practice in 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. Practice in Forging Shop
Introduction to forging tools; equipments and operations; forgability of metals; exercises on simple smithy; forging exercises.

4. Practice in Machine Shop
Machines, Grinders etc; cutting tools and operations; exercises on small work pieces.

5. Practice in Welding Shop
Introduction to different welding methods; welding equipments; electrodes; welding joints; welding defects; exercises involving use of gas and electric arc welding.

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

7. Practice in Sheet Metal Shop
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. Practice in Fitting Shop
Introduction of fitting and tools used in fitting shop; exercise involving marking, cutting, fitting

Suggested 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.