B.Tech. SYLLABUS

(I and II Semesters)

2013-14

NATIONAL INSTITUTE OF TECHNOLOGY

TIRUCHIRAPPALLI 620015

TAMILNADU, INDIA

CURRICULUM FOR I AND II SEMESTERS B. Tech.

I SEMESTER

CODE	COURSE OF STUDY	L	T	P	C
HM101	English for Communication	3	0	0	3
MA101	Mathematics I	3	0	0	3
PH101	Physics I	2	0	3	3
CH101	Chemistry I	2	0	3	3
ME101	Engineering Mechanics	3	0	0	3
CS101	Basics of Programming (Theory and Lab)	2	0	2	3
CC101	Energy and Environmental Engineering	2	0	0	2
MP101/	Engineering Graphics/	1	0	4	3
PR101	Workshop Practice	0	0	4	2
CF101	NSS/NCC/NSO	0	0	0	0
	Total	18/17	0	12	23/22

II SEMESTER

CODE	COURSE OF STUDY	L	T	P	C
HM102	Professional Communication	3	0	0	3
MA102	Mathematics II	3	0	0	3
PH102	Physics II	3	0	3	4
CH102	Chemistry II	3	0	3	4
BE I 102	Basic Civil Engineering *	2	0	0	2
BE II 102	Basic Mechanical Engineering *	2	0	0	2
BE III 102	Basics of Electrical and Electronics Engg. *	2	0	0	2
BS102	Branch Specific Course	2	0	0	2
PR101/	Workshop Practice /	0	0	4	2
MP101	Engineering Graphics	1	0	4	3
CF102	NSS/NCC/NSO	0	0	0	0
	Total	18/19	0	10	22/23

* Only two of the three basic engineering courses will be introduced to students based on their branch of study

HM101 ENGLISH FOR COMMUNICATION

Objectives

The primary objective is to develop in the under-graduate students of engineering a level of competence in English required for independent and effective communication for academic and social needs.

Course Material

Instruction will be provided through appropriate material – articles from popular magazines, newspapers, technical journals, samples from industries and also text books. Practice in the four language skills necessary for their specific technical requirements will be provided in an integrated manner.

Course Content

Communication An introduction - Its role and importance in the corporate world – Tools of communication – Barriers – Levels of communication – English for Specific purposes and English for technical purposes.

Listening Listening process & practice – Exposure to recorded & structured talks, class room lectures – Problems in comprehension & retention – Note-taking practice – Listening tests- Importance of listening in the corporate world.

Reading Introduction of different kinds of reading materials: technical & non-technical – Different reading strategies: skimming, scanning, inferring, predicting and responding to content – Guessing from context – Note making – Vocabulary extension.

Speaking Barriers to speaking – Building self-confidence & fluency – Conversation practice- Improving responding capacity - Extempore speech practice – Speech assessment.

Writing Effective writing practice – Vocabulary expansion - Effective sentences: role of acceptability, appropriateness, brevity & clarity in writing – Cohesion & coherence in writing –Writing of definitions, descriptions& instructions - Paragraph writing - Introduction to report writing.

Expected Outcome

The students will be able to express themselves in a meaningful manner to different levels of people in their academic and social domains.

Text Books

1. *Krishna Mohan and Meenakshi Raman (2000) Effective English Communication, Tata McGraw Hill, New Delhi.*
2. *Meenakshi Raman and Sangeetha Sharma (2006) Technical Communication, Oxford University Press, New Delhi.*

Reference Books

1. *M. Ashraf Rizvi (2005) Effective Technical Communication, Tata McGraw-Hill, New Delhi.*
2. *Golding S.R. (1978) Common Errors in English Language, Macmillan.*
3. *Christopher Turk (1985) Effective S peaking, E & FN Spon, London*

MA101 MATHEMATICS I

Objectives   To acquire fundamental knowledge and apply in engineering disciplines.

Characteristic equation of a matrix –Eigen values and Eigen vectors – Properties of Eigen values – Diagonalization of matrix – Cayley-Hamilton Theorem (without proof) verification – Finding Inverse and Power of a matrix using it – Quadratic form – Definite and indefinite forms – Orthogonal reduction of quadratic form to canonical form.

Sequences of real numbers – Limit of a sequence – Convergent and divergent sequences– sub sequence- Cauchy's sequence – monotone convergence theorem (without proof)- Sequence with recurrence relations.

Infinite series-Convergence Tests for positive term series – Comparison, Root, Ratio and Raabe's tests - Alternating series – Leibnitz's rule – Absolute and Conditional Convergence. Riemann rearrangement theorem (without proof).

Functions of several variables – Partial derivatives and Transformation of variables – Jacobian and its Properties- Maxima and Minima of function of two variables.

Double integral – Changing the order of Integration – Change of variables from Cartesian to Polar Coordinates – Area using double integral in Cartesian and Polar Coordinates – Triple integral – Change of Variables from Cartesian to Spherical and Cylindrical Coordinates – Volume using double and triple integrals.

Outcome
After the completion of the course, students would be able to solve curriculum problems.

Text Books
1. Kreyszig, E., Advanced Engineering Mathematics, 9thedition, John Wiley Sons, 2006.
2. Grewal, B.S., Higher Engineering Mathematics, 42ndedition, Khanna Publications, Delhi,
2012.
3. M K Venkataraman, Engineering mathematics, Volume I, 2nd ed., National Publishing Co. 2003

Reference Books
1.   Apostol, T.M. Calculus Volume I & II Second Edition, John Wiley & Sons (Asia)
*   2005.*
2.   Greenberg, M.D. Advanced Engineering Mathematics, Second Edition, Pearson
*   Education Inc. (First Indian reprint), 2002*
3.   Strauss. M.J, Bradley, G.L. and Smith, K.J. Calculus, 3rd Edition, Prentice Hall, 2002.
4.   T Veerarajan, Engg Mathematics McGraw-Hill Education (India) Pvt Limited, 2007

PH101 PHYSICS I
(Common to all branches)

Objectives

To make a bridge between the physics in school and engineering courses.

To introduce the basic concepts of modern science like Photonics, Engineering applications of acoustics, fundamentals of crystal physics and materials science.

Lasers

Introduction to Laser-characteristics of Lasers-Spontaneous and stimulated emissions – Einstein's coefficients – population inversion and lasing action – laser systems: Ruby laser, He-Ne Laser, semiconductor laser-applications:–Holography- CD-drive – industrial and medical applications.

Fiber Optics

Fermat's principle and Snell's law-optical fiber – principle and construction – acceptance cone - numerical aperture ‑ V-Number - types of fibers, Fabrication: Double Crucible Technique, Vapour phase Oxidation Process – fiber optic communication principle – fiber optic sensors-other applications of optical fibers.

Acoustics

Characteristics of musical sound – loudness – Weber-Fechner law – decibel – absorption coefficient – reverberation – reverberation time – Sabine's formula – acoustics of buildings – ultrasonics – production of ultrasonics using piezoelectric method –magnetostriction method- applications.

Crystallography

Crystalline and amorphous solids – lattice and unit cell – seven crystal system and Bravais lattices – symmetry operation – Miller indices – atomic radius – coordination number – packing factor calculation for sc, bcc, fcc – Bragg's law of X-ray diffraction –Laue Method-powder crystal method.

Magnetic materials, conductors and superconductors

Magnetic materials: Definition of terms – classification of magnetic materials and properties – domain theory of ferromagnetism- hard and soft magnetic materials – applications.
Conductors: classical free electron theory (Lorentz –Drude theory) – electrical conductivity
Superconductors: definition – Meissner effect – type I & II superconductors – BCS theory (qualitative) – high temperature superconductors ‑ Josephson effect – quantum interference (qualitative) – SQUID – applications.

Outcome

The student will be able to understand many modern devices and technologies based on lasers and optical fibers. Student can also appreciate various material properties which are used in engineering applications and devices.

Text Books

1. *A text book of Engineering Physics, M.N. Avadhanulu and P.G. Kshirsagar, S. Chand and Company, New Delhi (2009).*
2. *Engineering Physics, R.K. Gaur and S.L. Gupta, Dhanpat Rai Publications (P) Ltd., 8th edn., New Delhi (2001).*

Reference Books

1. *Laser Fundamentals, William T. Silfvast, 2nd edn, Cambridge University press, New York (2004)*
2. *Fundamentals of Physics, 6th Edition, D. Halliday, R. Resnick and J. Walker, John Wiley and Sons, New York (2001).*
3. *Introduction to solid state physics,7th Edn, Charls Kittel, Wiley, Delhi (2007)*

Laboratory Experiments

1. Torsional pendulum
2. Numerical aperture of an optical fiber
3. Temperature measurement - Thermocouple
4. Specific rotation of a liquid – Half Shade Polarimeter
5. Thickness of a thin wire – Air Wedge
6. Conversion of galvanometer into ammeter and voltmeter
7. Dispersive power of a prism – Spectrometer
8. Superconductivity- measurement of transition temperature
9. Absorption spectrometer
10. Brewster's Angle measurement
11. Measurement of Young's modulus

Reference Books

1. *Practical Physics, R.K. Shukla, Anchal Srivastava, New age international (2011)*
2. *B.Sc. Practical Physics, C.L Arora, S. Chand &Co. (2012)*

CH 101 CHEMISTRY I

(Common to all branches)

Objectives To introduce students to water chemistry, bonding concepts, entropy and basic organic chemistry.

Water

Sources, hard & soft water, estimation of hardness by EDTA method, softening of water, zeolite process & demineralization by ion exchangers, boiler feed water, internal treatment methods, specifications for drinking water, BIS & WHO standards, treatment of water for domestic use, desalination - reverse osmosis & electrodialysis.

Chemical Bonding

Basic concepts, bonding in metals, electron gas theory, physical properties of metals (electrical & thermal conductivity, opaque & lusture, malleability & ductility), Alloy-substitutional alloys, interstitial alloys.

Coordinate bond, EAN rule, 16 & 18 electron rule, crystal field theory, splitting of 'd' orbitals in octahedral, tetrahedral and square planar complexes.

Shape & Intermolecular Interactions

Shape-Lewis dot structures, formal charge, VSEPR method, consequences of shape, dipole moment, valence bond theory; Intermolecular interactions-ion ion interactions, ion-dipole interactions, hydrogen bonding, dipole-dipole interactions, London / dispersion forces, relative strength of intermolecular forces; Consequences-surface tension.

Thermodynamics

Entropy as a thermodynamic quantity, entropy changes in isothermal expansion of an ideal gas, reversible and irreversible processes, physical transformations, work & free energy functions, Helmholtz and Gibbs free energy functions, Gibbs-Helmholtz equation, Gibbs-Duhem equation, Clapeyron-Clausius equation & its applications, Van't Hoff isotherm and applications.

Fuels & Lubricants

Fuels - Classification, examples, relative merits, types of coal, determination of calorific value of solid fuels, Bomb calorimeter, theoretical oxygen requirement for combustion, proximate & ultimate analysis of coal, manufacture of metallurgical coke, flue gas analysis, problems. Lubricants - Definition, theories of lubrication, characteristics of lubricants, viscosity, viscosity index, oiliness, pour point, cloud point, flash point, fire point, additives to lubricants, Solid lubricants.

Outcome

Students will learn about quality of water, bonding theories, entropy change for various processes and basic stereo chemical aspects.

Text Books

1. *Engineering Chemistry, P.C. Jain, M. Jain, Dhanpat Rai Publishing Company, New Delhi, 2005.*
2. *Physical Chemistry, P. Atkins, J.D. Paula, Oxford University Press, 2002.*

Reference Books

1. *Modern Inorganic Chemistry, R.D. Madan, S. Chand & Company Ltd., New Delhi, 2012.*
2. *Engineering Chemistry, M.J. Shultz, Cengage Learning, New Delhi, 2007.*

Laboratory Experiments

1. Estimation of total alkalinity in the given water sample.

2. Estimation of carbonate, non-carbonate and total hardness in the given water sample.

3. Estimation of dissolved oxygen in the given water sample.

4. Determination of the percentage of Fe in the given steel sample.

5. Estimation of Ca in limestone.

6. Estimation of Fe^{3+} by spectrophotometer.

Reference Books

1. Laboratory Manual, Department of Chemistry, NITT

2. Laboratory Manual on Engineering Chemistry, S.K. Bhasin, S. Rani, Dhanpat Rai Publishing Company, New Delhi, 2011.

ME101 ENGINEERING MECHANICS
(Common to all branches)

Objectives

To explain the importance of mechanics in the context of engineering and conservation equations.

To explain the significance of centroid, centre of gravity and moment of inertia.

To introduce the techniques for analyzing the forces in the bodies.

To apply the different principles to study the motion of a body, and concept of relative velocity and acceleration.

To describe the trajectory of a particle under projectile motion.

To identify the basic elements of a mechanical system and write their constitutive equations.

Fundamentals   Mechanics and its relevance, concepts of forces, laws of mechanics - parallelogram law, Lami's theorem, law of polygon, concept of free-body diagram, centroids, center of gravity, area moment of inertia, mass moment of inertia – simple and composite planes, Numerical.

Friction   Laws of friction, static friction, rolling friction, application of laws of friction, ladder friction, wedge friction, body on inclined planes, simple screw jack – velocity ratio, mechanical advantage, efficiency, Numerical.

Statics Principles of statics, types of forces, concurrent and non-concurrent forces, composition of forces, forces in a plane and space, simple stresses and strains, elastic coefficients, Numerical.

Kinematics Fundamentals of rectilinear and curvilinear motion, application of general equations, concept of relative velocity, analytical and graphical techniques, Numerical.

Dynamics Principles of dynamics, D'Alembert's principle, conservation of momentum and energy, vibrations of simple systems, Numerical.

Outcome

The terminal objectives of the course is that, on successful completion of teaching-learning and evaluation activities, a student would be able to identify and analyze the problems by applying the fundamental principles of engineering mechanics and to proceed to research, design and development of the mechanical systems.

Text Books

1. *Kumar, K. L., Kumar, V. Engineering Mechanics, Pub.: Tata McGraw Hill, 2011.*
2. *Palanichamy, M. S., and Nagan, S., Engineering Mechanics – Statics & Dynamics, Pub.: Tata McGraw Hill, 2002.*
3. *Timoshenko, S. and Young, D. H., Engineering Mechanics, Pub.: McGraw Hill, 2006.*

Reference Books

1. Popov, E. P., Engineering Mechanics of Solids, Pub.: Prentice Hall, 1998.
2. Shames, I. H. and Rao, G. K. M., Engineering Mechanics – Static and Dynamics, Pub.: Pearson Education, 2009.
3. Beer, F. P., and Johnson Jr. E. R., Vector Mechanics for Engineers, Pub.: McGraw Hill, Year of publication: 2009.
4. Rao, J. S. and Gupta, K., Introductory Course on Theory and Practice of Mechanical Vibrations, Pub.: New Age International, 1999.

CS101 BASICS OF PROGRAMMING

Objectives
To learn the fundamentals of computers
To learn the problem solving techniques writing algorithms and procedures
To learn the syntax and semantics for C programming language
To develop the C code for simple logic
To understand the constructs of structured programming including conditionals and iterations

Introduction to computers – Computer Organization – Characteristics – Hardware and Software – Modes of operation – Types of programming languages – Developing a program.

Algorithms – Characteristics – Flowcharts - Principles of Structured programming – Sequential, selective structures - Repetitive structures –Bounded , Unbounded and Infinite iterations – Examples for each.

Introduction to C – C character set – Identifiers and Keywords – Datatypes – Constants – Variables – Declarations – Expressions – Statements – Symbolic constants – Operators– Library functions – Data input and output: Single character input and output – Entering input data – Writing output data – gets and puts functions. Control statements – Branching: if-else – Looping: while – do-while – for; Nested control structures – switch statement – break statement – continue statement – comma operator – goto statement.

Modular Programming – Functions and Procedures – Examples – Parameter passing methods.

Arrays – Defining an array – Processing an array – Multidimensional arrays-Pointers – Variable definitions and initialization – Pointer operators – Pointer expressions and arithmetic – Pointers and one-dimensional arrays- Functions – Defining a function – Accessing a function – Function prototypes – Passing arguments to a function –Passing arrays to a function – Passing pointers to a function – Recursion.

Outcome
Ability to write algorithms for problems
Knowledge of the syntax and semantics of C programming language
Ability to code a given logic in C language
Knowledge in using C language for solving problems

Text Books

1. *Byron Gottfried, "Programming with C", Third Edition, Tata McGraw Hill Education, 2010.*
2. *R.G.Dromey, "How to Solve it By Computers?", Prentice Hall, 2001*

Reference Books

1. *J.R. Hanly and E.B. Koffman, "Problem Solving and Program Design in C", 6th Edition, Pearson Education, 2009.*
2. *Paul Deital and Harvey Deital, "C How to Program", Seventh Edition, Prentice Hall, 2012.*
3. *Yashavant Kanetkar, "Let Us C", 12th Edition, BPB Publications, 2012.*

Laboratory Experiments

1. Programs using sequence construct
2. Programs using selection construct
3. Programs using Iterative construct
4. Programs using nested for loops
5. Programs using functions with Pass by value
6. Programs using functions with Pass by reference
7. Programs using recursive functions
8. Programs using one dimensional Array
9. Programs using two dimensional Arrays
10. Programs using Pointers and functions
11. Programs using Pointers and Arrays

CC101 ENERGY AND ENVIRONMENTAL ENGINEERING

COURSE OBJECTIVE
1. To teach the principal renewable energy systems.
2. To explore the environmental impact of various energy sources and also the effects of different types of pollutants.

Present Energy resources in India and its sustainability - Different type of conventional Power Plant--Energy Demand Scenario in India-Advantage and Disadvantage of conventional Power Plants – Conventional Vs Non-conventional power generation
Basics of Solar Energy- Solar Thermal Energy- Solar Photovoltaic- Advantages and Disadvantages-Environmental impacts and safety.
Power and energy from wind turbines- India's wind energy potential- Types of wind turbines- Off shore Wind energy- Environmental benefits and impacts.
Biomass resources-Biomass conversion Technologies- Feedstock preprocessing and treatment methods- Bioenergy program in India-Environmental benefits and impacts.
Geothermal Energy resources –Ocean Thermal Energy Conversion – Tidal.
Air pollution- Sources, effects, control, air quality standards, air pollution act, air pollution measurement. Water pollution-Sources and impacts, Soil pollution-Sources and impacts, disposal of solid waste.
Greenhouse gases – effect, acid rain. Noise pollution. Pollution aspects of various power plants. Fossil fuels and impacts, Industrial and transport emissions- impacts.

OUTCOME
Students will be introduced to the:
1. Principal renewable energy systems
2. Explore the environmental impact of various energy sources and also the effects of different types of pollutants.

TEXT BOOKS
1.Boyle, G. 2004. Renewable energy: Power for a sustainable future. Oxford University press.
2.B H Khan, Non Conventional Energy Resources-The McGraw –Hill Second edition.
3. G. D. Rai, Non conventional energy sources, Khanna Publishers, New Delhi, 2006.
4. Gilbert M. Masters, Introduction to Environmental Engineering and Science, 2nd Edition, Prentice Hall, 2003.

REFERENCES
1.Unleashing the Potential of Renewable Energy in India –World bank report.
2.Godfrey Boyle, Bob Everett and Janet Ramage.2010. Energy Systems and Sustainability. Power for a sustainable future. Oxford University press.

MP101 ENGINEERING GRAPHICS

Objectives

Irrespective of engineering discipline, it has become mandatory to know the **basics of Engineering graphics** The student is expected to possess the efficient drafting skill depending on the operational function in order to perform day to day activity.

Provide neat structure of industrial drawing

Enables the knowledge about position of the component and its forms

Interpretation of technical graphics assemblies

Preparation of machine components and related parts

Fundamentals Drawing standard - BIS, dimensioning, lettering, type of lines, scaling- conventions.

Geometrical constructions Dividing a given straight line into any number of equal parts, bisecting a given angle, drawing a regular polygon given one side, special methods of constructing a pentagon and hexagon – conic sections – ellipse – parabola – hyperbola - cycloid – trochoid.

Orthographic projection Introduction to orthographic projection, drawing orthographic views of objects from their isometric views - Orthographic projections of points lying in four quadrants, Orthographic projection of lines parallel and inclined to one or both planes Orthographic projection of planes inclined to one or both planes. Projections of simple solids - axis perpendicular to HP, axis perpendicular to VP and axis inclined to one or both planes.

Sectioning of solids Section planes perpendicular to one plane and parallel or inclined to other plane.

Intersection of surfaces Intersection of cylinder & cylinder, intersection of cylinder & cone, and intersection of prisms.

Development of surfaces Development of prisms, pyramids and cylindrical & conical surfaces.

Isometric and perspective projection Isometric projection and isometric views of different planes and simple solids, introduction to perspective projection.

Computer aided drafting Introduction to computer aided drafting package to make 2-D drawings.

Self-study only, not to be included in examinations.

Demonstration purpose only, not to be included in examinations.

Outcome

Towards the end of the course it is expected that the students would be matured to visualize the engineering components. A number of chosen problems will be solved to illustrate the concepts clearly.

Text Books

1. Bhatt, N. D. and Panchal, V.M., Engineering Drawing, Pub.: Charotar Publishing House, 2010.
2. Natarajan, K. V., A text book of Engineering Graphics, Pub.: Dhanalakshmi Publishers, Chennai, 2006.

Reference Books

1. Venugopal, K. and Prabhu Raja, V., Engineering Drawing and Graphics + AutoCAD, Pub.: New Age International, 2009.
2. Jolhe, D. A., Engineering drawing, Pub.: Tata McGraw Hill, 2008
3. Shah, M. B. and Rana, B. C., Engineering Drawing, Pub.: Pearson Education, 2009.
4. Trymbaka Murthy, S., Computer Aided Engineering Drawing, Pub.: I.K. International Publishing House, 2009.

PR 101 ENGINEERING PRACTICE

Objectives

Introduction to the use of tools and machinery in Carpentry, Welding, Foundry, Fitting and Sheet Metal Working.

Carpentry

Wood sizing exercise in planning, marking, sawing, chiseling and grooving to make

1. Half lap joint
2. Cross lap joint

Welding

Exercise in arc welding for making

1. Lap joint
2. Butt joint

Foundry

Preparation of sand mould for the following

1. Flange
2. Anvil

Fitting

Preparation of joints, markings, cutting and filling for making

1. V-joint
2. T-joint

Sheet metal

Making of small parts using sheet metal

1. Tray
2. Funnel

HM 102 PROFESSIONAL COMMUNICATION

Objectives

The primary objective is to develop in the under-graduate students of engineering a level of competence in English required for independent and effective communication for their professional needs.

Course Material

Instruction will be provided through appropriate material – articles from popular magazines, news papers, technical journals, samples from industries and also text books. Practice in the four language skills will be provided in an integrated manner.

Course Content

Listening: Barriers to listening: Physical & psychological – Steps to overcome them – Purposive listening practice – Active listening and anticipating the speaker – Use of technology in the professional world.

Speaking Fluency & accuracy in speech – Positive thinking – Kinds of thinking -Improving self expression – Tonal variations – Listener oriented speaking -Group discussion practice – Interpersonal Conversation -Developing persuasive speaking skills.

Reading Speed reading practice – Use of extensive readers –Trans-coding: verbal and non-verbal – Eye-reading practice – Analytical and critical reading practice- Introduction to ethics & values through case-study materials.

Writing Professional Correspondence – Formal and informal letters – Argument Writing practice – Perspectives in writing – Narrative writing -Different registers - Tone in formal writing – Summary writing practice- Introduction to reports.

Study Skills Reference Skills - Use of dictionary, thesaurus etc – Importance of contents page, cover & back pages – Bibliography.

Expected Outcome

The students will have knowledge of the various uses of English in their professional Environment and they will be able to communicate themselves effectively in their chosen profession.

Reference Books

1. *Shirley Taylor (1999), Communication for Business, Longman, New Delhi.*
2. *Robert Gannon (2000), Best Science Writing: Readings and Insights, University Press, Hyderabad.*
3. *Richard A. Boning (1990), Multiple Reading Skills, McGraw Hill, Singapore.*
4. *Albert J. Harris, Edward R.Sipay (1990), How to Increase Reading Ability, Longman.*
5. *David Martin (1994), Tough Talking, University press, Hyderabad.*

MA102 MATHEMATICS II

Objectives To learn mathematical concepts and methods .
Vector space – Subspaces – Linear dependence and independence – Spanning of a subspace – Basis and Dimension. Inner product – Inner product spaces – Orthogonal and orthonormal basis – Gram- Schmidt orthogonalization process.

Basic review of first order differential equation - Higher order linear differential equations with constant coefficients –Particular integrals for $x^n e^{ax}$, $e^{ax} \cos(bx)$, $e^{ax} \sin(bx)$ – Equation reducible to linear equations with constant coefficients using $x = e^t$ - Simultaneous linear equations with constant coefficients – Method of variation of parameters – Applications – Electric circuit problems.

Gradient, Divergence and Curl – Directional Derivative – Tangent Plane and normal to surfaces – Angle between surfaces –Solenoidal and irrotational fields – Line, surface and volume integrals – Green's Theorem, Stokes' Theorem and Gauss Divergence Theorem (all without proof) – Verification and applications of these theorems.

Analytic functions – Cauchy – Riemann equations (Cartesian and polar) –Properties of analytic functions – Construction of analytic functions given real or imaginary part – Conformal mapping of standard elementary functions ($z^2, e^z, \sin z, \cos z, z + \dfrac{k^2}{z}$) and bilinear transformation.

Cauchy's integral theorem, Cauchy's integral formula and for derivatives– Taylor's and Laurent's expansions (without proof) – Singularities – Residues – Cauchy's residue theorem – Contour integration involving unit circle.

Outcome After the completion of the course, students are able to solve industrially applicable problems.

Text Books
1*. Kreyszig, E., Advanced Engineering Mathematics, 9th edition, John Wiley Sons, 2006.*
2. Grewal, B.S., Higher Engineering Mathematics, 42nd edition, Khanna Publications, Delhi, 2012.
3. Hsiung, C.Y. and Mao, G. Y. Linear Algebra, World Scientific Pub Co Inc., 1999.

Reference Books
1. Apostol, T.M. Calculus, Volume I & II, 2nd Edition, John Wiley & Sons (Asia), 2005.
2. Greenberg, M.D. Advanced Engineering Mathematics, 2nd Edition, Pearson Education Inc. (First Indian reprint), 2002.
3. Strauss. M.J, Bradley, G.L. and Smith, K.J. Calculus, 3rd Edition, Prentice Hall, 2002.
4. Venkataraman, M. K. Linear Algebra, The National Publishing Co, 1999

PH102A PHYSICS II
(Circuit Branches)

Objectives

To make a bridge between the physics in school and engineering courses.

To introduce the basic concepts of modern physics like fundamentals of quantum mechanics, nuclear physics and advanced materials.

To introduce fundamental physics like electrodynamics and semiconductor physics for circuit branch students.

Quantum Mechanics

Inadequacy of classical mechanics (black body radiation, photoelectric effect) – wave and particle duality of radiation – de Broglie concept of matter waves – electron diffraction – Heisenberg's uncertainty principle – Schrodinger's wave equation – eigenvalues and eigenfunctions – superposition principle – interpretation of wave function – particle confined in one dimensional infinite square well potential.

Nuclear and Particle Physics

Nuclear properties and forces - Nuclear models - Shell model - Nuclear reaction - Radioactivity - types and half lives - application in determining the age of rock and fossils- Stellar nucleosynthesis. Fundamental forces - Particle physics - classification of matter - quark model - neutrino properties and their detection.

Advanced Materials

Nanomaterials: introduction and properties – synthesis – chemical vapour deposition – ball milling – applications. Carbon nanotubes: structure and properties – synthesis– arc method – pulsed laser deposition- applications.

Liquid Crystals: types – nematic, cholesteric, smectic – modes: dynamic scattering, twisted nematic – display systems.

Shape memory alloys-one way and two way memory effect- pseudoelasticity-applications.

Electrodynamics

Electrostatics: Coulomb's law - Gauss's law – proof of Gauss's law- Electrostatic filed in matter: dielectric polarization, polarizability and susceptibility - types of polarization – internal field and Claussius-Mosotti equation. Magetostatics: Lorentz force -Steady current and equation of continuity - Biot-Savart law – Ampere's law –Magnetostatic field in matter: torques and forces on magnetic dipoles-Magnetization-Faraday's law of induction – Maxwell's equations: generalization of Ampere's law –– propagation of EM waves in free space.

Semiconductor Physics

Introduction-Direct and indirect band gap semiconductors - Intrinsic semiconductor at 0 K-Intrinsic semiconductor at room temperature-Intrinsic carriers- Electron and Hole concentrations-doping-n-type – p-type-temperature variation of carrier concentration in extrinsic semiconductor-Extrinsic conductivity-Law of Mass action-Charge neutrality-Fermi level in extrinsic semiconductors-Electrical conduction in extrinsic semiconductors-Hall effect.

Expected Out come

The student will be able to understand fundamentals of electrodynamics and semiconductor physics which is base of many modern devices and technologies. Student will also get an exposure to modern physics topics like nuclear physics, nanotechnology and advanced materials.

Text Books

1. *A text book of Engineering Physics, M.N. Avadhanulu and P.G. Kshirsagar, S. Chand and Company, New Delhi (2009).*
2. *Engineering Physics, R.K. Gaur and S.L. Gupta, Dhanpat Rai Publications (P) Ltd., 8th ed., New Delhi (2001).*

Reference Books

1. *Concepts of Modern Physics. Arthur Beiser, Tata McGraw-Hill, New Delhi (2010).*
2. *Semiconductor Physics and Devices:Basic principle, Donald A. Neamen 4th ed,, McGraw-Hill, New York (2012)*
3. *Introduction to Elecrodynamics, David J. Griffiths, 3rd ed, Printice Hall of India, NewDelhi (2012)*
4. *Introduction to Nanotechnology, C.P. Poole and F.J. Owens, Wiley, New Delhi (2007)*
5. *Introduction to Liquid Crystals Chemistry and Physics,* 2nd ed, *Peter J. Collings, Princeton University Press, New Jersey, (2002).*
6. *Shape memory alloys-modeling and engineering applications, Ed. D. C. Lagoudas, Springer, New York (2008)*

PH102B PHYSICS II

(Non-Circuit Branches)

Objectives
To make a bridge between the physics in school and engineering courses
To introduce the basic concepts of modern physics like fundamentals of quantum mechanics, nuclear physics and advanced materials.
To introduce the concepts of NDT and Vacuum Technology.

Quantum Mechanics
Inadequacy of classical mechanics (black body radiation, photoelectric effect) – wave and particle duality of radiation – de Broglie concept of matter waves – electron diffraction – Heisenberg's uncertainty principle – Schrodinger's wave equation – eigenvalues and eigen functions – superposition principle – interpretation of wave function – particle confined in one dimensional infinite square well potential.

Nuclear and Particle Physics
Fundamental forces - Nuclear properties and forces - Nuclear models - Shell model - Nuclear reaction - Radioactivity - types and half lives - application in determining the age of rock and fossils- Neutrons and its applications (neutron diffraction, nuclear reaction etc)-Stellar nucleosynthesis. Particle physics - classification of matter - quark model- neutrino properties and their detection.

Advanced Materials
Nanomaterials - Introduction and properties – synthesis – chemical vapour deposition – ball milling – applications. Carbon nanotubes: structure and properties – synthesis– arc method – pulsed laser deposition- applications.
Liquid Crystal types – nematic, cholesteric, smectic – modes: dynamic scattering, twisted nematic – display systems.
Shape memory alloys-one way and two way memory effect- pseudoelasticity-applications

Non-Destructive Testing
Principle of ultrasonic testing – inspection methods – different types of scans – liquid penetrant testing – magnetic particle inspection – principle and types of radiography – exposure factor – attenuation of radiation – real time radiography – principle of thermography – thermographic camera – advantages and limitations of all methods.

Vacuum Technology
Introduction-Exhaust pump and their characteristics-different types of pumps-rotary vane pump-roots pump-diffusion pump-turbo-molecular pump-measurement of low pressure-pirani gauge-penning guage - applications of vacuum technology - thin film deposition: thermal evaporation-sputtering.

Expected Outcome

Student will get an exposure to most modern and advanced concepts in nuclear physics, nanotechnology and advanced materials. Study of basic concept of NDT is very important for a modern engineer.

Text Books

1. *A text book of Engineering Physics, M.N. Avadhanulu and P.G. Kshirsagar, S. Chand and Company, New Delhi (2009).*
2. *Engineering Physics, R.K. Gaur and S.L. Gupta, Dhanpat Rai Publications (P) Ltd., 8th ed., New Delhi (2001).*

Reference Books

1. *Concepts of Modern Physics. Arthur Beiser, Tata McGraw-Hill, New Delhi (2010).*
2. *Hand Book of Non-destructive evaluation, C.J. Hellier, McGraw-Hill, New York (2001)*
3. *Vacuum Science and Technology, V.V. Rao, T.B. Ghosh, K.L. Chopra, Allied Publishers, New Delhi (2008)*
4. *Introduction to Nanotechnology, C.P. Poole and F.J. Owens, Wiley, New Delhi (2007)*
5. *Introduction to Liquid Crystals Chemistry and Physics,* 2nd Ed, *Peter J. Collings, Princeton University Press, New Jersey, (2002).*
6. *Shape memory alloys - modeling and engineering applications, Ed. D. C. Lagoudas, Springer, New York (2008)*

Laboratory Experiments

1. Wavelength of sodium light – Newton's rings
2. Thermal conductivity –Lee's Disc
3. Wavelength of mercury spectrum – Spectrometer
4. Calibration of Voltmeter – Potentiometer
5. Wavelength of laser using diffraction grating
6. Field along the axis of a Circular coil
7. Non-destructive testing by ultrasonic flaw detector.
8. GM counter experiment
9. Zeeman effect experiment
10. Millikan's oil drop experiment
11. Kunds tube experiment

Reference Books

1. *Practical Physics, R.K. Shukla, Anchal Srivastava, New age international (2011)*
2. *B.Sc. Practical Physics, C.L Arora, S. Chand &Co. (2012)*

CH 102A CHEMISTRY II
(for CSE, ECE, EEE and ICE)

Objectives

To introduce the students to basic principles of electrochemistry, cell construction and evaluation, electrochemical power sources, the importance of corrosion in metal/alloy and polymer.

Electrochemistry

Conductivity of electrolytes- Specific, molar and equivalent conductivity, Nernst equation for electrode potential, EMF series, hydrogen electrode, calomel electrode, glass electrode, Electrolytic and galvanic cells, cell EMF, its measurement and applications, Weston standard cell, reversible and irreversible cells, concentration cell, electrode (hydrogen gas electrode) and electrolyte concentration cell, concentration cell with and without transference.

Corrosion

Dry corrosion and wet corrosion, mechanisms, types of corrosion, DMC, DAC, stress, inter granular, atmospheric and soil corrosion, Passivity, Polarization, over potential and its significance, Factors affecting corrosion, protection from corrosion by metallic coatings, electroplating, electroless plating and cathodic protection, Chemical conversion coatings and organic coatings- Paints, enamels.

Batteries

Different types of batteries-Primary, Secondary & Flow battery and Fuel cell. Working principle and uses-Laclanche cell, Alkaline battery, nicad battery, lithium battery & Mercury battery. Fuel cell- Theory, working and application. Different types of fuel cells- H_2/O_2, propane-oxygen, PEFC and SOFC. Lead Acid storage cell-charging & discharging principle, operation and uses. Solar battery- its working principle.

Solid State

Types of solids - close packing of atoms and ions - bcc , fcc structures of rock salt - cesium chloride- spinel - normal and inverse spinels, Stoichiometric Defect, controlled valency & Chalcogen semiconductors, Non-elemental semiconducting Materials, Preparation of Semiconductors-steps followed during the preparation of highly pure materials and further treatments. Semiconductor Devices-p-n junction diode.

Polymer

Nomenclature, functionality, classification, methods of polymerization, mechanism of polymerization, molecular weight determination-Viscometry, light scattering methods. Plastics-Moulding constituents of a plastics and moulding of plastics into articles. Important thermoplastics and thermosetting resins- synthesis & applications of PVA,

FLUON, PC, Kevlar, ABS polymer, phenolic & amino resins, epoxy resins and polyurethanes. Conductive polymers.

Outcome
Students would become familiar with the important practical applications of electrochemistry, solids, their properties and applications, and the polymer materials.

Text Books

1. *P. C. Jain and M. Jain, Engineering Chemistry, Dhanpat Rai Publishing Company, New Delhi, 2005.*
2. *B.R. Puri, L.R. Sharma, M.S. Pathania, Principles of Physical Chemistry, Vishal Publishing Company, 2008.*
3. *J. D. Lee, Concise Inorganic Chemistry, 5th Edn., Chapman and Hall, London, 1996.*

Reference Books

1. *S. S. Dara, S. S. Umare, A Text Book of Engineering Chemistry, S. Chand Publishing, 2011.*
2. *F.W. Billmayer. Textbook of Polymer Science, 3rd Edn, Wiley. N.Y. 1991.*
3. *A.R. West, Basic Solid State Chemistry, 2nd edition, John Wiley and Sons, 1999.*

CH 102B CHEMISTRY II
(for CIV, MECH and PROD)

Objectives To introduce the students to basic principles of electrochemistry, cell construction and evaluation, corrosion, adsorption, phase equilibrium and engineering materials of importance

Electrochemistry
Conductivity of electrolytes- Specific, molar and equivalent conductivity, Nernst equation for electrode potential, EMF series, hydrogen electrode, calomel electrode, glass electrode, Electrolytic and galvanic cells, cell EMF, its measurement and applications, Weston standard cell, reversible and irreversible cells, concentration cell, electrode (hydrogen gas electrode) and electrolyte concentration cell, concentration cell with and without transference, fuel cells, hydrox fuel cell.

Corrosion
Dry corrosion and wet corrosion, mechanisms, types of corrosion, DMC, DAC, stress, inter granular, atmospheric and soil corrosion, Passivity, Polarization, over potential and its significance, Factors affecting corrosion, protection from corrosion by metallic coatings, electroplating, electroless plating and cathodic protection, Chemical conversion coatings and organic coatings- Paints, enamels.

Surface Chemistry
Adsorption – types – adsorption of gases on solids – adsorption isotherm – Freundlich and Langmuir isotherms – adsorption of solutes from solutions – role of adsorbents – activated carbon in pollution abatement of air and waste water. Phase rule: Statement and explanation of the terms involved – one component water system – condensed phase rule – construction of phase diagram by thermal analysis – simple eutectic systems (Pb - Ag system only) – alloys – importance, ferrous alloys – nichrome, and stainless steel, non-ferrous alloys – brass and bronze – heat treatment of alloys.

Engineering Materials
Abrasives – Moh's scale of hardness – natural abrasives (diamond, corundum, emery, garnets and quartz) – synthetic abrasives (silicon carbide, boron carbide) – refractories – characteristics – classification (acidic, basic and neutral refractories) – properties (refractoriness, refractoriness under load, dimensional stability, porosity, thermal spalling) – manufacture of alumina magnesite and zirconia bricks. Cement - Important Parameters for Manufacturing Cement Clinkers. Chemical Constituents and Composition of Cement. Methods of Manufacture of Cement - Wet and Dry Processes. Additives for Cement. Properties of Cement - Setting and Hardening. Types of Portland Cement.

Polymers and Composites

Concept of macromolecules-Nomenclature of polymers-Tacticity- Polymerization processes- Mechanism-Types of Polymerization-Classification of Polymers-Effect of Polymer structure on properties-Moulding of plastics into articles-Important addition and condensation polymers –synthesis and properties – Molecular mass determination of polymers- Static and dynamic methods, Light scattering and Gel Permeation Chromatography-Rubbers –Vulcanization – Synthetic rubbers – Conducting polymers-Composite materials – Reinforced composites and processing.

Outcome

Students would have learnt the significance of electrochemistry and its application, corrosion, adsorption, engineering materials of importance and polymer.

Text Books

1. P. C. Jain & M. Jain, Engineering Chemistry, Dhanpat Rai Publishing Company, New Delhi, 2005.
2. B.R. Puri, L.R. Sharma, M.S. Pathania, Principles of Physical Chemistry, Vishal Publishing Company, 2008.

Reference Books

1. F.W. Billmayer. Textbook of Polymer Science, 3rd Edn, Wiley. N.Y. 1991.
2. S. S. Dara, S. S. Umare, A Text Book of Engineering Chemistry, S. Chand Publishing, 2011

CH 102C CHEMISTRY II
(for CHL and MME)

Objectives

To introduce the students to basic principles of electrochemistry, importance of corrosion, spectroscopic techniques, metals, alloys polymers and composites.

Electrochemistry

Conductivity of electrolytes- Specific, molar and equivalent conductivity, Nernst equation for electrode potential, EMF series, hydrogen electrode, calomel electrode, glass electrode, Electrolytic and galvanic cells, cell EMF, its measurement and applications, Weston standard cell, reversible and irreversible cells, concentration cell, electrode (hydrogen gas electrode) and electrolyte concentration cell, concentration cell with and without transference, fuel cells, hydrox fuel cell.

Corrosion

Dry corrosion and wet corrosion, mechanisms, types of corrosion, DMC, DAC, stress, inter granular, atmospheric and soil corrosion, Passivity, Polarization, over potential and its significance, Factors affecting corrosion, protection from corrosion by metallic coatings, electroplating, electroless plating and cathodic protection, Chemical conversion coatings and organic coatings- Paints, enamels.

Spectroscopic Techniques

Interaction of Electromagnetic radiation with matter- Born–Oppenheimer approximation-IR Spectroscopy- Instrumentation and Applications-Franck–Condon Principle - Electronic Spectra-Theory of electronic transitions – Instrumentation- Beers Law- Applications – Woodward-Fieser rules for acyclic dienes and α β unsaturated ketones – NMR Spectroscopy –Shielding and deshielding-Chemical shift-Applications -Atomic absorption and Atomic Emission Fundamentals

Metals and Alloys

Physical Properties of Metals-Theories of Bonding in metals – Free Electron theory – Valance bond theory – MO theory -Metallurgy – different processes involved in isolation and purification of metals from ores-thermodynamics of reduction processes – Isolation of Nickel, Chromium, Tungsten, Uranium, and Iron- Heat Treatment of Steel-Powder metallurgy-Alloy steels –Thermal Analysis-Thermogravimetry-Differential Thermal Analysis-Differential Scanning Calorimetry

Polymers and Composites

Concept of macromolecules-Nomenclature of polymers-Tacticity- Polymerization processes- Mechanism-Types of Polymerization-Classification of Polymers-Effect of Polymer structure on properties-Moulding of plastics into articles-Important addition and condensation polymers –synthesis and properties – Molecular mass determination of polymers- Static and dynamic methods, Light scattering and Gel Permeation Chromatography-Rubbers –Vulcanization – Synthetic rubbers – Conducting polymers-Composite materials – Reinforced composites and processing.

Outcome

Students would become familiar with the importance of electrochemistry, its applications, corrosion, spectroscopic techniques for characterization, importance of properties of metals, alloys polymers and composites.

Text Books

1. *P. C. Jain & M. Jain, Engineering Chemistry, Dhanpat Rai Publishing Company, New Delhi, 2005.*
2. *B.R. Puri, L.R. Sharma, M.S. Pathania, Principles of Physical Chemistry, Vishal Publishing Company, 2008.*

Reference Books

1. *F.W. Billmayer. Textbook of Polymer Science. 3rd Edn, Wiley. N.Y. 1991.*
2. *C. N. Banwell & E.M. McCash, Fundamentals of Molecular Spectroscopy, 4th Edn, Tata Mc Graw-Hill Edition, 1995.*
3. *S. S. Darer, S. S. Umare, A Text Book of Engineering Chemistry, S. Chand Publishing, 2011.*

Laboratory Experiments (for all Branches)

1. Corrosion rate by polarization technique
2. Conductometric titration
3. Potentiometric titration
4. pH metric titration
5. Percentage purity of bleaching powder
6. Percentage purity of washing soda
7. Determination of molecular weight of polymer by viscometry
8. Demonstration of sophisticated instruments and assignments on them

Reference Books

1. Laboratory Manual, Department of Chemistry, NITT
2. Laboratory Manual on Engineering Chemistry, S.K. Bhasin, S. Rani, Dhanpat Rai Publishing Company, New Delhi, 2011.

BE I 102 BASIC CIVIL ENGINEERING
(for Chemical, CSE, ECE, EEE, ICE, Mechanical, MME, Production)

Objectives
1. To give an overview of the fundamentals of the Civil Engineering fields to the students of all branches of Engineering
2. To realize the importance of the Civil Engineering Profession in fulfilling societal needs

Syllabus

Properties and uses of construction materials - stones, bricks, cement, concrete and steel.

Site selection for buildings - Component of building - Foundation- Shallow and deep foundations - Brick and stone masonry - Plastering - Lintels, beams and columns - Roofs.

Roads-Classification of Rural and urban Roads- Pavement Materials-Traffic signs and road marking-Traffic Signals.

Surveying -Classification-Chain Survey-Ranging-Compass Survey-exhibition of different survey equipment.

Sources of Water - Dams- Water Supply-Quality of Water-Wastewater Treatment – Sea Water Intrusion – Recharge of Ground Water.

Outcome
1. The students will gain knowledge on site selection, construction materials, components of buildings, roads and water resources
2. A basic appreciation of multidisciplinary approach when involved in Civil Related Projects.

Reference Books
1. *Punmia, B.C, Ashok Kumar Jain, Arun Kumar Jain, Basic Civil Engineering, Lakshmi Publishers, 2012.*
2. *Satheesh Gopi, Basic Civil Engineering, Pearson Publishers, 2009.*
3. *Rangwala, S.C, Building materials, Charotar Publishing House, Pvt. Limited, Edition 27,2009.*
4. *Palanichamy,M.S, Basic Civil Engineering, Tata Mc Graw Hill, 2000.*
5. *Lecture notes prepared by Department of Civil Engineering, NITT.*

BE II 102 BASIC MECHANICAL ENGINEERING
(for Civil, CSE, ECE, EEE, ICE)

Objectives

To explain the importance of concepts of mechanical engineering and conservation equations.

To introduce the techniques for analyzing the forces, momentum and power.

To introduce the various properties of materials, and the techniques of selection of materials.

To identify the basic elements of a mechanical system and write their constitutive equations and performance analysis techniques.

Fundamentals Introduction to mechanical engineering, concepts of thermal engineering, mechanical machine design, industrial engineering, and manufacturing technology.

Thermal Engineering Laws of thermodynamics, types of systems, concepts and types of I.C. engine, air compressors, principle of turbomachines, properties of steam and steam generators, automobile engineering, introduction to gas turbines and refrigeration & air-conditioning.

Engineering Materials Types of materials, selection of materials, material properties, introduction to materials structure, machine elements, transmission, fasteners, and support systems.

Manufacturing Technology Manufacturing, classification, lathe, drilling machines, milling machines, metal joining, metal forming, casting, forging, and introduction to powder metallurgy.

Outcome

The terminal objectives of the course is that, on successful completion of teaching-learning and evaluation activities, a student would be able to identify, appreciate and analyze the problems by applying the fundamentals of mechanical engineering and to proceed for the development of the mechanical systems.

Reference Books
1. *Lecture notes prepared by Department of Mechanical Engineering, NITT.*
2. *K. Venugopal, Basic mechanical Engineering*

BE III 102 BASICS OF ELECTRICAL AND ELECTRONICS ENGINEERING
(for Chemical, Civil, Mechanical, MME and Production)

Objectives   This course aims to equip the students with a basic understanding of Electrical circuits and machines for specific types of applications. The course gives a comprehensive exposure to house wiring. This course also equips students with an ability to understand basics analog and digital electronics.

DC & AC Circuits: Current, voltage, power, Kirchhoff's Laws - circuit elements R, L and C, phasor diagram, impedance, real and reactive power in single phase circuits.

DC & AC Machines: DC Motor, Induction motor, Synchronous motor, Synchronous generator and Transformers- construction, principle of operation, types and applications.

House wiring & safety: Single phase and three phase system – phase, neutral and earth, basic house wring - tools and components, different types of wiring – staircase, florescent lamp and ceiling fan, basic safety measures at home and industry.

Analog Electronics: semiconductor devices – p-n junction diode, Zener diode, BJT, operational amplifier – principle of operation and applications – Introduction to UPS.

Digital Electronics: Introduction to numbers systems, basic Boolean laws, reduction of Boolean expressions and implementation with logic gates.

Outcome The students shall develop an intuitive understanding of the circuit analysis, basic concepts of electrical machines, house wiring and basics of electronics and be able to apply them in practical situation.

Text Books
1. *Hughes revised by Mckenzie Smith with John Hilcy and Keith Brown, 'Electrical and Electronics Technology', 8th Edition, Pearson, 2012.*

Reference Books
2. *R.J. Smith, R.C. Dorf, 'Circuits Devices and Systems', 5th Edition, John Wiley and sons, 2001.*
3. *P. S. Dhogal, ' Basic Electrical Engineering – Vol. I & II', 42nd Reprint, Mc Graw Hill, 2012.*
4. *Malvino, A. P., Leach D. P. and Gowtham Sha, 'Digital Principles and Applications', 6th Edition, Tata Mc Graw Hill, 2007.*
5. *Vincent Del Toro, 'Electrical Engineering Fundamental', Prentice Hall India, 2002.*

BS 102 BRANCH SPECIFIC COURSES
BS 102 (CL) INTRODUCTION TO CHEMICAL ENGINEERING

Objectives

To give a comprehensive knowledge on various aspects practiced in chemical engineering and the sources of information on related topics.

Introduction to Unit Operations and Unit Processes, Development of Process Flow Sheeting, Basic tools of Physio-Chemical Calculations, Conservation Equations in Chemical Engineering, Principles and Applications of flow of Fluids and Solids, Heat and Mass Transfer, Chemical Reaction Kinetics, Concepts of Scale up, Modeling and Simulation Techniques in Chemical Processes, Significance of Chemical Engineering in Food, Health, Energy and Environment. Few Case studies: State of the Art Technology in Chemical Industries.

Outcome

The student will be able to appreciate various processes followed in transforming raw material into value added materials, significance of chemical engineering to the society in the areas of Health, Energy, Environment and Food.

Reference Books

1. *S. K. Ghosal, S. K., Sanyal and S. Datta, Introduction to Chemical Engineering, TMH Book Company, 1998*
2. *Anderson L. B. and L. A. Wenzel, Introduction to Chemical Engineernig, McGraw Hill Publications, 1998.*

BS102 (CE) INTRODUCTION TO CIVIL ENGINEERING

Objective

To give an overall exposure of the field of Civil Engineering and the role of Civil Engineers to the Civil Engineering students.

Syllabus

Role of Civil engineers in society, Ethics in Civil Engineering Practice, outstanding accomplishments of the profession, future trends, Types of projects, stages of projects, Specifications and Scope.

State of the art lectures on Structures, Transportation, Water Resources, Environment, Geotechnical and GIS / GPS / RS. Introduction to geology.

Properties and uses of construction materials such as stones, bricks, cement, concrete and steel.

Site selection for buildings – components of building foundation – shallow and deep foundations – brick and stone masonry – plastering – lintels, beams and columns – roofs.

Outcome

At the end of the course, the students will have a broad understanding of the State of the art in various disciplines of Civil Engineering. They are also introduced to the fundamentals of buildings and construction materials.

Textbooks

1. Sushil Kumar, Building construction, Standard Publishers, 2001
2. Rangwala S.C, Building materials, Charotar Publishing House Pvt. Limited, Edition 27, 2009.

Reference books

1.   Subinay Gangopadhyay, Engineering Geology, Oxford University Press, 2013
2.   M. S. Palanichamy, Basic Civil Engineering, Tata Mc Graw Hill, 2000.
3.   Lecture Notes Prepared by Civil Engineering Department, NIT-T.

BS 102(CS) INTRODUCTION TO COMPUTER SCIENCE AND ENGINEERING

Objectives

To introduce
The basic concepts in Computer Science and Engineering.
The different styles of programming.
Important features of programming languages.

Syllabus

Basic model of computation. principle of mathematical induction, notions of algorithms and programming, iteration and recursion.

Imperative style of programming, Functional style of programming, correctness and efficiency.

Features of block-structured languages, Functions and Procedures, parameter passing, Top-down style and step-wise refinement with concrete examples.

Outcomes

Students will be able to,

Compare different styles of programming languages.
Write algorithms for any given problem.
Analyze the correctness of the algorithm.

Text/Reference books

1. *Subhasis Banerjee, S.Arun Kumar, D. Dubhashi : Introduction to Computer Science Manuscript.*
2. *Harold abelson and Gerald Sussman, Structure and Interpretation of Computer Programs,MIT Press, 1996.*
3. *How to solve it by computer by R.J. Dromey, Prentice Hall India Series, 2007.*
4. *The New Turing Omnibus, Excursions in Computer by W.H. Freeman & Company, revised edition, 1993.*

BS102 (EE) INTRODUCTION TO ELECTRICAL AND ELECTRONICS ENGINEERING

Objectives This course facilitates the students to get a comprehensive exposure to electrical and electronics engineering.

History, major inventions, Scope, significance and job opportunities in electrical and electronics engineering, brief overview of various energy resources.

Basics of energy conversion, power apparatus used in power generation, transmission and distribution, Power apparatus used in various industries.

Basic ideas about utility supply, electrical tariff, energy audit and importance of energy saving.

Introduction to different types of electrical circuits, house wiring, electronic circuits for signal processing, specifications of electronic components.

Brief overview of curriculum, laboratories and various software packages, electronic testing and measuring equipments.

Outcome The students shall develop an insightful knowledge on various fundamental elements of electrical and electronics engineering.

Reference Books

1. Clayton Paul, Syed A Nasar and Louis Unnewehr, 'Introduction to Electrical Engineering', 2nd Edition, McGraw-Hill, 1992.
2. Kothari D. P. & Nagrath, I. J., 'Basic Electrical Engineering', 2nd Edition, Tata McGraw-Hill, 2001.
3. P. S. Dhogal, ' Basic Electrical Engineering – Vol. I & II', 42nd Reprint, Mc Graw Hill, 2012.

BS 102 (EC) INTRODUCTIONS TO ELECTRONICS AND COMMUNICATION ENGINEERING

Objectives

This course would facilitate the learner to acquire good exposure to electronics and communication engineering.

History of major inventions in electronics and communication engineering, Industries and R&D institutions in India, Overview of various specializations in ECE, Overview of laboratories in ECE dept., Electronic test and measurement equipments, Specifications for electronic components, Mini projects, Technical report preparation and presentation.

Introduction to Circuit theory and analysis, Nodal analysis, Mesh analysis for DC and AC circuits, Network reduction-techniques and theorems.

Introduction to Signals and Systems

Basics of telecommunication infrastructure, Introduction to Mobile, Satellite and Microwave Communication systems, modulation techniques

Introduction to DC generators, motors, Inverters and Transformers

Outcome

The learners are expected to have an overview of electronics and communication engineering and learn the introductory concepts in each of the specializations in ECE.

Reference Books

1. *Lecture notes prepared by Department of ECE, NITT*
2. *George Kennedy, Electronic Communication Systems, 4th edition, Tata McGraw-Hill, 1999.*
3. *Ralph J. Smith, Richard C. Dorf, Circuits, Devices and Systems: A First Course in Electrical Engineering, John Wiley & Sons, 1991*

BS102 (IC) INSTRUMENTATION AND CONTROL ENGINEERING

Objectives

To introduce the students on the role of Instrumentation and Control engineering in the society.

Place of engineers in the society and in an industrial organization. The technical manpower pyramid. Introduction to the program, subjects of study and its relevance, Opportunities for training, placement and for higher studies.

Overview of industry and scope of the discipline - Preliminary project design requirements - Various process conditions. Knowing client requirement and collection of specific data for projects.

Objectives, general concepts, terminologies, types and basic block diagrams of Instrumentation system.Objectives, general concepts, terminologies, types and basic block diagrams of control systems.

Introduction to instrumentation and control engineering codes and standards and their relevance to industry.

Case studies: Introduction to instrumentation and control in a typical application like temperature, flow, or pressure control.

Outcome

1. Students will know what an engineer does for the benefit of society.
2. Role of instrumentation and control engineering in an industrial organization.
3. They will know instrumentation and control engineering in a device or a plant.
4. They will know standards used in instrumentation and control engineering.
5. They will know how to apply basic building blocks of instrumentation and control engineering for a typical application.

Text Books

1. *Alan S Moris,Measurement and Instrumentation Principles, Butterworth-Heinemann Limited, Third Edition, 2001*
2. *Bolton W, IndustrialControl and Instrumentation, University Press, First Edition, 2005.*
3. *Chesmond C J, Basic Control System Technology, Viva Books Private Limited, 1998.*

References Books

1. *ISA standards*
2. *Bureau of Indian standards*

BS102 (ME) INTRODUCTION TO MECHANICAL ENGINEERING

Objective To give an introduction of mechanical engineering to the students to kindle interest in mechanical engineering branch.

Concept of living needs of individual and social, basic needs of a society - food, shelter, governance, security, commerce, health care education, energy, entertainment , clothing, transport, communication. Role of mechanical engineers in fulfilling these needs.

Detailed look in to the following of social needs (i) energy: microscopic and macroscopic forms of energy, energy conversion devices, Carnot's limitation, IC engines (ii) *Transportation* : Comparison of cost of various modes of transportation, basics of rolling friction, comparison of roller fiction and sliding friction, Theory of wheel and axel.

Introduction to working of some basic mechanical devices like air-conditioners, bicycle free wheel bicycle pump, turbo machines.

Introduction to various types of materials: metal polymer ceramic composites and their properties, performs.

Introduction to manufacturing processes: casting, forming, machining and joining.

Interdisciplinary engineering systems.

Intellectual property rights: patents, copy rights, trade mark design registration and geographical indication

Expected learning outcome The student after undergoing this course will know the concept of social living basic needs of the society, the role of mechanical engineers in fulfilling the needs of the society, materials, basic manufacturing process and various mechanical systems

Text Books
1. *Lecture notes prepared by Department of Mechanical Engineering, NITT.*

Reference Books
1. *Aplin, T. and Davis, J., Intellectual Property Law: Text, Cases, and Materials, Pub.: Oxford University Press, 2009.*
2. *Rachel Maines, Landmarks in Mechanical Engineering, Pub.: ASME, 1998.*
3. *John Bird and Carl, T.F.T.F. Ross, Mechanical Engineering Principles, Pub.: Taylor & Francis, 2002.*
4. *Don Herweck, Mechanical Engineering, Pub.: Capstone, 2008.*

BS 102 (MT) INTRODUCTION TO METALLURGICAL AND MATERIALS ENGINEERING

Objectives

To develop an understanding of the basic knowledge of Metallurgical and Materials Engineering and gain knowledge on overview of developments in the field of materials over periods

Historical perspective, scope of materials science and of materials engineering – Role of metals in civilization and in wars – rise and fall of emperors who conquered world- Metallurgy and materials of India – Damascus sword – Delhi iron Pillar etc.

Metals and Materials – Classification – Properties – Mechanical, electrical, thermal, magnetic, optical, decorative and its applications. Illustrative examples of practical uses of materials.

Modern materials – Bio and Nano materials.

Role of metals and materials in aerospace and telecommunication, Role of metals and materials in Indian medicines – Siddha, Ayurveda, etc.
Metallurgical Industries in India

Outcome

C1. Define engineering materials technology and understand each stage of the materials cycle, material selection criteria [d,f,h,I,k]

C2. Understand professional and ethical responsibilities of Metallurgical and Materials professional [f]

C3. Understand the impact of Metallurgical and Materials Engineering solutions in a global, economic, environmental, and societal context [h]

C4. Select different metallic materials for specific engineering applications [I,k]

Text Books

1. *Rajput R.K. "Engineering Materials and Metallurgy" S. Chand & Co., New Delhi. 2006*
2. *Transaction of Indian Institute of Metals, Special issue on Non ferrous materials – Heritage of India. Vol.59, No.6, 2006.*
3. *Pooler and F.J. Owens, Introduction to nano technology, Wiley student edition, 2003.*
4. *Sujata V Bhat, Bio Materials, Narosa Publishing House, New Delhi, 2004.*

BS102 (PR) INTRODUCTION TO PRODUCTION ENGINEERING

Objectives

To introduce the scope of Production Engineering and its relevance to industries.

Role of Production Engineer, Introduction to Manufacturing Processes – Casting, Welding, Metal Forming, Machining, Powder Metallurgy, Advanced Manufacturing Processes.

Introduction to Product Design and Development, Rapid Prototyping. Introduction to Engineering Materials – Ferrous Materials, Non-ferrous Materials, Composites, Polymers, Types of Industries.

Introduction to Metrology and Quality Control, Total Quality Management (TQM), Material Handling, Reliability and Maintenance, Productivity, Industrial Safety.

Introduction to Engineering Economy and Costing, Work System Design, Facility Design, Production Planning and Inventory Control.

Introduction to Operation Research, Quality Management, Management Information System (MIS), Intellectual Property Rights(IPR) , Supply Chain Management(SCM), Computer Aided Manufacturing(CAM), Computer Integrated Manufacturing(CIM). Introduction to Theory of Machines.

Outcome

The students will have knowledge in the broad spectrum of Production Engineering.

Text Books

1. E.Paul De Garmo, J.J.Black, Ronald A. Kohser, Materials and Processes in Manufacturing, 8th edition, PHI, 2008.
2. P.C.Sharma, A Text Book of Production Engineering, S.Chand and Company Limited, 2008

Reference Books

1. Kalpakjian, Manufacturing Technology, Addision Wesley Publishing Company, England, 2003
2. Groover M.P., Fundamentals of Modern Manufacturing, Materials, Processes and Systems, John Wiley, 2006.
3. Amitabha Ghosh, Asok Kumar Mallik, Manufacturing Science, EWP Pvt. Ltd, 2007.