

B.Tech. SYLLABUS

(I and II Semesters)

Applicable for students admitted in

2014-15



National Institute of Technology Puducherry

Karaikal – 609 605

I SEMESTER

CODE	COURSE OF STUDY	L	T	P	C
HM101	Communication in English-I	1	0	3	3
MA101	Mathematics-1	3	0	0	3
PH101	Physics-1	2	0	3	3
CH101	Chemistry-1	2	0	3	3
CE101	Engineering Mechanics	3	0	0	3
CS101	Basics of programming	2	0	2	3
CC101	Energy and Environmental Engineering	2	0	0	2
ME101	Engineering graphics	1	0	4	3
CF101	NSS/NCC/NSO	0	0	0	0
TOTAL		16	0	15	23

II SEMESTER

CODE	COURSE OF STUDY	L	T	P	C
HM102	Communication in English-II	1	0	3	3
MA102	Mathematics-II	3	0	0	3
PH102	Physics-II	3	0	3	4
CH102	Chemistry-II	3	0	3	4
CE102	Fundamentals of Civil Engineering	2	0	2	3
ME102/ EE102	Elements of Mechanical Engineering/ Basics of Electrical and Electronics Engineering (ME)	2	0	0	2
BS102	Branch Specific Course	2	0	0	2
ME104	Workshop Practice	0	0	4	2
HM104	Professional Ethics and Human Values	2	0	0	2
CF102	NSS/NCC/NSO	0	0	0	0
TOTAL		18	0	13	25

HM101- Communication in English-I

Objective: To prepare the students to read and listen to information related to immaterial things

Listening Skills: Listening for information, inference and evaluation. Importance of Listening skills in Corporate World-MTI -The Speech Organs-IPA Symbols and transcription- consonant clusters-varieties of English: GAE, RP, And GIE. Radio talks, videos etc...,

Reading Skills: Reading for information, inference and evaluation. (News papers, Scientific Research, Desired reading materials)

Speaking Skills: Building Confidence and Fluency-dialogue practice-extempore practice-speech assessment and Public Speaking -Use of Technology in Oral Communication-Interviews.

Reference Skills: Using a dictionary, graphs, glossary, index, bibliography etc.

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

Books Suggested:

1. Meenakshi Raman and Sangeeta Sharma, *Technical Communication*, OUP Publication, 2005.
2. Urmila Rai and M.S. Rai, *Business Communication* by, Himalaya Publishing House, 2002.
3. Any Desired reading materials (Scientific Research Material).

Lab:

Activities designed on Speaking and listening Skills based on the theory syllabus. Like Pair work Activities, role plays, Jam sessions, Debates, Movie clips to illustrate non verbal communication, Varieties of English practice, Skits, Mock interview sessions, grammar games and practice, etc...,

MA101 MATHEMATICS I

Objectives: To acquire fundamental knowledge on mathematics and its application in engineering disciplines.

Matrix Theory: Elementary row and column operations on a matrix, Rank of matrix – Normal form – Inverse of a matrix using elementary operations –Consistency and solutions of systems of linear equations using elementary operations, linear dependence and independence of vectors - Characteristic roots and vectors of a matrix - Caley - Hamillton theorem (statement only) and its applications, Reduction to diagonal form - Reduction of a quadratic form to canonical form – orthogonal transformation.

Sequences: 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.

Differential Calculus: Rolle’s theorem; Mean value theorem; Taylor’s and Maclaurin’s theorems (without proof) with remainders, Functions of several variables, Partial Differentiation, Total Differentiation, Euler’s theorem and generalization, maxima and minima of functions of several variables (two and three variables) – Lagrange’s method of Multipliers; Change of variables – Jacobians. Asymptotes and curvature- Curve tracing.

Ordinary differential equations of first order: Separable equations; equations reducible to separable form; exact equations; integrating factors; linear first order equations; Bernoulli’s equation; Orthogonal trajectories, Newton’s law of cooling, Law of Natural growth and Decay

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

Recommended Text Book:

1. Erwyn Kreyszig, *Advanced Engineering Mathematics*, John Wiley and Sons, 10th Edition, 2010.
2. T. Veera Rajan, *Engineering Mathematics* (For First Year), Mc Graw Hill Education, 2007.

Reference Books:

1. B.S.Grewal, *Higher Engineering Mathematics*, Khanna Publications, 42nd Edition, 2012.

PH101 PHYSICS I

Objectives:

- To enable the students to refresh their basics of Physics and orient themselves in implementation of concepts in engineering.
- To give an exposure on basics of quantum mechanics and statistical physics.
- Not only to provide foundation for understanding the course PH102 but also branch specific courses offered by different engineering departments during advanced semesters.

Unit 1: Waves and Oscillations: Wave motion- Travelling wave in one dimension-wave equation-examples- Superposition of waves and standing waves-Simple harmonic motion -Energy of SHM-examples: simple pendulum, LC circuit-damped oscillations-forced oscillations and resonance conditions.

Unit 2: Acoustics and Optics: Characteristics of musical sound-loudness-Weber-Fechner law-decibel-absorption coefficient-reverberation-reverberation time-Sabine's formula-acoustics of buildings-ultrasonic production: Magnetostriction and Piezoelectric methods-determination of velocity of ultrasonic waves-applications. Coherent light sources-theory of interference of light-air wedge-Newton's rings-Diffraction-grating-Polarization-applications.

Unit 3: Thermodynamics and statistical mechanics: Mole-ideal gas-heat capacity-exact differential-first law-Meyer's relation-isothermal and adiabatic processes-work done-second law-carnot's engine-Carnot's theorem-Kelvin's scale of temperature- Clausius theorem and entropy-first law revisited. Statistical physics-distribution functions- comparison of Maxwell-Boltzmann-Fermi Dirac and Bose Einstein distribution functions-Thermodynamic potentials-Maxwell's equations-statistical interpretations of temperature and entropy.

Unit 4: Electrodynamics: Coulomb's law for distribution of charges-polarization and Gauss's law-electric current and equation of continuity-magnetic induction and Lorentz force-steady current and Biot Savart law-Ampere's law-magnetization and magnetic intensity-Faraday's law of induction-generalization of Ampere's law-Maxwell's equation- electromagnetic wave equation-propagation of EM waves in free space.

Unit 5: Quantum mechanics: Inadequacy of classical mechanics-wave and particle duality of radiation-de Broglie concept of matter waves-Heisenberg's uncertainty principle-Schrödinger wave equation-interpretation of wave function-eigenvalues and eigen functions-superposition principle-particle confined in one dimensional infinite square well potential. Schrödinger solution for hydrogen atom.

Outcome:

- Fundamental knowledge of students obtained in school will get refreshed while handling topics with mathematical approach.
- The unit on Acoustics and Optics are oriented towards engineering aspects.
- Students will also get an exposure on topics of modern physics through units like thermodynamics, statistical physics and quantum physics.

Text books:

1. M.N. Avadhanulu and P.G. Kshirsagar, *A text book of Engineering Physics*, S. Chand and Company, New Delhi, 2009.
2. R.K. Gaur and S.L. Gupta, *Engineering Physics*, Dhanpat Rai Publications (P) Ltd., 8th edn., New Delhi, 2001.
3. R. A. Serway and J.W.Jewett, *Physics for Scientists and Engineers*, 9th edition, Cengage Learning, 2012.

Reference books:

1. Halliday, Resnic and Walker, *Fundamentals of Physics*, 9th Edition, John Wiley, 2011.
2. David J. Griffiths, *Introduction to Electrodynamics*, 3rd ed, Printice Hall of India, NewDelhi 2012.
3. Arthur Beiser, *Concepts of Modern Physics*, Tata McGraw-Hill, New Delhi, 2010.
4. E. M. Purcell, *Electricity and magnetism-Berkeley Physics Course*, Vol.2., Tata McGraw-Hill, 2008.
5. Walter Greiner, Ludwig Neise, Horst Stöcker and D. Rischke, *Thermodynamics and Statistical Mechanics*, Springer, 1995.
6. Richard P. Feynman , *The Feynman Lectures on Physics - Vol. I,II and III: The New Millennium Edition*, 2012.

Laboratory experiments

1. Torsional pendulum
2. Sonometer- Frequency of tuning fork.
3. Determination of thickness of a thin wire-Air wedge.
4. Newton's rings- Determination of radius of curvature of a lens.
5. Determination of dispersive power of grating.
6. Half shade polarimeter-determination of specific rotator power.
7. Filed along the axis of a circular coil.
8. (i) Conversion of Galvanometer into ammeter and voltmeter.
(ii) Calibration of voltmeter-Potentiometer.
9. Charge-discharge characteristics of RC circuit.
10. Verification of Newton's law of cooling.
11. Determination of diameter of the sphere by Monte Carlo method.
12. Simple harmonic motion.

Reference books:

1. J.D. Wilson and Cecilia A. Hernández-Hall, *Physics laboratory, experiments*, 8th edition, Cengage Learning.
2. C.L Arora, *B.Sc. Practical Physics*, S. Chand &Co. 2012.

CH 101 CHEMISTRY I

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

Electrochemistry: Electrolytic and galvanic cells, EMF series, Nernst equation for electrode potential, cell EMF, its measurement and applications, Weston standard cell, hydrogen electrode, calomel electrode, glass electrode, 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, Factors affecting corrosion, protection from corrosion by metallic coatings, electroplating, electrolessplating and cathodic protection.

Nanomaterials: Introduction to nanochemistry – preparation of few Nano materials: carbon nanotubes, graphene, polymer nanostructures, Nanoomposites: definition, types, polymer matrix composites. etc – Properties of Nano materials and their Engineering applications and Future perspectives.

Organic Chemistry: Carbon-carbon bond properties, hybridization-sp³, sp² and sp, homolytic and heterolytic cleavage of carbon-carbon bonds, SN 1 and SN 2, E1 and E2 reactions, Birch reduction, MPV reduction, Baeyer-Villiger oxidation, Oppenauer oxidation, aromatic nucleophilic substitution, benzyne mechanism, aromatic electrophilic substitution.

Fuels and Lubricants: Fuels - classification, examples and relative merits, types of coal, determination of calorific value of solid fuels, Bomb calorimeter, theoretical oxygen requirement for combustion, proximate and 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 and carbon residue, additives to lubricants, manufacture of lube oil.

Text Books

1. P.C. Jain and M. Jain, *Engineering Chemistry*, Dhanpat Rai Publishing Company (P) Ltd., New Delhi, 2007.
2. J. March, *Advanced Organic Chemistry*, Wiley Eastern, New Delhi, 1990.
3. Mark A.Ratner and Daniel Ratner, *Nanotechnology*, Pearson Education 2003.

Reference Books

1. R. Gopalan, D. Venkappayya and N. Sulochana, *Engineering Chemistry*, Vikas Publishing House, New Delhi, 2005.
2. J.C. Kuriacose, J. Rajaram, *Chemistry in Engineering and Technology*, Vol I & II, Tata McGraw Hill publishing Company Ltd, New Delhi, 1984.
3. P.W. Atkins, *Physical Chemistry*, Oxford University Press, 1998.

CHEMISTRY-I LAB

1. Percentage purity of bleaching powder
2. Percentage purity of washing soda
3. pH metric titration
4. Conductometric titration
5. Potentiometric titration
6. Determination of corrosion rate of mild steel in acid medium by weight loss method

Reference Book

1. Laboratory Manual, Department of Chemistry, NITT

CE101 ENGINEERING MECHANICS

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.

UNIT-I: 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.

UNIT-II: 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 problems.

UNIT-III: 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 problems.

UNIT-IV: Kinematics: Fundamentals of rectilinear and curvilinear motion, application of general equations, concept of relative velocity, analytical and graphical techniques, Numerical problems.

UNIT-V: Dynamics: Principles of dynamics, D'Alembert's principle, conservation of momentum and energy, vibrations of simple systems, Numerical problems.

Text Books

1. K. L. Kumar and V. Kumar, *Engineering Mechanics*, Tata McGraw Hill, 2011.
2. M. S. Palanichamy and S. Nagan, *Engineering Mechanics – Statics & Dynamics*, Tata McGraw Hill, 2002.
3. S. Timoshenko and D. H. Young, *Engineering Mechanics*, McGraw Hill, 2006.
4. E. P. Popov, *Engineering Mechanics of Solids*, Prentice Hall, 1998.

Reference Books

1. I. H. Shames and G. K. M. Rao, *Engineering Mechanics – Static and Dynamics*, Pearson Education, 2009.
2. F. P. Beer and E. R. Johnson Jr, *Vector Mechanics for Engineers*, McGraw Hill, 2009.
3. J. S. Rao and K. Gupta, *Introductory Course on Theory and Practice of Mechanical Vibrations*, 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

Unit I – Fundamentals of Computer

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

Unit II – Algorithms and Structured Programming

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

Unit III – Overview of C and Branching

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.

Unit IV – User Defined Functions

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

Unit V – Arrays and Pointers

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.

Outcomes

- 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.

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

Objective:

To teach principal renewable energy systems.

To explore the environmental impact of various energy sources and also the effects of different type 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. G. Boyle, *Renewable energy: Power for a sustainable future*, Oxford University press, 2004.
2. B. H. Khan, *Non Conventional Energy Resources*-The McGraw –Hill Second edition, 2009.
3. G. D. Rai, *Non conventional energy sources*, Khanna Publishers, New Delhi, 2006.
4. Gilbert M. Masters, *Introduction to Environmental Engineering and Science*, Prentice Hall, 2nd Edition, 2003.

REFERENCES

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

ME101 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.

To 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

UNIT-I: 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.

UNIT-II: 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.

UNIT-III: 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.

UNIT-IV: 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.

UNIT-V: 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)

Text Books

1. N. D. Bhatt and V.M. Panchal, *Engineering Drawing*, Charotar Publishing House, 2010.
2. K. V. Natarajan, *A text book of Engineering Graphics*, Dhanalakshmi Publishers, Chennai, 2006.
3. K. Venugopal and V. Prabhu Raja, *Engineering Drawing and Graphics + AutoCAD*, New Age International, 2009.

Reference Books

1. D. A. Jolhe, *Engineering drawing*, Tata McGraw Hill, 2008
2. M. B. Shah and B. C. Rana, *Engineering Drawing*, Pearson Education, 2009.
3. S. Trymbaka Murthy, *Computer Aided Engineering Drawing*, I.K. International Publishing House, 2009.

HM102- Communication in English-II

Objective: To enable to speak the students.

Writing Skills: Paragraph Writing- Essays -Report writing, Technical writing -unity-Plain English

Technical Writing Skills: Report writing, Business Proposals- Business Correspondence: Enquiry, complaint, sales letters - Precise writing-Para phrasing, summary writing on graphs, tables, charts etc....

Speaking Skills: Public speaking skills- Technical presentation skill- Interviews- Inter personal Communication- Communication (Making presentations).

Technical skills: Presentations-Group Discussions-Pamphlet and brochure designing.

Soft Skills: Relationship between Soft skills and Communication Skills-Leadership skills-team management Skills-Lateral thinking-Negotiation skills –Telephone etiquettes.

Prose or Poetry: Collection of two three proses or poetry pieces at the discretion of the teacher for enhancing the literary sensibility of the students.

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

Suggested Reading:

1. Thomas S. Kane, *The New Oxford Guide to Writing*, OUP publication, 1988.
2. John Sealy, *The Oxford guide to effective writing and Speaking*, OUP publication, 2007.
3. Any Book on Public Speaking pronunciation.

Lab:

Virtual Course: Presentations, letter writing practice, soft skills practice, Mock interviews, Group discussions, Writing skills practice etc.

MA102 MATHEMATICS II

Objectives: To acquire fundamental knowledge on mathematics to apply in engineering disciplines.

Integral Calculus: Fundamental theorem of integral calculus and mean value theorems. Beta and Gamma integrals – Elementary properties – Differentiation under integral sign.

Multiple Integrals: Double and triple integrals – computation of surface areas by double integrals - volumes by double and triple integrals – change of variables in double and triple integrals.

Vector Calculus: Scalar and Vector fields; Vector Differentiation; Level surfaces directional derivative - Gradient of scalar field; Divergence and Curl of a vector field - Laplacian - Line and surface integrals; Green's theorem in plane; Gauss Divergence theorem; Stokes' theorem.

Ordinary higher order differential equations: Higher order linear equations with constant coefficients. Euler and Cauchy's equations; Method of variation of parameters; System of linear differential equations with constant Coefficients.

Laplace Transformation: Laplace transform - Inverse Laplace transform - properties of Laplace transforms - Laplace transforms of unit step function, impulse function and periodic function - convolution theorem - Solution of ordinary differential equations with constant coefficients and system of linear differential equations with constant coefficients using Laplace transform.

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

Recommended Text Book:

1. Erwyn Kreyszig, *Advanced Engineering Mathematics*, John Wiley and Sons, 10th Edition, 2010.
2. B.S. Grewal, *Higher Engineering Mathematics*, Khanna Publications, 42nd Edition, 2012.
3. T. Veera Rajan, *Engineering Mathematics* (For First Year), Mc Graw Hill Education, 2007.

Reference Books:

1. T.M. Apostol, *Calculus*, Volume I & II, 2nd Edition, John Wiley & Sons (Asia), 2005.
2. M.D. Greenberg, *Advanced Engineering Mathematics*, 2nd Edition, Pearson Education Inc. (First Indian reprint), 2002.
3. M. K. Venkataraman, *Linear Algebra*, The National Publishing Co, 1999.

PH102 PHYSICS II

Objective:

- To enable the students to get exposure on different types of materials, properties and application in the field of engineering.
- To give an exposure on advanced materials in engineering and their characterization techniques.
- To understand the physics of lasers and their applications, very much essential in modern engineering and technology.

Unit 1: Crystallography: Crystalline and amorphous solids-system of crystals-symmetry operation-single crystal-defects in solids-Miller indices-atomic radius-coordination number-atomic packing factor calculation-Bragg's law-X-ray diffraction techniques-Bragg's spectrometer-Powder photograph method.

Unit 2: Conductors, semiconductors-Dielectrics and Magnetic materials: Free electron theory (classical and quantum)-Band theory of solids- semiconductors- intrinsic- extrinsic semiconductors-pn junction diode- dielectrics-types of polarization-internal field and Clausius Mosotti equation- - ferroelectric materials-magnetic materials-types and properties-domain theory-hard and soft magnetic materials-applications-superconductivity and types-Meissner effect-high temperature super conductors-applications.

Unit 3: Advanced materials: Liquid crystals-types-application as display devices-nano materials (one, two and three dimensional)-physical properties and applications. Physics of thin films-different methods of synthesis and techniques of characterization-Materials for renewable energy sources- thermo electric materials.

Unit 4: Materials evaluation: Ultrasonic inspection-pulse echo method-liquid penetration technique-magnetic particle inspection-radiography-thermography- quartz crystal microbalance-types of spectra-IR, UV and visible spectroscopy-Raman spectra-ESR-NMR technique-Applications-Microscopy techniques- Scanning electron microscopy (SEM)-Transmission electron microscopy(TEM)-Atomic force microscopy(AFM)-Ellipsometry.

Unit 5: Lasers and fiber optics: Spontaneous and stimulated emissions-Einstein's coefficients-population inversion and lasing action-coherence-properties and types of lasers-applications-Fermat's principle and Snell's law-optical fiber-numerical aperture-types of fibers- fiber optics communication principle-fiber optic sensors.

Outcome:

- Student will get not only an exposure on physics of materials science but also recent advancements in the materials science.
- Understand the basic concept of materials characterization techniques and NDT, which are very essential for a modern engineer.

Text books:

1. V. Rajendran and A. Marikani, *Materials Science*, Tata McGraw-Hill, 2004.
2. R. A. Serway and J.W.Jewett, *Physics for Scientists and Engineers*, 9th edition, Cengage Learning, 2013.

Reference books:

1. Richard P. Feynman , *The Feynman Lectures on Physics* - Vol. I,II and III: The New Millennium Edition, 2012.
2. C.P. Poole and F.J. Owens, *Introduction to Nanotechnology*, Wiley, New Delhi, 2007.
3. Deborah D. L. Chung, *Functional Materials: Electrical, Dielectric, Electromagnetic, Optical and Magnetic Applications*, world scientific publishers, 2010.
4. Rolf. E. Hummel, *Electronic Properties of Materials*, Springer 2001.
5. Anthony R. West, *Solid State Chemistry and its Applications*, 2nd Edition, 2014.
6. R. S. Sirohi, Mahendra P. Kothiyal, *Optical Components, Techniques, and Systems in Engineering*, Taylor & Francis, 1991

Laboratory experiments

1. Measurement of temperature using thermocouple.
2. Determination of Optical absorption coefficient of materials using laser.
3. Determination of numerical aperture of an optical fiber.
4. (i) Determination of wavelength of laser using diffraction grating.
(ii) Determination of particle size of dusty particles using laser.
5. Nondistructive testing by ultrasonic inspection
6. B-H curve of ferromagnetic materials.
7. Determination of dielectric constant of liquid and solids.
8. Characteristics of a photo diode and a LED.
9. Determination of energy band gap of a thermistor.
10. Determination of elastic constants- Searle's dynamical method.
11. Series resonance-LCR circuit.
12. Thermal conductivity –Lee's disc method

Reference books:

3. J.D. Wilson and A. Cecilia, Hernández-Hall, *Physics laboratory experiments*, 8th edition, Cengage Learning.
4. C.L Arora, *B.Sc. Practical Physics*, S. Chand &Co. 2012.

CH 102 CHEMISTRY II

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.

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

UV-Visible Spectroscopy: Laws of absorption, deviation from Beer's law, origin of UV and visible spectra, colour in organic compounds, absorption by organic and inorganic molecules, Woodward-Fieser rules for calculating absorption maximum in dienes and α , β -unsaturated carbonyl compounds, chemical applications, photometric titrations.

Coordination Chemistry: Formation and types of metal complexes, EAN rule, 16 and 18 electron rule, crystal field theory, CFSE, magnetism and colour of transition metal ions, metal carbonyls - bonding and structure, Organometallic compounds in catalysis - hydrogenation, hydroformylation and polymerization, chemistry of hemoglobin, Bohr effect.

Alloys and Metals: Alloys-Introduction: Types of Ferro and non ferrous alloys and their uses (Nickel alloys-Nichrome, Locanel –Copper Alloys-Brass-Dutch-German Silver-Aluminium alloys Duraluminium, Magnalumin, extraction of metals-definition-extraction of aluminium and iron from their ores

Polymers: Related terms, nomenclature, functionality, classification, types of polymerization, mechanism of polymerization, industrial synthesis of polystyrene, polyethylene terephthalate and Nylon, applications of important polymers in industries and medicine, Plastics – classification, Thermosetting and Thermoplastics.

Text Books

1. P.C. Jain and M. Jain, Engineering Chemistry, Dhanpat Rai Publishing Company (P) Ltd., New Delhi, 2007.
2. W. Kemp, Organic Spectroscopy, Palgrave, New York, 2008.

Reference Books

1. R. Gopalan, D. Venkappayya and N. Sulochana, Engineering Chemistry, Vikas Publishing House, New Delhi, 2005.
2. J.C. Kuriacose, J. Rajaram, Chemistry in Engineering and Technology, Vol I & II, Tata McGraw Hill publishing Company Ltd, New Delhi, 1984.
3. J.A.Kent: Riegel's handbook of Industrial Chemistry, CBS Publishers.

CHEMISTRY II LAB

1. Estimation of total alkalinity in the given water sample
2. Estimation of carbonate, noncarbonated and total hardness in the given water sample
3. Estimation of dissolved oxygen in waste water
4. Estimation of Fe^{2+} by external indicator
5. Estimation of Fe^{3+} by spectrophotometer
6. Molecular weight determination by Oswald viscometer

Reference

1. Laboratory Manual, Department of Chemistry, NITT.

ME102 Elements of Mechanical Engineering

(For Civil, CSE, ECE, EEE, ICE)

Objectives

- To give an overview of the fundamentals of the Civil Engineering fields to the students of all branches of Engineering
- To realize the importance of the Civil Engineering Profession in fulfilling societal needs
- Properties and uses of construction materials - stones, bricks, cement, concrete and steel.

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

UNIT-II: Thermal Engineering Laws of thermodynamics, types of systems, concepts and types of I.C. engine, air compressors, principle of turbomachines.

UNIT-III: Properties of steam and steam generators, automobile engineering, introduction to gas turbines and refrigeration & air-conditioning.

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

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

Text Books/ Reference Books

1. K. Venugopal and V.Prabhu Raja, *Basic mechanical Engineering*, Anuradha Publisher, 2000.

CE102 Fundamentals of Civil Engineering

(For Civil, CSE, ECE, EEE, MECH)

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.

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

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

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

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

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

Text Books:

1. M.S. Palanichamy, *Basic Civil Engineering*, Tata Mc Graw Hill, 2000.
2. B.C. Punmia, Ashok Kumar Jain and Arun Kumar Jain, *Basic Civil Engineering*, Lakshmi Publishers, 2012.

Reference Books:

1. Satheesh Gopi, *Basic Civil Engineering*, Pearson Publishers, 2009.
2. S.C. Rangwala, *Building materials*, Charotar Publishing House, Pvt. Limited, 27th Edition, 2009.

BS 102(CS) INTRODUCTION TO DATA STRUCTURES

Objectives

- To understand the concepts of structured Programming language.
- To understand the concepts of pointers and files
- To understand the concepts of ADTs, searching and sorting

Unit I - Introduction

Different Programming Style - Principle of Mathematical Induction, Notions of algorithms and programming - correctness and efficiency.

Unit II - C Programming

Functions - Arrays - Preprocessor - Pointers - Variation in Pointer declarations - Function - Pointers.

Unit III - C Programming Advanced Concepts

Structures and Unions - File Handling Concepts - File Manipulations - Dynamic Memory Allocation.

Unit IV - Abstract Data Types

List - Stack - Queue - Applications.

Unit V - Searching and Sorting

Linear Search - Binary Search – Sorting - Selection, Insertion, Bubble.

Outcomes

- Ability to write programs to use pointers, file handling concepts in c.
- Ability to write programs to implement stacks, queues, linked lists
- Ability to knowhow on the implementation of sorting searching algorithms

Text Books

1. Byron Gottfried, *Programming with C*, MCGraw Hill Company Ltd., 2010.
2. Mark Allen Weiss, *Data Structures and Algorithm Analysis in C*, 2nd Edition, Pearson Education, 2011.

Reference Books

1. Reema Thareja, *Data Structures Using C*, Oxford University Press, 2011
2. Aho, Hopcroft and Ullman, *Data Structures and Algorithms*, Pearson Education, 1983.

BS102 (EE) INTRODUCTION TO ELECTRICAL AND ELECTRONICS ENGINEERING

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

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

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

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

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

Unit V: 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.

Text Books

1. Clayton Paul, Syed A Nasar and Louis Unnewehr, *Introduction to Electrical Engineering*, 2nd Edition, McGraw-Hill, 1992.
2. D. P. Kothari and I.J. Nagrath, *Basic Electrical Engineering*, 3rd Edition, Tata McGraw-Hill, 2009.
3. P.S. Dhogal, *Basic Electrical Engineering – Vol. I & II*, 42nd Reprint, Mc Graw Hill, 2012.

Reference Books

1. M.S. Naidu and S. Kamakshiah, *Introduction to Electrical Engineering*, Tata McGraw Hill, 2001.

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

ME 104 WORKSHOP 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

Smithy Work

Reforming the shape using Smithy work

1. Round rod to Square rod
2. Round rod to Hook

Assembling and Dismantling

1. Dismantling of front and back wheel
2. Assembling of bicycle back wheel
3. Dismantling of Pumps

Usage

1. Usage of Bearing and Pulley
2. Hydraulic Jack

HM104-PROFESSIONAL ETHICS AND HUMAN VALUES

OBJECTIVE

To create an awareness on Engineering Ethics and Human Values.

To understand social responsibility of an engineer.

To appreciate ethical dilemma while discharging duties in professional life.

HUMAN VALUES: Morals, Values and Ethics – Integrity- Work Ethics- Honesty-t Courage -Empathy - Self-Confidence-- Character .

ENGINEERING ETHICS: Senses of 'Engineering Ethics' - variety of moral issue - types of inquiry - moral dilemmas – moral autonomy - Kohlberg's theory - Gilligan's theory - consensus and controversy - Models of Professional Roles - theories about right action - Self-interest - customs and religion - uses of ethical theories. Valuing Time - Co-operation –Commitment.

ENGINEERING AS SOCIAL EXPERIMENTATION: Engineering as experimentation - engineers as responsible experimenters - codes of ethics - a balanced outlook on law - the challenger case study

SAFETY, RESPONSIBILITIES AND RIGHTS: Safety and risk - assessment of safety and risk - risk benefit analysis and reducing risk - the three mile island and chernobyl case studies.

GLOBAL ISSUES: Multinational corporations - Environmental ethics - computer ethics - weapons development – engineers as managers-consulting engineers-engineers as expert witnesses and advisors - moral leadership-

References:

1. Mike Martin and Roland Schinzinger, *Ethics in Engineering*, McGrawHill, New York, 1996.
2. M. Govindarajan, S. Natarajan and V. S. Senthil Kumar, *Engineering Ethics*, Prentice Hall of India, New Delhi, 2004.

EE 102 BASICS OF ELECTRICAL AND ELECTRONICS ENGINEERING

(For MECH only)

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.

Unit-I: 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.

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

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

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

Unit-V: 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

1. R.J. Smith, R.C. Dorf, 'Circuits Devices and Systems', 5th Edition, John Wiley and sons, 2001.

2. P. S. Dhogal, 'Basic Electrical Engineering – Vol. I & II', 42nd Reprint, Mc Graw Hill, 2012.

3. Malvino, A. P., Leach D. P. and Gowtham Sha, 'Digital Principles and Applications', 6th Edition, Tata Mc Graw Hill, 2007.

4. Vincent Del Toro, 'Electrical Engineering Fundamental', Prentice Hall India, 2002.