Semester: 1

Course Code	Course Name	Credit structure			
		L	T	P	C
CH 101	Chemistry	3	1	0	4
PH 101	Physics -1	3	2	0	4
HS 101	English Communication	3	1	0	4
MA101	Mathematics -1 (Calculus)	3	2	0	4
CH111	Chemistry lab	0	0	3	2
EN101	Engineering Graphics	2	0	3	4
EN111	Manufacturing Science and workshop	2	0	3	4
Total		16	6	9	26

Semester: 2

Course Code	Course Name	Credit structure			
		L	T	P	C
HS 102	HSS*	3	0	0	4
MA 102	Mathematics – II (Linear Algebra and ODE)	3	2	0	4
EN 102	Introduction to Infrastructure	2	0	2#	4
PH 102	Physics – II	3	2	0	4
CS 101	Computer Programming	2	0	3	4
EE 101	Electrical Engineering	3	1	0	4
EE 111	Electrical Engineering Lab	0	0	3	2
PH 111	Physics Lab	0	0	3	2
Total		16	5	11	28

* Depending upon the availability of faculty, this course could be offered as Philosophy/Sociology/English Literature.

CH 101 : Chemistry 3-1-0-4

Chemistry

Unit 1

Periodic properties: trends in size, electron affinity, ionization potential and electronegativity
Chemical bonding
Coupled reactions, Use of Ellingham diagram and thermodynamics in the extraction of elements
Corrosion and passivation
Water treatment
Basics of spectroscopy (UV-Vis, IR and NMR)

Unit 2

C 1 chemistry – syn gas to industrially important organic molecules

Liquid crystals, classification, synthesis, properties and applications

Macromolecules, classification, molecular weight and MWD, thermal and mechanical properties.

Polymer waste disposal

Basics of chromatography

Unit 3

Phase equilibria: Phase rule, one component systems, two component systems (simple eutectic, peritectic,

solid solutions) Hume-Rothery rules.

Complex reactions, Arrhenius parameters and collision theory.

Catalysis (homogeneous and heterogeneous), biocatalysis. Important Industrial applications (at least Three)

Unit 4

Special topics:

1. Fuel cells 2. Catalytic converter 3. Nano materials 4. Dye-sensetized solar cells
5. Green chemistry

Text Books: (Latest editions)

1. Elements of Physical Chemistry, P.W. Atkins & De Paula, Oxford
2. Fundamentals of Physical Chemistry, S.H. Maron & J.B. Lando, Macmilan,
3. Basic Inorganic Chemistry : Cotton and Wilkinson.
4. Heterogeneous Catalysis, D. K. Chakravarty & B. Vishwanathan, New Age International.
5. Liquid Crystals, S. Chandrasekhar, Cambridge University Press
6. Polymer Science - V. R. Gowarikar, N. V. Viswanathan & Jayadev Sreedhar

Reference Books: (Latest editions)

1. Concise Inorganic Chemistry (ELBS, 5th Edition), J. D. Lee.
2. Organic Chemistry, R. T. Morrison & R. N. Boyd
3. Spectroscopy of Organic compounds, P. S. Kalsi.
5. Fundamentals of molecular spectroscopy, C. N. Banwell & Mc Cash
6. Green Chemistry : Environment Friendly alternatives, Rashmi Sanghi & M. Srivastava (Eds)
7. Physical Chemistry, G. M. Barrow, 5th Ed. Tata McGraw Hill, New Delhi.
8. Physical Chemistry – A Molecular Approach,D. A. McQuarrie & J. D. Simon,Viva Books.
9. General Chemistry, B. H. Mahan, Pearson
10.General Chemistry, D. D. Ebbing:, Houghton Miffin Co.
11.J. C. Kuriacose and J. Rajaram: Chemistry in Engineering and Technology, Vol. I & II, Tata McGraw-Hill, New Delhi.
12.Heterogeneous Catalysis:Principles & Applications,G.C.Bond,Clarendon Press, Oxford.
13.Methods and Reagents for Green Chemistry: An Introduction, Pietro Tundo, Alvise Perosa & Fulvio Zecchini,Wiley Interscience.
14.Fundamental Principles of Polymeric Materials, Christopher S. Brazel & Stephen L. Rosen

PH 101: Physics –I 3-2-0-4

Coordinate System: Cartesian, Cylindrical and Spherical Coordinates. Unit vectors and their time derivatives.

Review of particle dynamics: Inertial and Non-inertial frames of reference, Centrifugal and Coriolis Forces. Conservative force, Work-Energy Theorem. Centre of mass, conservation of momentum, Collision in one and two dimensions. Small oscillations, free, forced and damped oscillations.

Dynamics of rigid bodies, Moments and products of inertia, conservation of angular momentum, Simple gyroscope.

Kinetic theory of gases, equipartition principle, Maxwellian velocity distribution.

First and the Second law of thermodynamics, Adiabatic and isothermal processes, Carnot cycle, Entropy. Entropy as a measure of disorder.

Thermal radiation, Stefan's law, Wien's displacement law, Rayleigh- Jeans law and ultraviolet catastrophe, Planck's radiation law. Wave nature of matter, de Broglie hypothesis, Davisson Germer Experiment, Photoelectric and Compton effect. Heisenberg's uncertainty principle.

Nuclear Physics, Binding energy, Fission, Fusion, Nuclear reactors.

Elements of band theory of solids, metals and semiconductors.

Text / Reference :

1. D. Klepner and R. J. Kolenkow, An Introduction to Mechanics, Tata-McGraw Hill (2007)
2. H.S. Mani and G.K. Mehta, Introduction to Modern Physics, 1st Edition, East-west Press Pvt. Ltd.-New Delhi, 2000
3. A. Beiser, Concepts of Modern Physics, 6th Edition, Tata McGraw Hill Education Pvt. Ltd., 2009

HS 101: English Communication 3-1-0-4

English Usage and Vocabulary development

Prepositions; Articles; Reported Speech; Tenses; Modals; Concord; Conditionals; Parallelism; modification.

Idioms and phrases; phrasal verbs; Synonyms; Antonyms; words often confused; homophones;.

Vocabulary Extension Methods; Word formation prefixes; suffixes.

Language Comprehension through reading and listening

Reading process; purposeful reading; reading for vocabulary development; Eclectic Reading; active and passive reading; Intensive Reading Skills.

Speed Reading; Eye Span and Fixation Points; Skimming and Scanning; Passage based reading; Understanding various types of Questions based on Reading Comprehension Passages.

Listening Process; Types of Listening; Purposeful Listening; Understanding and removing Barriers to Listening.

Listening Comprehension; Practical Lab Based exercises; Effective Listening Techniques; Listening for correct accent and pronunciation.

Speaking Strategies and Professional Speaking

Understanding Speech Sounds: English Pronunciation, Vowel and consonant sounds and pronunciation guidelines related to vowel and consonant sounds.

Improving Fluency: Articulation, good Pronunciation; voice quality; accent, stress and intonation patterns.

Public Speaking: Making Formal Speeches; Understanding and delivering Oral Presentations; Understanding and participating in Group Discussions; Situational Role plays etc.

Projecting a Positive Image: Understanding Non Verbal Communication; eye contact; Facial Expressions; Paralanguage and Physical appearance; Following Etiquettes; removing any Bias from Language.

Writing Strategies and Skills

Role of language for effective writing; strategies to ensure effective writing; Formal and Informal writing.

Letters: Enquiry, complaints and Claims; Request Letters; appointment Letters; Apology Letters; Condolence Letters etc.

E mails; notices; circulars; memorandums; Resume; advertisements etc.

Descriptive and Narrative Prose: Passages; Profile Sketches; Note making; paraphrasing and summarizing

Use of Technology in Communication

Facsimile; Telex; Multimedia; Internet; Teleconference; Videoconference; weblogging; podcasting.

Using Technology to improve written messages and overall communication.

Text/References:

1. O'dell and McCarthy: English Phrasal Verbs in Use, Cambridge University Press, 2004 Ed.
2. O'dell and Mc Carthy: English Vocabulary in Use, Cambridge University Press, 2002 Ed.
3. Thomson and Martinet: A practical English Grammar, Oxford India, Rev. Ed. 2009
4. Lester and Beason: The McGraw Hill Handbook of English Grammar and Usage, Tata McGraw Hill Education Private Limited, 2010 Ed.
5. K.R. Laxminarayanan: Advanced English Communication Skills Lab, SCITECH Publications, 2009 Ed.
6. K.R. Laxminarayanan: English for Technical Communication, vol. 1&2, SCITECH Publications, 2009 Ed.
7. K.R. Laxminarayanan: Effective Technical English, SCITECH Publications, 2009 Ed.
8. Sasikumar, Dutt and Rajeevan: Listening and Speaking, Foundation books; 2007 Rev. Ed.
9. Adler. Proctor: Communication Goals and Approaches, Cenage Learning, 2008 Ed.
10. Pal and Korlahalli: Essentials of Business Communication: Sultan Chand and Sons, 2008 Rev. Ed.
11. M. Ashraf Rizvi: Effective Technical Communication: Tata McGraw Hill Education Private Limited, 2010 Ed.
12. John Seely: Oxford Guide to Effective Writing and Speaking, Oxford University Press, 2009 Ed.

MA 101: Mathematics-1 (Calculus) 3-2-0-4

The real number System; Review of limits, continuity, differentiability; Applications of the derivative; Successive derivatives and Leibnitz Theorem; Mean value theorems,L'Hospital's Rule; Fixed Point Iteration Method, Newton's method, Picard's method; Sufficient conditions for Local Maximum, Points of Inflection; Taylor's Theorem, Convergence of sequences and series ,Power Series, Taylor Series; Curve sketching; Riemann integrals, Fundamental theorem of Calculus, Improper integrals, applications to area, volume, arc length; Review of vectors and Three dimensional geometry; Multi-variable functions, continuity and differentiability; Partial Derivatives, gradient and directional derivatives, chain rule, maxima and minima, Lagrange multipliers; Double and Triple integration, Jacobians and change of variables formula; Parametrization of curves and surfaces, vector fields, Line and surface integrals; Divergence and curl, Theorems of Green, Gauss, and Stokes.

Text/References :

Text Books:

1. G. B. Thomas and R. L. Finney: Calculus and Analytic Geometry, 9th edition, Addison – Wesley/Narosa, 1998.
2. S. R. Ghorpade and B. V. Limaye: A course in Calculus and Real Analysis, Springer, 2006 (Indian Reprint, 2010)

Reference Books:

1. T.M. Apostol: Calculus, vol. 1, 2nd Ed., Wiley India, 2006.
2. T.M. Apostol: Calculus, Vol. II, Wiley India, 2007.
3. E. Kreyszig: Advanced Engineering Mathematics, 9th Ed. Wiley India, 2011.

CH 111 : Chemistry Laboratory 0-0-3-2

Experiments illustrating the concepts of 1) Complexometric Reaction, 2) Oxidation – Reduction Reactions, 3) Spectrophotometery , 4) Electric Potential, 5) Chemical Kinetics, 6) Organic Synthesis, 7) Chromatography, 8) Packing Fraction, 9) Adsorption, 10) Catalysis, 11) Electrolytic Conductance

Text?references

1. D.P. Shoemaker, C.W. Garland and J.W. Nibler: Experiments in Physical Chemistry, McGraw Hill International Edition, 1996
2. V.D. Athawale and P. Mathur: Experimental Physical Chemistry, 1st Edition, New Age International Publication, New Delhi, 2001.
3. J.B. Yadav: Advanced Practical Physical Chemistry, Goel Pub., Meerut, 2003
4. S. M. Khopkar: Basic Concepts of Analytical Chemistry, 3rd Edition, New Age International Publication, New Delhi, 2008
5. P. Samnani: Experiments in Chemistry, Anmol Publication Pvt. Ltd. New Delhi, 2007

EN 101 : Engineering Graphics 2-0-3-4

Introduction to the engineering design process and the importance of technical Graphics/Drawings; Integrated design and 3D modelling, visualization - sketching & computer aided drawing, geometrics - geometry construction, shape description, multi-view drawings - orthographic projection, isometric views, axonometric projections, auxiliary & section views; Dimensioning; Assembly drawings.

Texts:

1. Ostrowsky, O., *Engineering Drawing with CAD Applications*, Elsevier Science & Technology, 1989
2. Banach, D. T., and Jones, T., *Autodesk Inventor 2011 Essentials Plus*, Cengage Learning, Inc, 2010
3. Jensen, C. H., Helsel, J. D., and Short, D. R., *Engineering Drawing and Design*, 7th edition, McGraw Hill, 2007

ME 111 Manufacturing Science and Workshop Practice 2-0-3-4

Introduction to Manufacturing. Historical perspective; Importance of manufacturing; Classification of manufacturing processes, Engineering materials. Woodwork. Fitting Basics of Casting, Metal Forming. Basic concepts of plastic deformation. Hot & cold working. Common bulk deformation processes (Rolling, Forging, Extrusion and Drawing). Common sheet metal forming processes. Machining. Chip formation and generation of machined surfaces. Tools -geometry, materials, Common machining operations (turning, milling drilling ,shaping etc). Grinding & other Finishing processes. Introduction to unconventional machining processes (EDM, ECM, UCM, CHM, LBM) etc., Welding& Other Joining Processes, Fundamentals & classification of Joining processes, Welding-Gas arc & resistance welding, Brazing and soldering, Adhesive bonding, Mechanical fastening, Principles of heat treating; annealing, normalizing, hardening and tempering, Manufacturing of Polymer and Powder Products, Classification of polymers, Introduction to extrusion, injection molding, blow molding, compression and transfer molding. Powders & Green compacts from powders including slip casting of ceramics. Sintering. Manufacturing for Electronics. Special Processes like Chemical Vapor Deposition,Etching,Physical Vapour Deposition. Modern Trends in Manufacturing.

Text/Reference:

1. Schey, J. A., *Introduction to Manufacturing Process*, 3rd Edition, McGraw Hill, 2000.
2. Singh, D. K., *Fundamentals Of Manufacturing Engineering*, Ane Books Pvt Ltd, new Delhi, 2nd Ed., 2009.
3. Hajra Choudhary, S. K., *Elements of Workshop Technology*, Media Promotors & Publishers Pvt Ltd, 12th Edition, 2002.

PH 102 Physics –II 3-2-0-4

Coulomb's law; Gauss' law; Conductors; Capacitors; Electrostatic Fields in Matter; Dielectrics; Bound charges, Electric Displacement, Linear Dielectrics; Lorentz force law; Continuity equation; The Biot-Savart law, Ampere's law; Magnetic vector potential, Magnetostatic boundary conditions; Magnetic Fields in Matter; Bound currents, Auxiliary field H; Electrodynamics, Electromotive force; Faraday's law; Inductance; Displacement current; Maxwell's equations; Poynting vector; Electromagnetic waves; Waveguides, Simple antenna

Text Books:

1. D. J. Griffiths: Introduction to electrodynamics, 3rd Edition, Phi Learning, 2009

Reference Books:

1. J.R. Reitz, F.J. Milford, R.W. Christy: Foundations of Electromagnetic Theory, 4th Edition, Pearson Addison Wesley, 2009
2. A. Mahajan, A. Rangwala: Electricity and Magnetism, 1st Edition, Tata McGraw Hill, 1988
3. E.M. Purcell: Berkeley Physics Course: Electricity and Magnetism, Volume 2, 2nd Edition, Tata McGraw Hill, 2007
4. R.P. Feynman, R.B. Leighton, M. Sands: The Feynman Lectures on Physics - Vol II, Narosa Publishing House, 2010.

MA 102 Mathematics – II (Linear Algebra and Differential Equations 3-2-0-4

Linear Algebra: Vectors in R^n; Vector subspaces of R^n; Basis of vector subspace; Systems of Linear equations; Matrices and Gauss elimination; Determinants and rank of a matrix; Abstract vector spaces, Linear transformations, Matrix of a linear transformation, Change of basis and similarity, Rank-nullity theorem; Inner product spaces, Gram-Schmidt process, Orthonormal bases; Projections and least-squares approximation; Eigenvalues and eigenvectors, Characteristic polynomials, Eigenvalues of special matrices; Multiplicity, Diagonalization, Spectral theorem, Quadratic forms.

Differential Equations: Exact equations, Integrating factors and Bernoulli's equation; Orthogonal trajectories; Lipschitz condition, Picard's theorem; Wronskians; Dimensionality of space of solutions, Abel-Liouville formula; Linear

ODE's with constant coefficients; Cauchy-Euler equations; Method of undetermined coefficients; Method of variation of parameters; Laplace transforms, Shifting theorems, Convolution theorem

Texts/References:

1. Anton, H., *Elementary linear algebra with applications*, 8th edition, John Wiley & Sons, 1995.
2. Apostol, T.M., *Calculus, Volume* 2, 2nd Edition, Wiley Eastern, 1980.
3. Boyce, W.E., and DiPrima, R., *Elementary Differential Equations,* 8th Edition, John Wiley & Sons, 2005.
4. Kreyszig, E., *Advanced Engineering Mathematics,* 8th Edition, John Wiley & Sons, 1999.
5. Kumaresan, S., *Linear algebra – A Geometric approach*, Prentice Hall of India, 2000.
6. Strang, G., *Linear algebra and its applications,* 4th Edition, Thomson, 2006.

PH 111 Physics Laboratory 0-0-3-2

Error analysis and accuracy of measurement.

Selected experiments from mechanics and heat (e.g. compound pendulum, centrifugal force, thermal conductivity, velocity of sound in air), electricity & magnetism (LCR circuit, Helmholtz coil), optics (interference and diffraction) and modern physics (specific charge of electron, hydrogen spectrum, photoelectric effect) etc.

References:

1. B. L. Worsnop and H. T. Flint: Advanced Practical Physics for students, Asia Publishing House, 1971.
2. G. L. Squires: Practical Physics, Cambridge University Press, 2001.

CS 101 Computer Programming 2-0-3-4

Introduction to the state of the art in computing focusing on hardware and its architecture, operating systems, memory management, standard programming language and programmable software environment (PSE); Machine representation of numbers and characters. IEEE Floating point numbers; ASCII characters. Variables and Types; I/O Functions and Formating; Arithmetic Operators; Forming Arithmetic Expressions; Using Variables and Arithmetic Operators and Built-In Library Functions; Operators for Implementing Decision Making; Logical expressions and control; Implementing Loops and Repetitive Processes; Tools for Modular Programming; Data Sharing/Passing Mechanisms; Functions, Pointers, Arrays, Structures Strings; File and Disk I/O Operations; Introduction to selected PSE platform, basic programming, execution and debugging; Iteration using variants of loops; Writing script Files and Creation of User-defined Functions; Flow control statements; Data Structures and Management; Scientific Visualization; Interfacing hardware with PSE; Notions of Parallel Processing

Texts/References:

1. Rajaraman, V., *Computer Programming in C*, 16th print, 2006, Prentice Hall India, 1994.
2. B. R. Hunt, R. L. Lipsman, J.M. Rosenburg, K. Coombes, J. Osborne and G. Stuck,A Guide to MATLAB for Beginners and Experienced Users, Cambridge University Press, 2nd Edition, 2006.

EE 101 Electrical Engineering 3-1-0-4

Circuit elements – active, passive, time-variant, time-invariant, linear, non-linear, unilateral, bilateral; Sources – independent and dependent; Electric circuit and analysis – Ohm's law, Kirchhoff's laws, loop and node analyses, limitations of lumped circuit analysis; Network theorems – Superposition, Thevenin, Norton, Maximum power transfer; Natural and forced responses to DC excitation – RL, RC and RLC circuits; Sinusoidal steady state analysis; Polyphase circuits. Magnetic field – Biot-Savart law, Ampere's circuital law, Faraday's laws, Lenz law; Magnetic materials, characteristics, losses, coupled circuits. Transformers – single phase and three phase transformers, auto-transformers. Electro-mechanical energy conversion systems – DC generator and DC motor; AC Machines – synchronous generator and motor, three phase and single phase induction motors; Stepper motor. Power system - generation, transmission, distribution, costing of electricity.

Texts/References :

1. Hayt, W. H., Kemmerly, J. E., Durbin, S. M., "*Engineering Circuit Analysis*", sixth edition, Tata Mc-Graw Hill, 2006.
2. Toro, V. D., "*Electrical Engineering Fundamentals*", second edition, Prentice Hall India, 2009.
3. Wildi, T., "*Electrical Machines, Drives and Power Systems*", sixth edition, Pearson Education, 2006.

EE 111 Electrical Engineering Laboratory 0-0-3-2

Frequency response of RLC circuits; Power factor improvement; Power measurement in balanced and unbalanced three phase circuits; Modeling the magnetic system by an equivalent electric circuit; Performance of single phase induction motor; Speed control of stepper motor.

Diode clipper, clamper and rectifier circuits; Transistor amplifier and oscillator; Operational amplifier circuits; Combinational digital circuits; Sequential digital circuits

Reference:

Toro, V. D., "*Electrical Engineering Fundamentals*", second edition, Prentice Hall India, 2009.