Chemistry Group

CSE, ECE, CIVIL: 1st Semester

S. No.	Course Category	Course Code	Course Title	Hours per week			Marks		Credit
							Internal	External	
1.	Basic Science course	BTAC-18101	Chemistry	3	1	0	40	60	4
2.	Basic Science course	AMCS-18101 AMME-18101	Mathematics-I (CSE) Mathematics-I (ECE, CIVIL)	4	1	0	40	60	5
3.	Engineering Science Courses	BTCS-18101	Programming for Problem Solving	3	0	0	40	60	3
4.	Engineering Science Courses	BTMP-18101	Workshop/Manufacturing Practices	1	0	4	60	40	3
5.	Humanities and Social Sciences including Management courses	BTHU-18101	English	2	0	0	40	60	2
6.	Basic Science course	BTAC-18102	Chemistry Lab	0	0	3	30	20	1.5
7.	Humanities and Social Sciences including Management courses	BTHU-18102	English Lab	0	0	2	30	20	1
8.	Engineering Science Courses	BTCS-18102	Programming for Problem Solving lab	0	0	4	30	20	2
							310	**340**	**21.5**

CSE, ECE, CIVIL:2nd Semester

S. No.	Course Category	Course Code	Course Title	Hours per week			Marks		Credit
							Internal	External	
1.	Basic Science course	BTPH-18101	Physics	3	1	0	40	60	4
2.	Basic Science course	AMCS-18102 AMME-18102	Mathematics-II (CSE) Mathematics-II (ECE, CIVIL)	4	1	0	40	60	5
3.	Engineering Science Courses	BTEC-18101	Electrical and Electronics Engineering	3	1	0	40	60	4
4.	Engineering Science Courses	BTME-18101	Engineering Graphics & Design	1	0	4	60	40	3
5.	Basic Science course	BTPH-18102	Physics Lab	0	0	3	30	20	1.5
6.	Engineering Science Courses	BTEC-18102	Electrical & Electronics Engineering Lab	0	0	2	30	20	1
							240	**260**	**18.5**

Physics Group

ME, CHEM, BT, IT: 1st Semester

S. No.	Course Category	Course Code	Course Title	Hours per week			Marks		Credit
							Internal	External	
1.	Basic Science course	BTPH-18101 BTPH-18103	Physics Physics (only for Biotechnology)	3	1	0	40	60	4
2.	Basic Science course	AMME-18101 AMCS-18101 AMBT-18101	Mathematics-I (ME, CHEM) Mathematics-I (IT) Mathematics-I (BT)	4	1	0	40	60	5
3.	Engineering Science Courses	BTEC-18101	Electrical & Electronics Engineering	3	1	0	40	60	4
4.	Engineering Science Courses	BTME-18101	Engineering Graphics & Design	1	0	4	60	40	3
5.	Basic Science course	BTPH-18102	Physics Lab	0	0	3	30	20	1.5
6.	Engineering Science Courses	BTEC-18102	Electrical & Electronics Engineering Lab	0	0	2	30	20	1
							240	**260**	**18.5**

ME, CHEM, BT, IT: 2nd Semester

S. No.	Course Category	Course Code	Course Title	Hours per week			Marks		Credit
							Internal	External	
1.	Basic Science course	BTAC-18101	Chemistry	3	1	0	40	60	4
2.	Basic Science course	AMME-18102 AMCS-18102 AMBT-18102	Mathematics-II (ME, CHEM) Mathematics-II (IT) Mathematics-II (BT)	4	1	0	40	60	5
3.	Engineering Science Courses	BTCS-18101	Programming for Problem Solving	3	0	0	40	60	3
4.	Engineering Science Courses	BTMP-18101	Workshop/Manufacturing Practices	1	0	4	60	40	3
5.	Humanities and Social Sciences including Management courses	BTHU-18101	English	2	0	0	40	60	2
6.	Basic Science course	BTAC-18102	Chemistry Lab	0	0	3	30	20	1.5
7.	Humanities and Social Sciences including Management courses	BTHU-18102	English Lab	0	0	2	30	20	1
8.	Engineering Science Courses	BTCS-18102	Programming for Problem Solving Lab	0	0	4	30	20	2
							310	**340**	**21.5**

Chemistry (BTAC-18101) **3L:1T:0P (4 credits)**

Common to All

Objectives

Concepts of quantum chemistry, bonding, stereochemistry, and those of Synthesis methodologies and reactivity of organic compounds.

1.**Introduction to quantum theory for chemical systems:** (6 lectures)
Schrodinger equation, Applications to Hydrogen atom, Atomic orbitals, many electron atoms.

2.Chemical bonding in molecules: (12 lectures)
MO theory, Structure, bonding and energy levels of bonding and shapes of many atom molecules, Coordination Chemistry, Electronic spectra and magnetic properties of complexes with relevance to bio-inorganic chemistry, organometallic chemistry.

3.**Introduction to Stereochemistry:** (6 lectures)
Stereodescriptors – R, S, E, Z. Enantiomers and Diastereomers. Racemates and their resolution. Conformations of cyclic and acyclic systems.

4.Reactivity of organic molecules: (9 lectures)
Factors influencing acidity, basicity, and nucleophilicity of molecules, kinetic vs. thermodynamic control of reactions.

5.Strategies for synthesis of organic compounds: (12 lectures)
Reactive intermediates substitution, elimination, rearrangement, kinetic and thermodynamic aspects, role of solvents.

Suggested Text Books

1. Engineering Chemistry, Satyaprakash, Khanna Book Publishing, Delhi
2. Engg. Chemistry, Jain & Jain, Dhanpat Rai & Co. (P) Ltd.
3. Essentials of Physical Chemistry, Bahl & Tuli, S.Chand Publishing
4. Applied Chemistry, Sunita Rattan, Kataria
5. Engineering Chemistry, Baskar, Wiley
6. Engineering Chemistry – I, D. Gourkrishna, Vikas Publishing
7. Advanced Organic Chemistry, Dr. Jagdamba Singh & Dr. L.D.S. Yadav, Pragati Prakashan.
8. University Chemistry, by B. H. Mahan

Chemistry Laboratory (BTAC-18102) **0L:0T:3P (1.5 credits)**

Common to All

Objective: It will illustrate the principles of chemistry that have been learnt so far, as well as others relevant to the study of science and engineering.

Choice of 10-12 experiments from the following:

- Determination of surface tension and viscosity
- Thin layer chromatography
- Identification of an organic compounds through group detection, physical constants (m.p and b.p).
- Ion exchange column for removal of hardness of water
- Determination of chloride content of water
- Colligative properties using freezing point depression
- Determination of the rate constant of a reaction
- Determination of cell constant and conductance of solutions
- Potentiometry - determination of redox potentials and emfs
- Synthesis of a polymer/drug
- Saponification/acid value of an oil
- Chemical analysis of a salt
- Lattice structures and packing of spheres
- Models of potential energy surfaces
- Chemical oscillations- Iodine clock reaction
- Determination of the partition coefficient of a substance between two immiscible liquids
- Adsorption of acetic acid by charcoal
- Use of the capillary viscosimeters to demonstrate the isoelectric point as the pH of minimum viscosity for gelatin sols and/or coagulation of the white part of egg .

Physics (BTPH-18101) **3L:1T:0P (4 credits)**

Common to All

1. Optics and Fibre Optics (12 lectures)

Diffraction: Introduction to interference and example; concept of diffraction, Fraunhofer and Fresnel diffraction, Fraunhofer diffraction at single slit, double slit, and multiple slits; diffraction grating, characteristics of diffraction grating and its applications.

Polarisation: Introduction, polarisation by reflection, polarisation by double refraction and selective absorption, scattering of light, circular and elliptical polarisation, optical activity, Polaroids.

Fibre Optics: Introduction, optical fibre as a dielectric wave guide: total internal reflection, numerical aperture and various fibre parameters, losses associated with optical fibres, step and graded index fibres, application of optical fibres.

Lasers: Principles and working of laser: population inversion, pumping, various modes, threshold population inversion, types of lasers: solid state, semiconductor, gas; application of lasers.

2. Electromagnetism and Magnetic Properties of Materials (12 lectures)

Laws of electrostatics, electric current and the continuity equation, laws of magnetism. Ampere's Faraday's laws. Maxwell's equations. Polarisation, permeability and dielectric constant, polar and non-polar dielectrics, internal fields in a solid, Clausius-Mossotti equation, applications of dielectrics. Magnetisation, permeability and susceptibility, classification of magnetic materials, ferromagnetism, magnetic domains and hysteresis, applications.

3. Quantum Mechanics (12 lectures)

Introduction to quantum physics, black body radiation, explanation using the photon concept, photoelectric effect, Compton effect, de Broglie hypothesis, wave-particle duality, Born's interpretation of the wave function, verification of matter waves, uncertainty principle, Schrodinger wave equation, particle in box, quantum harmonic oscillator, hydrogen atom.

Reference Books

1. Engineering Physics R.K Gaur, S.L Gupta Dhanpat Rai and Sons.
2. Engineering Physics, D K Bhattacharya and Poonam Tondon Oxford University Press
3. Engineering Physics, Malik; HK, Singh; AK, Tata McGraw Hill,
4. Concepts of Modern Physics, Beiser; A., Tata McGraw Hill.
5. Introduction to Electrodynamics, Griffiths; DJ, Prentice Hall.
6. Laser Theory & Applications, Thygrajan; K, Ghatak; AK, Mc Millan India Ltd.

Engineering Physics Laboratory (BTPH-18102) 0L:0T:3P (1.5 credits)

Common to All

Note: Students are required to perform 10 experiments in relevance to their branch from the list given below:

Experiment 1: Rigidity modulus of a material – Tensional pendulum

Experiment 2: To determine the Moment of Inertia of a Flywheel.

Experiment 3: To determine the Elastic Constants/Young's Modulus of a Wire by Searle's method

Experiment 4: To determine g by Kater's Pendulum.

Experiment 5: To find the moment of inertia of an irregular body about an axis through its C.G with the torsional pendulum.

Experiment 6: To study the variation of time period with distance between centre of suspension and centre of gravity for a bar pendulum and to determine: (i) Radius of gyration of the bar about an axis through its C.G. and perpendicular to its length. (ii) The value of g in the laboratory.

Experiment 7: To determine the Height of an object using a Sextant.

Experiment 8: Determination of beam divergence and beam intensity of a given laser.

Experiment 9: To find the velocity of ultrasound in liquid.

Experiment 10: To find out the frequency of AC mains using electric-vibrator

Experiment 11: To determine the angle of prism and angle of minimum deviation for given prism – Spectrometer

Experiment 12: To find the refractive index of a material using spectrometer

Experiment 13: Time Constant of RC Circuit

Experiment 14: Resonance in LCR circuit

Experiment 15: To study the series/parallel LCR circuit and determine its (a) Resonant Frequency, (b) Quality.

Experiment 16: Magnetic field along the axis of a coil (Stewart & Gee's method)

Experiment 17: To study B-H curve using CRO.

Experiment 18: Numerical Aperture, acceptance angle and Bending Losses in Optical fiber

Experiment 19: Wavelength of Light-Diffraction Grating-Using LASER

Experiment 20: Newton's Rings Experiment

Experiment 21: To study laser interference using Michelson's Interferometer.

Experiment 22: To determine the wave length of light used using diffraction grating.

Experiment 23: To determine the Planck's constant from kinetic energy versus frequency graph

Experiment 24: To determine the stopping potential from the photocurrent versus applied potential graph.

Experiment 25: V-I Characteristics of Solar Cell.

Experiment 26: To determine the band gap of a semiconductor.

Experiment 27: To determine the resistivity of a semiconductor by four probe method

Experiment 28: To study the Hall Effect for the determination of charge current densities

Experiment 29: To study the characteristic of different p-n junction diode- Ge and Si.

Experiment 30: Energy gap of a material of p-n junction

Experiment 31: To determine unknown capacitance by flashing and quenching method.

Experiment 32: To study the characteristic of Zener diode.
Experiment 33: Study and proof of Malus' law in polarization.

Reference Books:

Following reference books may be useful for further reading in Physics or instrumentation relevant to the experiments:

1. "Fundamentals of Physics", 6th Ed., D. Halliday, R. Resnick and J. Walker, John Wiley and Sons, Inc., New York, 2001.
2. "Physics", M. Alonso and E.J. Finn, Addison Wesley, .1992.
3. "The Feynman Lectures in Physics (Vols. 1, 11 and 111)", R.P. Feynman, R.B. Leighton and M.Sands, Addison Wesley, 1963.
4."Fundamentals of Optics", 4th Ed., F.A. Jenkins and H.E. White, McGraw-Hill Book Co., 1981.
5. "Optics", A Ghatak, Tata-McGraw Hill, New Delhi, 1992
6. "Vibration and Waves", A.P. French, Arnold-Heinemann, New Delhi, 1972.
7. "Students Reference Manual for Electronic Instrumentation Laboratories", S.E. Wolf and R.F.M. Smith, PHI, 1990.
8. "Basic Electronic Instrument Handbook", C.F. Coombs, McGraw-Hill Book Co., 1972.
9. "Laboratory Experiments in College Physics", C.H. Bernard and C.D. Epp, John Wiley and Sons, Inc., New York, 1995.
10. "Practical Physics", G.L. Squires, Cambridge University Press, Cambridge, 1985.
11. "Great Experiments in Physics", M.H. Shamos, Holt, Rinehart and Winston Inc.,1959.
12. "Experiments in Modern Physics", A.C. Melissinos, Academic Press, N.Y., 1966.
13. "Reliable Knowledge", J.Ziman, Cambridge University Press, Cambridge, 1978.
14. "Introductory Readings in the Philosophy of Science", Edited by E.D. Klenke, R. Hollinger, A.D. Kline, Prometheous Books, Buffalo, New York, 1988.
15. Practical Physics, by C L Arora. S. Chand & Company LTD.

Physics (BTPH-18103) **3L:1T:0P (4 credits)**

For Biotechnology branch only

1. Lasers and Fibre Optics (10 lectures)

Lasers: Principles and working oflaser: population inversion, pumping, threshold population inversion,types of laser: solid state (Ruby), semiconductor, gas (He-Ne); application of lasers (Medical Applications, Industrial Applications).

Fibre Optics: Introduction, optical fibre as a dielectric wave guide: total internal reflection, step and graded index fibres,numerical aperture and various fibre parameters, losses associated with optical fibres, application of optical fibres (various types of sensors and endoscopes).

2. X-rays and Ultrasounds (10 lectures)

X-rays:X-rays, Production of X-rays, Continuous and Characteristic X-Rays, Absorption of X-rays, Bragg's law, Adverse effects of X-rays, X-ray radiography.

Ultrasounds: Ultra sound generators, properties of ultrasound- waves and its propagation in biological tissues, Pulse echo techniques, Doppler principle, involvement in design of medical instruments, Adverse effects of ultrasound waves.

3. Magnetic Materials and Superconductivity (8 lectures)

Magnetic Materials: Origin of magnetism, Basic idea of Diamagnetic, Paramagnetic, Ferromagnetic, Ferrimagnetic and Ferrite materials, Soft and Hard Magnetic materials, applications of magnetic materials.

Superconductivity: Superconductivity, Signatures of Superconducting state, Meissner Effect, Type-I and Type-II superconductors, SQUIDS and its applicationsin medical industry.

4. Nanostructures (8 lectures)

Nanoscale, surface to volume ratio, electron confinement, confinement dimensions, Qualitative idea of quantum well, quantum wire and quantum dot. Carbon nanotubes: types, properties and applications, Introduction to Electron microscopy.

Reference Books:

1. Concepts of Modern Physics, Beiser; A., Tata McGraw Hill.
2. Engineering Physics, D.K. Bhattacharya, Poonam Tondon, Oxford University Press.
3. Laser Theory & Applications, Thygrajan; K, Ghatak; AK, Mc Millan India Ltd.
4. Engineering Physics R.K Gaur, S.L Gupta Dhanpat Rai and Sons.

Mathematics –I (AMME-18101) **4L: 1T:0P 5credits**

For Students of Mechanical, Chemical, Civil & Electronics and Communication Engineering

Objectives:
The objective of this course is to familiarize the prospective engineers with techniques in calculus, multivariate analysis and linear algebra. It aims to equip the students with standard concepts and tools at an intermediate to advanced level that will serve them well towards tackling more advanced level of mathematics and applications that they would find useful in their disciplines.

Calculus: (6 lectures)
Evaluation of definite and improper integrals; Beta and Gamma functions and their properties; Applications of definite integrals to evaluate surface areas and volumes of revolutions.

Calculus: (6 lectures)
Rolle's Theorem, Mean value theorems, Taylor's and Maclaurin theorems with remainders; indeterminate forms and L'Hospital's rule; Maxima and minima.

Sequences and series: (10 lectures)
Convergence of sequence and series, tests for convergence; Power series, Taylor's series, series for exponential, trigonometric and logarithm functions; Fourier series: Half range sine and cosine series, Parseval's theorem.

Multivariable Calculus (Differentiation): (8 lectures)
Limit continuity and partial derivatives, directional derivatives, total derivative; Tangent plane and normal line; Maxima, minima and saddle points; Method of Lagrange multipliers; Gradient, curl and divergence.

Matrices: (10 lectures)
Inverse and rank of a matrix, System of linear equations; Symmetric, skew-symmetric and orthogonal matrices; Determinants; Eigenvalues and eigenvectors; Diagonalization of matrices; Cayley-Hamilton Theorem, and Orthogonal transformation.

Suggested Text/Reference Books

1. G.B. Thomas and R.L. Finney, Calculus and Analytic geometry, 9th Edition, Pearson, Reprint, 2002.
2. Erwin kreyszig, Advanced Engineering Mathematics, 9th Edition, John Wiley & Sons, 2006.
3. Veerarajan T., Engineering Mathematics for first year, Tata McGraw-Hill, New Delhi, 2008.
4. Ramana B.V., Higher Engineering Mathematics, Tata McGraw Hill New Delhi, 11th Reprint, 2010.
5. N.P. Bali and Manish Goyal, A textbook of Engineering Mathematics, Laxmi Publications, 2008.
6. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 36th Edition, 2010.

Mathematics-I (AMCS-18101) **4L: 1T:0P 5 credit**

For Students of Computer Science and Engineering and Information Technology

Objectives:

The objective of this course is to familiarize the prospective engineers with techniques in basic calculus and linear algebra. It aims to equip the students with standard concepts and tools at an intermediate to advanced level that will serve them well towards tackling more advanced level of mathematics and applications that they would find useful in their disciplines.

Calculus: (8 lectures)

Evaluation of definite and improper integrals; Beta and Gamma functions and their properties; Applications of definite integrals to evaluate surface areas and volumes of revolutions.

Calculus: (8 lectures)

Rolle's Theorem, Mean value theorems, Taylor's and Maclaurin theorems with remainders; indeterminate forms and L'Hospital's rule; Maxima and minima.

Matrices: (8 lectures)

Matrices, vectors: addition and scalar multiplication, matrix multiplication; Linear systems of equations, linear Independence, rank of a matrix, determinants, Cramer's Rule, inverse of a matrix, Gauss elimination and Gauss-Jordan elimination.

Vector spaces: (8 lectures)

Vector Space, linear dependence of vectors, basis, dimension; Linear transformations (maps), range and kernel of a linear map, rank and nullity, Inverse of a linear transformation, rank nullity theorem, composition of linear maps, Matrix associated with a linear map.

Vector spaces: (8 lectures)

Eigenvalues, eigenvectors, symmetric, skew-symmetric, and orthogonal Matrices, eigenbases. Diagonalization; Inner product spaces, Gram-Schmidt orthogonalization.

Suggested Text/Reference Books:

1. G.B. Thomas and R.L. Finney, Calculus and Analytic geometry, 9th Edition, Pearson, Reprint, 2002.
2. Erwin Kreyszig, Advanced Engineering Mathematics, 9th Edition, John Wiley & Sons, 2006.
3. Ramana B.V., Higher Engineering Mathematics, Tata McGraw Hill New Delhi, 11th Reprint, 2010.
4. N.P. Bali and Manish Goyal, A textbook of Engineering Mathematics, Laxmi Publications, Reprint, 2010.
5. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 35th Edition, 2000.
6. V. Krishnamurthy, V.P. Mainra and J.L. Arora, An introduction to Linear Algebra, Affiliated East–West press, Reprint 2005.

Mathematics –I (AMBT-18101) **4L: 1T:0P 5credits**

For Students of Biotechnology

Objectives:

The objective of this course is to familiarize the prospective engineers with basic knowledge of Mathematics required to solve their engineering problems.

Detailed Contents:

Algebra: (10 lectures)

Complex Numbers, Permutations and combinations, Binomial Theorem for positive/negative index and its applications, Arithmetic and geometric progressions.

Trigonometry: (6 lectures)

Review of trigonometric functions, Sum and product formulae for trigonometric functions, Trigonometric equations and sum - to - product formulae for trigonometric functions, Identities related to double angle formulae.

Determinants and Matrices: (8 lectures)

Matrices, Operations on matrices, Determinants and its properties, Singular and non-singular matrices, Adjoint and inverse of a matrix and its properties, Solutions of system of linear equations using Cramer's rule and matrix method.

Linear Algebra: (6 lectures)

Rank of matrix, Symmetric, Skew-Symmetric and Orthogonal Matrices, Eigenvalues, Eigenvectors, Diagonalization of matrices, Cayley Hamilton Theorem.

Coordinate Geometry: (6 lectures)

Rectangular coordinate system, Straight lines, Circles (in standard form only).

Differentiation: (8 lectures)

Functions, Domain and range, Properties of standard functions (trigonometric, exponential and logarithmic) and their graphs, Limit, Continuity and Differentiability. Differentiation of standard functions (polynomials, trigonometric, inverse trigonometric exponentials and logarithmic), Product rule, Quotient rule, Chain rule

Textbooks/ References:

1. Mathematics, A Text books (Parts I & II), NCERT, New Delhi.
2. R.D. Sharma, Mathematics (Class XI and Class XII,Vol- I & II), Dhanpat Rai Publications, New Delhi
3. Krishnamurthy V.K., Mainra V.P. and Arora J.L. An introduction to Linear Algebra, East West Press
4. Loney, S. L., The elements of Coordinate Geometry, Michigan Historical Reprint series
5. Shanti Narayan, Differential and Integral Calculus, S. Chand
6. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers

Mathematics –II (AMME-18102) **3L: 1T: 0P 4credits**

For Students of Mechanical, Chemical, Civil & Electronics and Communication Engineering

Objective:

The objective of this course is to familiarize the prospective engineers with techniques in multivariate integration, ordinary differential equations and complex variables. It aims to equip the students to deal with advanced level of mathematics and applications that would be essential to tackle their mathematical challenges in their engineering problems.

Multivariable Calculus (Integration): (10 lectures)

Multiple Integration: Double integrals (Cartesian), change the order of integration in double integrals, Change of variables (Cartesian to polar), Applications: areas and volumes, Centre of mass and Gravity (constant and variable densities), Triple integrals (Cartesian), Simple applications involving cubes, sphere and rectangular parallelepipeds. Scalar line integrals, vector line integrals, scalar surface integrals, vector surface integrals, Theorems of Green, Gauss and Stokes.

Ordinary differential equations of first order: (6 lectures)

Exact, linear and Bernoulli's equations, Equations not of first degree: equations solvable for p, equations solvable for y, equations solvable for *x* and Clairaut's type.

Ordinary differential equations of higher orders: (8 lectures)

Second order linear differential equations with constant and variable coefficients, method of variation of parameters, Cauchy-Euler equation, Power series solutions, Legendre polynomials, Bessel functions of the first kind and their properties.

Complex Variable – Differentiation: (8 lectures)

Differentiation, Cauchy-Riemann equations, analytic functions, harmonic functions, finding harmonic conjugate, elementary analytic functions (exponential, trigonometric, logarithm) and their properties, Conformal mappings, Mobius transformations and their properties.

Complex Variable – Integration: (8 lectures)

Contour integrals, Cauchy-Goursat theorem (without proof), Cauchy Integral formula(without proof), Liouville's theorem and Maximum-Modulus theorem (without proof), Taylor's series, zeros of analytic functions, singularities, Laurent's series, Residues, Cauchy Residue theorem (without proof), Evaluation of definite integral involving sine and cosine, Evaluation of certain improper integrals using the Bromwich contour.

Suggested Text/Reference Books:

1. G.B. Thomas and R.L. Finney, Calculus and Analytic geometry, 9th Edition, Pearson, Reprint, 2002.
2. Erwin Kreyszig, Advanced Engineering Mathematics, 9th Edition, John Wiley & Sons, 2006.
3. E. A. Coddington, An Introduction to Ordinary Differential Equations, Prentice Hall India, 1995.
4. J. W. Brown and R. V. Churchill, Complex Variables and Applications, 7th Ed., McGraw Hill, 2004.
5. N.P. Bali and Manish Goyal, A textbook of Engineering Mathematics, Laxmi Publications, 2008.
6. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 36th Edition, 2010.
7. B. V. Ramana, Higher Engineering mathematics, Tata McGraw Hills, New Delhi.

Mathematics –II (AMCS-18102) **3L: 1T: 0P 4credits**

For Students of Computer Science and Engineering and Information Technology

Objective:

The objective of this course is to familiarize the computer engineers with statistical techniques.it aims to equip the students with standard concepts and tools at an intermediate to advance level that will serve them well towards tackling various problems in the discipline.

Basic Probability: (12 hours)

Probability spaces, conditional probability, independence; Discrete random variables, Independent random variables, the multinomial distribution, Poisson approximation to the binomial distribution, infinite sequences of Bernoulli trials, sums of independent random variables; Expectation of Discrete Random Variables, Moments, Variance of a sum, Correlation coefficient, Chebyshev's Inequality**.**

Continuous Probability Distributions: (4hours)

Continuous random variables and their properties, distribution functions and densities, normal, exponential and gamma densities.

Bivariate Distributions: (4 hours)

Bivariate distributions and their properties, distribution of sums and quotients, conditional densities, Bayes' rule.

Basic Statistics: **(**8hours)

Measures of Central tendency: Moments, skewness and Kurtosis - Probability distributions: Binomial, Poisson and Normal - evaluation of statistical parameters for these three distributions, Correlation and regression – Rank correlation.

Applied Statistics: (8hours)

Curve fitting by the method of least squares- fitting of straight lines, second-degree parabolas and more curves that are general. Test of significance: Large sample test for single proportion, difference of proportions, single mean, difference of means, and difference of standard deviations.

Small samples: (4 hours)

Test for single mean, difference of means and correlation coefficients, test for ratio of variances - Chi-square test for goodness of fit and independence of attributes.

Suggested Text/Reference Books

1. Erwin Kreyszig, Advanced Engineering Mathematics, 9th Edition, John Wiley & Sons, 2006.
2. P. G. Hoel, S. C. Port and C. J. Stone, Introduction to Probability Theory, Universal Book Stall, 2003.
3. S. Ross, A First Course in Probability, 6th Ed., Pearson Education India, 2002.
4. W. Feller, An Introduction to Probability Theory and its Applications, Vol. 1, 3rd Ed., Wiley, 1968.
5. N.P. Bali and Manish Goyal, A textbook of Engineering Mathematics, Laxmi Publications, Reprint, 2010.
6. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 35th Edition, 2000.
7. Veerarajan T., Engineering Mathematics (for semester III), Tata McGraw-Hill, New Delhi, 2010.

Mathematics –II (AMBT-18102) **3L: 1T: 0P 4credits**

For Students of Biotechnology

Objectives:

The objective of this course is to familiarize the prospective engineers with techniques in multivariate differentiation and integration, ordinary differential equations and vector calculus. It aims to equip the students to deal with advanced level of mathematics and applications that would be essential to tackle their mathematical challenges in their engineering problems.

Partial Differentiation: (8 lectures)

Functions of several variables, Partial derivatives, Homogeneous functions, Maximum and minimum of several variable functions, Jacobians.

Integration: (12 lectures)

Integral as anti-derivative, Integration: by substitution, by parts and partial fractions, Definite integral and its properties, Double integrals, Areas of bounded regions and rectification; change the order of integration, change of variable, Triple Integration and simple applications.

Differential Equations: (10 lectures)

Order and degree, Techniques for solving first order ordinary differential equation, Exact ODEs, Linear ODEs, Differential Equations of first order and higher degree, Clairaut's equation.

Linear Ordinary Differential Equations of second & higher order: (8 lectures)

Solution of linear Ordinary Differential Equations of second and higher order; methods of finding complementary functions and particular integrals. Special methods for finding particular integrals: Method of variation of parameters, Cauchy's homogeneous and Legendre's linear equation.

Vector Calculus: (8 lectures)

Vectors in 2- dimensions and 3- dimensions, Dot Product and cross product of vectors, Scaler and vector functions, Gradient of a scaler field, Directional derivatives, Divergence of Vector Field, Curl of Vector Field

Suggested Text/Reference Books:

1. Mathematics, A Text books (Parts I & II), NCERT, New Delhi
2. R.D. Sharma, Mathematics (Class XII,Vol- I & II), Dhanpat Rai Publications, New Delhi
3. Shanti Narayan, Differential and Integral Calculus, S. Chand
4. Kreyszig, Erwin, Advanced Engineering Mathematics, 8th Edition, John Wiley
5. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 36th Edition
6. N.P. Bali and Manish Goyal, A text book of Engineering Mathematics, Laxmi

English (BTHU-18101)
(Common to All Branches) **2L:0T:0P (2 credits)**

Detailed contents

1. Vocabulary Building

1.1The concept of Word Formation
1.2Root words from foreign languages and their use in English
1.3Acquaintance with prefixes and suffixes from foreign languages in English to formderivatives.
1.4 Synonyms, antonyms, and standard abbreviations.

2. Basic Writing Skills

2.1 Sentence Structures
2.2 Use of phrases and clauses in sentences
2.3 Importance of proper punctuation
2.4 Creating coherence
2.5 Organizing principles of paragraphs in documents
2.6 Techniques for writing precisely

3. Identifying Common Errors in Writing

3.1 Subject-verb agreement
3.2 Noun-pronoun agreement
3.3 Misplaced modifiers
3.4 Articles
3.5 Prepositions
3.6 Redundancies
3.7 Clichés

4. Nature and Style of sensible Writing

4.1 Describing
4.2 Defining
4.3 Classifying
4.4 Providing examples or evidence
4.5 Writing introduction and conclusion

5. Writing Practices

5.1 Comprehension
5.2 Précis Writing
5.3 Essay Writing

Language Lab(BTHU-18101) **0L:0T:2P (1 credit)**
(Oral Communication)

This unit involves interactive practice sessions in Language Lab and will comprise of the following:
1Listening Comprehension
2Pronunciation, Intonation, Stress and Rhythm
3Common Everyday Situations: Conversations and Dialogues
4Communication at Workplace
5Interviews
6Formal Presentations

Suggested Readings:

(i) MArtin's English Grammar
(ii) Practical English Usage. Michael Swan. OUP. 1995.
(iii)On Writing Well. William Zinsser. Harper Resource Book. 2001
(iv) Communication Skills. Sanjay Kumar and PushpLata. Oxford University Press. 2011.
(v) Exercises in Spoken English. Parts. I-III. CIEFL, Hyderabad. Oxford University Press

For Batches 2018 & Onwards

Academic Autonomous Status vide letter No. F22-1/2014 (AC)

BTCS-18101 Programming for Problem Solving

L T P
3 0 0 [3 credits]

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

Unit1: Introduction to Programming **(4 lectures)**
Introduction to components of a computer system (disks, memory, processor, where a program is stored and executed, operating system, compilers etc.)
Idea of Algorithm: steps to solve logical and numerical problems. Representation of Algorithm: Flowchart/Pseudocode with examples.
From algorithms to programs; source code, variables (with data types) variables and memory locations, Syntax and Logical Errors in compilation, object and executable code.

Unit 2: Arithmetic expressions and precedence **(2 lectures)**

Unit 3: Conditional Branching and Loops **(6 lectures)**
Writing and evaluation of conditionals and consequent branching **(3 lectures)**
Iteration and loops **(3 lectures)**

Unit 4: Arrays: Arrays (1-D, 2-D), Character arrays and Strings **(6 lectures)**

Unit 5: Basic Algorithms **(6 lectures)**
Searching (Linear Search), Basic Sorting Algorithms (Bubble Sort), Finding roots of Equations.

Unit 6: Function **(5 lectures)**
Functions (including using built in libraries), Parameter passing in functions, call by value, passing arrays to functions: idea of call by reference

Unit 7: Recursion: **(4 -5 lectures)**
Recursion, as a different way of solving problems. Example programs, such as Finding Factorial, Fibonacci series.

Unit 8: Structure: Structures, Defining structures and Array of Structures **(4 lectures)**

Unit 9: Pointers: Idea of pointers, Defining pointers. **(2 lectures)**

Unit 10: File handling (only if time is available, otherwise should be done as part of the lab)

Suggested Text Books

(i) Byron Gottfried, Schaum's Outline of Programming with C, McGraw-Hill
(ii) E. Balaguruswamy, Programming in ANSI C, Tata McGraw-Hill

Suggested Reference Books

(i) Brian W. Kernighan and Dennis M. Ritchie, The C Programming Language, PHI

Course Outcomes : The student will learn

1. To formulate simple algorithms for arithmetic and logical problems.
2. To translate the algorithms to programs (in C language).
3. To test and execute the programs and correct syntax and logical errors.
4. To implement conditional branching, iteration and recursion.
5. To decompose a problem into functions and synthesize a complete program using divide and conquer approach.
6. To use arrays, pointers and structures to formulate algorithms and programs.
7. To apply programming to solve matrix addition and multiplication problems and searching and sorting problems.
8. To apply programming to solve simple programming problems, namely root finding of function, differentiation of function and simple integration.

7/5/18 7/5/18

For Batches 2018 & Onwards

Academic Autonomous Status vide letter No. F22-1/2014 (AC)

BTCS-18102 Programming for Problem Solving Lab

L	T	P	
0	0	4	[2 credits]

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

Tutorial1: Problem solving using computers:
Lab1: Familiarization with programming environment

Tutorial2: Variable types and type conversions:
Lab 2: Simple computational problems using arithmetic expressions

Tutorial3: Branching and logical expressions:
Lab 3: Problems involving if-then-else structures

Tutorial4: Loops, while and for loops:
Lab 4: Iterative problems e.g., sum of series

Tutorial5: 1D Arrays: Linear search, Bubble sort
Lab 5: 1D Array manipulation

Tutorial6: 2D arrays and Strings
Lab 6: Matrix problems, String operations

Tutorial7: Functions, call by value, call by reference:
Lab 7: Simple functions

Tutorial8&9: Finding roots of quadratic equation.
Lab 8 and 9: Programming for Finding roots of quadratic equation.

Tutorial10: Recursion, structure of recursive calls
Lab 10: Recursive functions

Tutorial11: Pointers, structures
Lab 11: Pointers and structures

Tutorial12: File handling:
Lab 12: File operations

Laboratory Outcomes

1. To formulate the algorithms for simple problems
2. To translate given algorithms to a working and correct program
3. To be able to correct syntax errors as reported by the compilers
4. To be able to identify and correct logical errors encountered at run time
5. To be able to write iterative as well as recursive programs
6. To be able to represent data in arrays, strings and structures and manipulate them through a program
7. To be able to declare pointers of different types and use them in defining self-referential structures.
8. To be able to create, read and write to and from simple text files.

7/5/18. 7/5/18

BTEC-18101: Electrical & Electronics Engineering

L	T	P
3	1	0

Objective:

An insight to the importance of electrical energy in chemical plants. Basics of electricity, selection of different types of drives for a given application process. Basic insight into power supplies, instrumentation amplifiers in industries.

Course outcomes:

- To understand the basic concepts of D.C., single phase and three phase A.C. supply and circuits, and solve basic electrical circuit problems
- To understand the basic concepts of transformers and motors used as various industrial drives
- To understand the concept of semiconductor devices and their applications.

1. ***Introduction (3 hours)***
   Elements in an Electrical circuit: R, L, C, voltage and current sources and their conversion to each other.

2. ***DC Circuits (8 hours)***
   Introduction to DC circuits, KCL, KVL, Mesh and Nodal analysis, Step response in RL, RC, RLC circuits

3. ***AC Circuits (8 hours)***
   Introduction to Sinusoidal AC waveform, Peak Value, RMS Value, Sinusoidal ac through R, L, C, RL, RC & RLC circuits, Phasor analysis of AC circuits, 3-phase circuits.

4. ***Magnetic Circuits & Transformer (6 hours)***
   Principle of electromagnetic induction, self-induced emf and mutually induced emf. Transformers: construction, principle, emf equation, losses, efficiency.

5. ***Electromagnetic Energy Conversion (6 hours)***
   Energy in magnetic field, Electromechanical energy conversion principle, introduction to 3-phase induction motor, single phase induction motor and DC motor.

6. ***Semiconductor Devices (3 hours)***
   PN junction diode and its applications, BJT, FET, operational amplifiers, model and applications.

7. ***Digital Circuits (5 hours)***
   Binary, Octal and Hexadecimal number system and their arithmetic operations, Logic gates, Introduction of R-S, J-K, D and T Flip Flops and their truth tables.

8. ***Principles of Measurement (3 hours)***
   Principles of measurement of voltage, current and power. Moving coil, Moving iron & Electrodynamometer type instruments.

Suggested Readings/Books

1. D.P. Kothari and I.J. Nagrath, "Basic Electrical Engineering" Tata McGraw Hill.
2. Vincent Del Toro, "Electrical Engg Fundamentals" Prentice Hall India.
3. E. Hughes, "Electrical and Electronics Technology", Pearson 2010.
4. D.C. Kulshreshtha, "Basic Electrical Engineering" McGraw Hill.
5. B. L. Threja, "A text book of Electrical technology" S. Chand publishers.
6. A.K.Sawhney, "Acourse in Electrcical & Electronics Measurements" Dhanpat Rai & Co.

BTEC-18102: Electrical and Electronics Engineering Lab

L	T	P
0	0	2

Laboratory Outcomes

- Get an exposure to common electrical components and their ratings.
- Make electrical connections by wires of appropriate ratings.
- Understand the usage of common electrical measuring instruments.
- Understand the basic characteristics of transformers and electrical machines.
- Understand the basic operation of semiconductor devices.

Note: Students are required to perform minimum of 10 experiments.

- To familiarize the students with Basic Safety Precautions.

1. Introduction to Voltmeter, Ammeter, Multimeter, Resistors, Capacitors and Inductors.
2. To measure power and power factor in single phase AC Circuit.
3. To verify the voltage and current relations in three phase star & delta connected systems.
4. To measure the minimum operating voltage, current drawn, power consumed, and the power factor of a fluorescent tube light and compact fluorescent lamp (CFL).
5. To obtain the characteristics of a P-N junction diode.
6. To verify the truth table of logic gates.
7. To obtain the characteristics of a transistor under common emitter (CE) configuration.
8. To study various parts of (i) Transformer (ii) DC Motor (iii) 3 Phase Induction Motor.
9. To measure the primary and secondary voltages, currents, power and turn ratio of a transformer at load.
10. To perform open- and short circuit tests on a single phase transformer and find iron loss & Cu loss.
11. To start and reverse the direction of rotation of a DC motor.
12. To start and reverse the direction of rotation of 3 phase Induction motor.
13. Demonstration of various parts of (a) Moving Iron (b) Moving Coil instruments.

For Batches 2018 & Onwards
Academic Autonomous Institute (No. F22-1/2014 (AC))

BTMP18101 Workshop/Manufacturing Practices (Theory & Lab.)

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

L	T	P	C
1	0	4	3

Course Outcomes:

1. Define and identify various manufacturing processes.
2. Describe different manufacturing processes commonly employed in the industry.
3. Fabricate small components using different manufacturing processes.

Lectures & videos: (12 hours)

Detailed contents

1. Manufacturing Methods- casting, forming, machining, joining, advanced manufacturing methods
2. CNC machining, Additive manufacturing
3. Fitting operations & power tools
4. Electrical &Electronics
5. Carpentry
6. Plastic molding, glass cutting
7. Metal casting
8. Welding (arc welding & gas welding), brazing

Workshop Practice: (48 hours)

1. Machine shop
2. Fitting shop
3. Carpentry
4. Electrical & Electronics
5. Welding shop (Arc welding + gas welding)
6. Casting
7. Smithy
8. Plastic moulding & Glass Cutting

Practical Examination would involve the actual fabrication of simple components, utilizing one or more of the techniques covered above.

Suggested Text/Reference Books:

i. Hajra Choudhury S.K., Hajra Choudhury A.K. and Nirjhar Roy S.K., "Elements of Workshop Technology", Vol. Vol. II 2010, Media promoters and publishers private and I 2008 limited, Mumbai.
ii. Kalpakjian S. And Steven S. Schmid, "Manufacturing Engineering and Technology", 4th edition, Pearson Education India Edition, 2002.
iii. Gowri P. Hariharan and A. Suresh Babu,"Manufacturing Technology – I" Pearson Education, 2008.
iv. Roy A. Lindberg, "Processes and Materials of Manufacture", 4th edition, Prentice Hall India, 1998.
v. Rao P.N., "Manufacturing Technology", Vol. Vol. II and Tata McGrawHill House, 2017, I.

BTME 18-101 Engineering Graphics

		L	T	P	C
Internal Marks:	60				
External Marks :	40	1	0	4	3
Maximum Marks:	100				

Courses Outcomes:

1. Assess the importance of engineering graphics in the industry and society.
2. Apply visual concepts of engineering graphics.
3. Construct various engineering components using engineering graphics.
4. Apply engineering graphics standards.
5. Apply modern engineering graphics software tools necessary for engineering practice.

1. Introduction to Engineering Drawing:
Principles of Engineering, Graphics and their significance, usage of Drawing instruments, lettering, Conic sections, including the Rectangular Hyperbola (General method only); Cycloid, Epicycloid, Hypocycloid and Involute; Scales – Plain, Diagonal and Vernier Scales.

2. Orthographic Projections:
Principles of Orthographic Projections-Conventions, Projections of Points and lines inclined to both planes; Projections of planes inclined Planes - Auxiliary Planes.

3. Projections of Regular Solids:
Solids inclined to both the Planes-Auxiliary Views; Draw simple annotation, dimensioning and scale. Floor plans that include: windows, doors, and fixtures such as WC, bath, sink, shower, etc.

4. Sections and Sectional Views of Right Angular Solids:
Prism, Cylinder, Pyramid, Cone – Auxiliary Views; Development of surfaces of Right Regular Solids - Prism, Pyramid, Cylinder and Cone; Draw the sectional orthographic views of geometrical solids, objects from industry and dwellings (foundation to slab only)

5. Isometric Projections:
Principles of Isometric projection – Isometric Scale, Isometric Views, Conventions; Isometric Views of lines, Planes, Simple and compound Solids; Conversion of Isometric Views to Orthographic Views and Vice-versa, Conventions.

6. Overview of Computer Graphics:
Listing the computer technologies that impact on graphical communication, Demonstrating knowledge of the theory of CAD software [such as: The Menu System, Toolbars (Standard, Object Properties, Draw, Modify and Dimension), Drawing Area (Background, Crosshairs, Coordinate System), Dialog boxes and windows, Shortcut menus (Button Bars), The Command Line (where applicable), The Status Bar, Different methods of zoom as used in CAD, Select and erase objects.; Isometric Views of lines, Planes, Simple and compound Solids.

7. Customization & Computer Aided Drafting:
Computer aided drafting consisting of set up of the drawing page and the printer, including scale settings, Setting up of units and drawing limits; ISO and ANSI standards for coordinate dimensioning and tolerancing; Orthographic constraints, Snap to objects manually and

automatically; Producing drawings by using various coordinate input entry methods to draw straight lines, Applying various ways of drawing circles.

8. Annotations, layering & other functions:
Applying dimensions to objects, applying annotations to drawings; Setting up and use of Layers, layers to create drawings, Create, edit and use customized layers; Changing line lengths through modifying existing lines (extend/lengthen); Printing documents to paper using the print command; orthographic projection techniques; Generation of solids with different commands. Drawing sectional views of composite right regular geometric solids and project the true shape of the sectioned surface.

Text/Reference Books:

1. Bhatt N.D., Panchal V.M. & Ingle P.R., (2014), Engineering Drawing, Charotar Publishing House
2. Shah, M.B. & Rana B.C. (2008), Engineering Drawing and Computer Graphics, Pearson Education
3. Agrawal B. & Agrawal C. M. (2012), Engineering Graphics, TMH Publication
4. Narayana, K.L. & P Kannaiah (2008), Text book on Engineering Drawing, Scitech Publishers
5. (Corresponding set of) CAD Software Theory and User Manuals
6. Gill P S, Engineering Graphics and Drafting, Kataria and Sons Delhi.
7. Engineering Graphics - Course – Nptel; https://onlinecourses.nptel.ac.in/noc16_ce04

Note:
1. **Except the basic essential concepts, most of the teaching part can happen concurrently in the laboratory.**
2. **In the final viva-voce examination every student will be given job assignment to be performed using graphics software tools.**