ASSAM SCIENCE AND TECHNOLOGY UNIVERSITY

Course Structure and Syllabus
For First Semester B.Tech Programme

(For All Branches)
FIRST SEMESTER
(AUGUST-NOVEMBER)

Course Structure:

Sl. No	Sub Code	Subject	Hrs/week			Credits
			L	T	P	C
	Theory					
1	MA131101	Mathematics-I	3	2	0	4
2	PH131102	Physics-I	2	2	0	3
3	CY131103	Chemistry-I	2	2	0	3
4	EE131104	Basic Electrical & Electronics Engineering-I	3	2	0	4
5	CS131105	Introduction to Computing	2	0	0	2
6	HS131106	English Communication & Technical Report Writing.	0	2	2	2
7	CE131107	Engineering Graphics-I	1	2	0	2
	Practical					
8	PH131112	Physics-I Lab	0	0	2	1
9	CY131113	Chemistry-I Lab	0	0	2	1
10	EE131114	Basic Electrical & Electronics Engineering-I Lab	0	0	2	1
11	CS131115	Introduction to Computing Lab	0	0	2	1
12	CE131117	Engineering Graphics-I-Lab	0	0	2	1
	Total		13	12	12	25
Total Contact Hours = 37						
Total Credits = 25						

Detailed Syllabus:

Subject Code : MA131101
Subject: Mathematics - I

L-T-P: 3-2-0 **Credit 4**
Expected Weeks :12

Modules	Topics	Course Content	Hours
I	**DIFFERENTIAL CALCULUS**	**Single variable calculus:** Successive Differentiation-Leibnitz theorem, Taylor's and Maclaurin's Series, Expansion of function. **Multi variable calculus:** Partial Derivatives, Euler's theorem on homogeneous function (Statement & Application), Total derivatives. **Curve tracing:** Concept of curve tracing, Some important curves. **Jacobian:** Jacobians and their applications (for two and three variables), Errors and Approximations. **Maxima and Minima:** Maxima and Minima of Functions of two variables, Lagrange's method of undetermined multipliers.	16
II	**INTEGRAL CALCULUS**	**Single variable calculus:** Reduction formula $\int_0^{\pi/2} \sin^n x dx$, $\int_0^{\pi/2} \cos^n x dx$, $\int_0^{\pi/2} \sin^m x \cos^n x dx$ $\int_0^{\frac{\pi}{4}} tan^n x\ dx$, $\int_0^{\frac{\pi}{4}} Sec^n x\ dx$. Areas under Plane curves (Cartesian & Polar), Volume and surface area of solids of revolution of plane curves. **Multi variable calculus:** Differentiation under integral sign (Leibniz's rule) Multiple integrals**.** Areas and Volumes by double and triple integrals Beta and Gamma functions.	20
III	**DIFFERENTIAL EQUATIONS**	**First order first degree equation:** Exact differential equation, reducible to exact differential equation. **First order higher degree equation:** Solvable for p, x, y, Clairaut's equation. **Higher order homogenous linear differential equation:** With constant coefficients, Homogeneous (Cauchy-Euler) Equation. **Higher order Non homogenous linear differential equation:** Differential operator methods, Variation of parameter method, Method of undetermined coefficients. **Solution Of Simultaneous Equations.**	12
Total			48

Text Books/Reference Books:

1. Advanced Engineering Mathematics by Erwin Kreyszig (Wiley Eastern Ltd.).
2. Higher Engineering Mathematics by B. S. Grewal (Khanna Publication, Delhi).
3. Engineering Mathematics, Wylie C.R. & Barrett L.C. (McGraw-Hill, Inc.)
4. An Introduction to Differential Equations, R.K. Ghosh and K.C.Maity (New Central Book Agency)
5. Engineering Mathematics(part I and part II), Babu –Ram (Pearson).
6. A textbook of Engineering Mathematics –I by U.N.Mishra, A.Devi, B.Sarma and R.Kalita. (Mani Manik Prakash, Guwahati).

Subject Code : PH131102

Subject: Physics-I

L-T-P: 2-2-0 **Credit 3**

Expected Weeks :12

Modules	Topics	Course Content	Hours
I	**GENERAL PHYSICS**	Stress and Strain, Hooke's law, Types of elasticity, Equivalence of a shear to a compression and an extension at right angles to each other, Energy of a strained body, Relation connecting the elastic constants, Poisson's ratio, Bending of beams, Expression for bending moment, Cantilever.	6
II	**GEOMETRICAL AND WAVE OPTICS**	Spherical and Chromatic aberrations, Expression for longitudinal chromatic aberration, Achromatism of thin lens, Interference of light, Types of Interference (division of wavefront and division of amplitude), Interference in thin films and wedge shaped films, Newton Rings Fresnel and Fraunhoffer diffraction, Fraunhoffer diffraction at a single slit, Intensity distribution in the diffraction pattern due to single slit, Plane diffraction grating, Conditions for secondary maxima and minima, Dispersive and Resolving power of a grating.	8
III	**LCR CIRCUIT IN DC NETWORK**	Helmholtz equation of Growth and Decay of current in L-R circuit, Charging of a condenser, Discharging of a condenser through an inductor, Charging of a capacitor through L&R, Discharge of a capacitor through L&R.	6
IV	**DIELECTRICS AND MAGNETIC MATERIALS**	Polar and Non-polar Materials, Dielectric Constant and Dielectric Susceptibility of a material, Polarizability and Polarization, Different types of Polarization, Expression for local field inside a Dielectric, Clausius–Mossotti Relation, Effect of temperature and frequency on polarization, Dielectric Loss, Applications of Dielectric materials. Classification of Magnetic Materials- Diamagnetism, Paramagnetism, Ferromagnetism, Domain theory of Ferromagnetism, Hysteresis Loop, Hysteresis Loss, Expression for Hysteresis Loss in B-H Loop, Soft and Hard Magnetic Materials, Antiferromagnetism and Ferrimagnetism, Applications of Magnetic Materials in different fields	8
V	**ELECTROMAGNETIC THEORY**	The Del Operator, Gradient of a Scalar Function, Divergence of a Vector, Curl of a Vector and their Physical Significance, Ampere's Law, Poisson's Equation and Laplace's Equation, Continuity Equation, Inconsistency in Ampere's Law, Displacement Current, Maxwell's Equations (Derivation not required), Physical Significance of Maxwell's Equations, Differences between Conduction Current and Displacement Current.	8
Total			36

Text Books and Reference Books:

1. Applied Physics for Engineers, Neeraj Mehta, PHI Learning Private Limited, New Delhi
2. Detailed Text Book of Engineering Physics, S.P. Basavaraju, Subhas Publication Subhas Stores, Bangalore.
3. Fundamentals of Physics - Jearl Walker, Published by Wiley India Private Limited, ISBN: 978-81-265-1442-7.
4. Elements of Properties of Matter, D.S. Mathur. Publisher: S. Chand.

Subject Code : CY131103
Subject: Chemistry – I

L-T-P: 2-2-0 **Credit 3**
Expected Weeks :12

Modules	Topics	Course Content	Hours
I	**THERMODYNAMICS: FIRST LAW**	Meaning of system and surroundings; extensive and intensive thermodynamic functions. Internal energy and work. Work of expansion of a gas under various conditions. The convention of sign; Infinitesimal change and reversibility of a process; First law of thermodynamics. State and path functions. Exact and inexact differentials and the use of the laws of partial derivatives. Heat capcity C_v; Enthalpy and C_p. Relation between C_p and C_v for an ideal gas. Work of expansion and temperature change. Heats of vaporization, fusion, chemical reaction, hydration etc.	4
II	**THERMODYNAMICS: SECOND LAW**	Entropy and randomness; measuring entropy; entropy change in a reversible and a spontaneous process; entropy of melting and mixing; entropy change in a chemical process. Carnot's engine and its efficiency. Second law of thermodynamics. Absolute entropy.	4
III	**THERMODYNAMICS: FREE ENERGY**	Helmholtz free energy; Gibbs free energy and chemical potential. Dependence of Gibbs function on temperature. Thermodynamic equilibrium constant K; equilibrium constants K_p and K_c. Dependence of equilibrium constant on temperature and pressure.	3
IV	**ELECTROCHEMISTRY**	Electrode and electrode potential; Various types of electrodes; Electrolytic cell and Galvanic cell; Cell emf; Concentration cell; lead storage battery; dry battery and Nickel - cadmium battery. Fuel cell.	4
V	**WAVE PROPERTY OF MATTER**	A brief summary of the failure of the laws of classical mechanics. Wave-particle duality: De Broglie relation; Heisenberg's uncertainty principle; Electron-diffraction as a proof of wave property of matter.	4
VI	**WAVEFUNCTION AND OPERATOR**	Wave function and its properties. Born's interpretation of wave function; Operators and observables; Linear momentum operator. Schrodinger's introduction of kinetic energy operator. Hamiltonian operator; Eigenvalue equations, eigen function and eigen value.	4
VII	**QUANTIZATION OF ENERGY, QUANTUM NUMBERS**	Particle in an one-dimensional box and quantization of energy; three-dimensional potential box and degeneracy of energy states. Schrodinger equation for hydrogen atom in Cartesian and polar coordinates; radial and angular wavefunction. Three space quantum numbers; Energy of hydrogen atom; Mathematical expressions for different hydrogen wavefunctions (radial and angular) and their graphical representation; radial distribution function and probability density. Spin quantum number; Pauli's exclusion principle. Relative energy levels of the electron in hydrogen atom; Electronic structure of multi-electron atoms and classification of elements into *s*, *p*, *d* and *f* blocks.; Ionization energy and electron affinity.	4

VII	**MOLECULAR ORBITAL THEORY**	Molecular orbital theory; linear combination of atomic orbitals in simple diatomic molecule. Bonding and anti-bonding M.O. in H_2^+ and H_2 molecules. Orbital overlap diagrams (*s-s, s-p, p-p* etc.). Energy level diagrams for homonuclear and heteronuclear diatomic molecules; explanation of bond order, bond energy and magnetic property based on MO energy level diagrams. The concept of hybrid atomic orbitals with different types of hybrid orbitals. Concept of resonance.	4
IX	**BONDING IN COORDINATION COMPOUNDS**	Bonding in Coordination compounds: valence bond theory and crystal field theory.	2
X	**MOLECULAR SPECTRA**	Introduction to molecular spectra. Infrared spectra: principle, modes of vibration (stretching, bending), absorption frequencies of functional groups and application. Proton magnetic resonance spectra: principle, chemical shift, interpretation of PMR spectra of simple molecules.	3
Total			36

Text/Reference Books

1. P. W. Atkins, Physical Chemistry, Elbs, (Any Edition). (Low Cost Ed.).
2. D. K. Chakrabarty, Inorganic Chemistry, (Second Edition), New Age International, 2012 (New Delhi).
3. B. Sivasankar, Engineering Chemistry, Mcgraw-Hill (2008), New Delhi.
4. David W. Ball, Physical Chemistry, Cengage, 2009 (Low Cost Ed.)
5. R.S.Berry, S.A.Rice And J.Ross, Physical Chemistry. John Wiley, 1980.

Subject Code : EE131104

Subject: Basic Electrical And Electronics Engineering - I

L-T-P: 3-2-0 **Credit 4**

Expected Weeks :12

Modules	Topics	Course Content	Hours
I	**DC NETWORKS:**	Definitions of active, passive, linear non- linear circuit elements and networks; Kirchoff's laws; Nodal and mesh analysis; Voltage and current sources; Network theorems superposition. Thevenin's, Norton's and maximum power transfer.	8
II	**MAGNETIC CIRCUITS:**	Definitions of mmf, flux, flux-density and reluctance; comparison between electric and magnetic circuits; series, parallel and series-parallel circuits and their solutions; energy stored in a magnetic circuit; lifting power of a magnet; electromagnetic induction, self and mutual inductance, hysteresis and eddy current losses. .	8
III	**SINGLE PHASE AC CIRCUITS:**	Alternating voltages and currents- instantaneous, average and rms values, form factor and peak factor; forms of representation of alternating quantities; concept of phasor and phasor diagrams; concept of lead and lag; reactance and impedance; AC circuits- resistive, inductive, capacitive, R-L, R-C and R-L-C circuits; AC circuits in series, parallel and series-parallel combinations; impedance triangle; admittance, susceptance and conductance; apparent, active and reactive power and power factor; resonance in AC circuits	10
IV	**THREE-PHASE AC CIRCUITS**	Concept of three-phase AC , connections, phase and line values in star and delta connections; solutions of simple 3-ph balanced circuits with resistive and reactive loads; 3-ph power, phase sequence.	6
V	**INSTRUMENTS**:	Classification of instruments; essentials of indicating type instruments- deflecting controlling and damping torque; types of indicating instruments; moving coil and moving iron ammeters and voltmeters; extension of range of instruments - use of shunts and multiplier; Wattmeter, Single phase induction type energy meter; Errors and compensations.	8
VI	**ELECTRONICS:**	Diode as a rectifier- half wave and full wave rectifier circuits; ripples in output waveform- ripple factor; introduction to filters; zener diode and its application as voltage regulator; bipolar junction transistor and its classification, static characteristics.	8
Total			48

Text/Reference Books:

1. Basic Electrical Engineering: I J Nagrath
2. Basic Electrical Engineering: Mittle
3. Electro Technology: H Cotton
4. A Text book of Electrical Technology: B L Theraja
5. Electrical and Electronic Technology- Edward Hughes
6. Principles of Electronics- V. K. Mehta

Subject Code : CS131105
Subject: Introduction To Computing

L-T-P: 2-0-0 **Credit 2**
Expected Weeks :12

Modules	Topics	Course Content	Hours
I	**INTRODUCTION**	Definition **of** algorithm and computer programming. Use of Flow Charts. Symbols and their uses. Introduction to Editing Tools	2
II	**PROGRAM DEVELOPMENT AND PROGRAMMING LANGUAGES**	Brief discussion on different types of programming languages. Introduction to **C** language,	4
III	**PROGRAMMING IN C LANGUAGE**	Identifiers, data types, operators in **C** language. Header and Library files. Simple programs using assignment statements	4
IV	**CONDITIONAL CONTROL STATEMENTS**	If, nested if, switch-case etc. Ex- Conversion between 3◦F & ◦c, Simple Interest, Compound Interest etc.	4
V	**ARRAYS:**	Definition and example of arrays. Single dimension and multi dimensional arrays. Ex. Sorting in ascending & descending , Minimum & Maximum of an array, Reverse of an array elements, Palindrom, roots of an Second degree equation etc.	4
VI	**FUNCTIONS:**	Type Of Functions, Function Definition ,Function prototype, declaration, function calling. Formal argument & actual argument. Parameter passing technique.	4
VII	**INFORMATION TECHNOLOGY**	Elements of Information Technology.	2
Total			24

Text/Reference Books:

1. Computer Programming in C (PHI) — Rajaraman
2. Computer Fundamentals and Programming in C(Oxford) – Reema Thareja
3. Mastering C (Tata McGraw Hill) – Venugopal and Prasad
4. Let us C (Bpb) –Yashawant kanetkar
5. Balaguruswamy.

Subject Code : HS131106

Subject: English Communication And Technical Report Writing

L-T-P: 0-2-2 **Credit 2**

Expected Weeks :12

Modules	Topics	Course Content	Hours
I	**BASICS OF COMMUNICATION**	Need of Communication Skills; Channels, forms and dimensions of Communication; Oral and written communication; Internal and external communication; Verbal and non-verbal communication; Barriers to communication; Principles of effective communication.	1
II	**WRITING SKILLS**	Letters, reports, notes, memos; Language and format of various types of business letters; Language and style of reports; Report writing strategies; Analysis of a sample report.	3
III	**GRAMMAR AND VOCABULARY**	Tenses and Concept of Time; Active and Passive Constructions; Direct-Indirect Speeches; Preposition; Conditionals; Parallel Structure; Modifiers; Sentence Transformation;.Vocabulary (Idioms, Confusables, One-word substitute, Synonyms-Antonyms).	3
IV	**CAREER ORIENTAL COMMUNICATION**	Resume Writing, Curriculum Vitae (Cv) ,Statement Of Purpose (Sop) Team-Talks, Group Discussion And Interviews	3
V	**ADVANCED TECHNIQUES IN TECHNICAL COMMUNICATION**	Interview through telephone/video-conferencing; Power-point presentation: structure and format; Using e-mail for business communication; Standard e-mail practices; Language in e-mail; Using internet for collecting information; Referencing while using internet materials for project reports.	2
VI	**LANGUAGE LABORATORY**	(a)Emphasizing Listening and comprehension skills; Reading Skills; Sound Structure of English and intonation patterns (b)Language laboratory training in speaking skills covering oral presentations, mock interviews and model group discussions through the choice of appropriate programmes.	12
total			24

Text/Reference Books:

1. Technical writing, B.N. Basu, PHI Learning Private Limited, ISBN: 978-81-203-3334-5.
2. Communication Skills for Engineers and Scientists, Sangeeta Sharma Binod Mishra, PHI Learning Private Limited, ISBN: 978-81-203-3719-0.
3. Communication Skills for Engineers, C. Muralikrishna, Sunita Mishra, Dorling Kindersley Private Limited, licensees of Pearson Education in South Asia, ISBN: 978-81-317-3384-4.
4. Technical Communication: A Practical Approach, William Sanborn Pfeiffer, T.V.S. Padmaja, Dorling Kindersley Private Limited, licensees of Pearson Education in South Asia, ISBN: 978-81-317-0088-4.
5. A Handbook of Pronunciation of English Words – by J.Sethi, D.V. Jindal (PHI Learning)
6. Common Mistakes in English – by T.J.Fitikides (Pearson)

Subject Code : CE131107/ CE131117

Subject: Engineering Graphics – I / Engineering Graphics – I Lab

L-T-P: 1-2-0/ 0-0-2 **Credit 2/1**

Expected Weeks :12

COURSE CONTENTS:

Module	Topic	Hours
1	**Introduction:** Drawing Instruments, Handling & Use	**2**
2	**Lines, Lettering and Dimensioning:** Types, Thickness, Shades, single stroke letters, general rules of dimensioning.	**5**
3	**Scales:** Representative fraction, Types of scales-Plain scales, Diagonal scales, Comparative scale, Vernier scale, Scale of chords.	**5**
4	**Curves used in engineering practices:** Conic sections – Ellipse, Parabola, Hyperbola, Tangent and normal to conics, Cycloid,Trochoid, Epicycloid, Hypocycloid, Epitrochoid, Hypotrochoid, Spiral, Logarithmic spiral.	**5**
5	**Orthographic Projection:** Planes of projection, four quadrants, First angle projection, Third angle projection. i. **Projection of Points** ii. **Projection of Straight Line:** Introduction, Inclined to one plane and parallel to the other, Line incline to both the planes, Line contained by a plain perpendicular to both the reference planes, true length of a straight line and its inclinations with to reference plane. iii. **Projections of Planes:** Traces of planes, projection of planes inclined to one reference plane and perpendicular to other, projection of oblique planes.	**2** **3** **5** **5**
6	**Isometric View** Introduction Axes, Line, Plane, Scale Isometric drawing of objects (prism, pyramids)	**4**
	TOTAL	**36**

Text/Reference Books:

1. Engineering Graphics Degree, K.C. John, Published by PHI Learning Private Limited, ISBN-978-81-203-3788-6.
2. Engineering Drawing, N. D. Bhatt, Charotar Publishing House Pvt. Ltd., ISBN: 978- 93-80358-17-8.
3. Engineering Drawing with an introduction to AutoCAD, Dhananjay A Jolhe, Tata McGraw Hill Education Pvt. Ltd., ISBN: 978-0-07-064837-1.

Subject Code : PH131112
Subject: Physics-I Lab

L-T-P: 0-0-2 **Credit 1**

Expected Weeks: 12

Experiment No.	Experiment Title	Hours
I	Determination of Rigidity of Modulus of the material of the given rod by Statical method.	1
II	Determination of Moment of Inertia of a given solid about its own axis by using M.I.Table.	1
III	Determination of Resistance of a Galvanometer using Post Office Box.	1
IV	Determination of ratio of E.M.F of two cells using Potentiometer**.**	1
V	Determination of Young's Modulus using Searle's Apparatus	1
VI	Determination of Powers of Given lenses using an Optical Bench (i) Concave Lense (ii) Convex Lense	2
VII	Determination of Horizontal Components of Earth's Magnetic field using Magnetometer	1
VIII	Determination of (i)Angle of Incidence(i) and Deviation Curve (d) of a Prism using Spectrometer. (ii)The angle of minimum deviation and refractive index of material of the Prism	2
IX	Determination of coefficient of Viscosity of water by Capillary Flow Method.	1
X	Revision of the Experiments and Internal Viva	1
Total		12

Subject Code : CY131113
Subject: Chemistry-I Lab

L-T-P: 0-0-2 **Credit 1**

Expected Weeks :12

Experiment No.	Experiment Title	Hours
I	Qualitative Analysis of an Organic sample: Detection of elements (N,S and Halogens) and functional groups in different organic samples :	
	1. β-Naphthol	1
	2. m-Nitrobenzene	1
	3. Oxalic Acid	1
	4. Benzophenone	1
	5. o-Chloro benzoic acid	1
	6. p -Toluidine	1
	7. Resorcinol	1
II	Inorganic preparation	
	1. Mohr's salt	2
	2. Potash Alum	2
III	Revision of the Experiments and Internal Viva	1
Total		12

Subject Code : EE131114
Subject: Basic Electrical & Electronics Engineering-I Lab

L-T-P: 0-0-2 **Credit 1**

Expected Weeks :12

Experiment No.	Experiment Title	Hours
I	Calibration of a Milliammeter as a Voltmeter.	1
II	Calibration of a Millivoltmeter r as an Ammeter	1
III	Characteristics of Filament Lamp.	1
IV	Verification of Thevenins Theorem	1
V	Verification of Maximum Power Transfer Theorem	1
VI	Study of R-L-C Series Circuit	1
VII	Study of R-L-C Parallel Circuit	1
VIII	Forward Characteristics of Semiconductor Diode	1
IX	Measurement of Power with Wattmeter.	1
X	Measurement of Ohmic & Effective Resistance	1
XI	Revision of the Experiments and Internal Viva	2
Total		12

Subject Code : CS131115
Subject: Introduction to Computing Lab

L-T-P: 0-0-2 **Credit 1**

Expected Weeks :12

Experiment No.	Experiment Title	Hours
I	(a) Write a program to display Hello World. (b) Write a program to find: i. Addition of two numbers. ii. Subtraction of two numbers. iii. Multiplication of two numbers. iv. Division of two numbers.	1
II	(a) Write a program to find area of : i. Rectangle. (ii) Circle.(iii)Triangle. (b) Write a program to find simple interest, compound interest and amount.	1
III	(a) Write a program to check whether the number is odd or even. (b) Write a program to find the greater of two numbers. (c) Write a program to do swapping of two numbers using third variable. (d) Write a program to find the greatest of three numbers using if else.	1
IV	(a) Write a program to calculate the sum of all the numbers from 1 to 50 using for loop. (b) Write a program to display your name upto 10 times using while loop. (c) Write a program to print even numbers from 1 to 50.	1
V	(a) Write a program to add the digits of a 4 digit number. (b) Write a program to covert temperature from C to F and F to C. (c) Write a program to check whether a year is leap year or not.	1
VI	(a) Write a program to display an array of elements. (b) Write a program to find the factorial of a number. (c) Write a program to print all the numbers divisible by 2 and 3 between 1 and 50.	1
VII	(a) Write a program to find the greatest among 10 numbers. (b) Write a program to perform a multiplication table of a user given number. (c) Write a program to reverse a number.	1
VIII	(a) Write a program to find the area of a triangle,rectangle and circle using switch case. (b) Write a program to calculate the grade using nested if and case statements. (c) Write a program to perform addition, subtraction & multiplication of two numbers using switch case.	1
IX	(a) Write a program to find the smallest among 10 numbers. (b) Write a program for swapping of two numbers using functions. (c) Write a program to find the factorial of a number using function.	1

X	(a) Write a program to copy a string using library function. (b) Write a program to calculate x=a*(b*c)/(b-c). (c) Write a program to calculate sum of even numbers from 1 to 50. (d) Write a program to find the sum of numbers divisible by 7.	1
XI	(a) Write a program to display your name upto 10 times using for loop. (b) Write a program to find the length of a string using library function. (c) Write a program to reverse a string using library function. (d) Write a program to concatenate a string using library function.	1
XII	Revision of the Experiments and Internal Viva	1
Total		12

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