



ASSAM SCIENCE AND TECHNOLOGY UNIVERSITY

Course Structure and Syllabus for the First Semester B. Sc. (Electronic Science) Programme

FIRST SEMESTER

Sl. No.	Sub-Code	Subject	Hrs / Week			Credits
			L	T	P	C
Theory						
1	MA161101	Mathematics I	3	2	0	4
2	PH161102	Physics I	3	2	0	4
3	HS161104	English communication and technical writing	2	2	0	3
4	BES161103	Basic Electronics	2	2	0	3
5	BES161105	Electricity and magnetism	2	2	0	3
6	BES161106	Semiconductor devices and its application	2	2	0	3
Practical						
7	PH161112	Physics-I Lab	0	0	2	1
8	BES161113	Electronics Lab-I in Basic Electronics	0	0	4	2
9	BES161116	Electronics Lab-II in Semiconductor devices	0	0	4	2
Total			14	12	10	25
Total Contact Hours = 36						
Total Credits = 25						

Subject code: MA161101

Subject: Mathematics-I

L-T-P: 3-2-0

Credit: 4

Modules	Topics	Course Content	Hours
1	First order differential equation	Exact linear and Bernoulli's form, second order differential equation with constant coefficient, equations in Clairaut's form.	8
2	Vector algebra and calculus	Vector algebra - Scalar and vector triple products and related problems. Equations of straight lines. Vector calculus Vector function of a scalar variable Differentiation of a vector function Scalar vector point function Gradient of a scalar point function Directional derivatives and related problems Divergence and curl of a vector point function Idea of line, surface and volume integrals Green's theorems Gauss' divergence theorems and Stokes theorems (Statements and applications).	12
3	Binominal, Exponential and logarithm series	Approximation using Binomial theorem- Summation of series based on the above elementary properties of a group- Centre of the group- cyclic groups- Cosets normal and conjugate subgroups- Homomorphism of groups- Kernel- Lagrange's theorem.	10
4	Logarithmic differentiation	Differentiation in parametric form- Implicit function- Successive differentiation- Leibnitz theorem (statement only)- Problems using above theorem- Derivatives and radius of curvature- Partial differentiation- Higher order partial derivatives maxima and minima.	9
5	Preliminary concepts of straight lines	Straight lines, coplanar lines, conditions for two lines to be coplanar- Equation of the plane containing two lines- To find the shortest.	9
		Total	48

Text Books/Reference Books:

1. N. Seshadri, Text Book of Calculus.
2. T.K. Manikavasagam Pillai, "Ancillary Mathematics". S. Viswanathan.
3. Ordinary and Partial differential equation, B.S. Grewal.
4. Vector Analysis (Schaum's Outline Series).

Subject code: PH161102

Subject: Physics-I

L-T-P: 3-2-0

Credit: 4

Module	Topics	Course Content	Hours
1	General Physics	Conservative and non-conservative forces, force as gradient of potential, Rotational motion, torque, angular momentum, conservation of angular momentum, work and power in rotational motion, KE of rotation, moment of inertia, Gravitation: Kepler's law of planetary motion, Newton's law of gravitation from Kepler's law, artificial satellites, geostationary satellite, eccentricity of orbit of a satellite, escape velocity. Elasticity: Hook's law, different kinds of elastic constants, work done in deforming a body, Relation among the elastic constants. Surface tension, excess pressure inside soap bubble and liquid drop, rise of liquid in a capillary tube, Streamline and turbulent flow, critical velocity, viscosity of fluids, Poiseuille's equation. Bernoulli's equation.	15
2	Geometrical and wave Optics	Spherical and Chromatic aberrations, Expression for longitudinal chromatic aberration, Achromatism of thin lens, Interference: Interference of light, Types of Interference (division of wavefront and division of amplitude), Diffraction:Fresnel and Fraunhofer Diffraction, Fraunhofer diffraction at a single slit, Intensity distribution in the diffraction pattern due to single slit.	10
3	Electrostatics and current electricity	Gauss's theorem and its applications, potential due to dipole, Capacity of parallel plate capacitor, effect of dielectric on capacity of capacitor, mechanical force on charged conductor, energy stored in a charged capacitor. Electric current density, Applications of Kirchoff's law to solve electrical network problem, Electromagnetic induction: Self and mutual induction, Alternating current: Generation of alternating current, current and potential across resistive, inductive and capacitive elements and their phase relationships, power factor.	10
4	Dielectrics	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, effect of temperature and frequency on polarization, Dielectric loss.	6
5	Magnetic Materials	Classification of magnetic materials, Diamagnetism, paramagnetism, ferromagnetism, Domain theory of ferromagnetism, Hysteresis Loss, Expression for Hysteresis loss in B-H loop, soft and hard magnetic materials,	7

		Antiferromagnetism and Ferrimagnetism, Application of magnetic material in different fields.	
		Total	48

Text books/ Reference books

1. Elements of Properties of Matter, D. S Mathur.
2. Fundamentals of Physics, Jearl Walker
3. Electricity and Magnetism - D.Chattopadhyay and P.C.Rakshit.
4. A Text book of Light - B Gosh and K G Mazumdar
5. College Physics, K. N. Sharma & Neerja

Subject code: HS161104

Subject: English communication and technical writing

L-T-P: 2-2-0

Credit: 3

Modules	Topics	Course Content	Hours
1	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.	4
2	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.	8
3	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).	8
4	Career oriental communication	Resume Writing, Curriculum Vitae (Cv) , Statement Of Purpose (Sop) Team-Talks, Group Discussion And Interviews	5
5	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.	6
6	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.	5
		Total	36

Text Books/Reference Books:

- 1) P. Balasubramaniam- Phonetics for English Students
- 2) David Crystal- Cambridge Encyclopedia of English Language
- 3) V. Sasikumar and P.V. Dhamija- Spoken English
- 4) Ludlow And Pantheon- The Essence of Effective Communication

Subject code: BES161103

Subject: Basic Electronics

L-T-P: 2-2-0

Credit 3

Modules	Topics	Course Content	Hours
1	Introductory circuit analysis	Evolution and Impact of Electronics, Introduction to circuit component-resistors, capacitors, inductors, Current, Voltage, Power, Resistance and Ohm's law, Equivalent resistance. Equivalent capacitance, Linear controlled sources, Kirchhoff's law, Nodal Analysis, Mesh Analysis.	7
2	Diode	P-N junction Diode, Biasing a semi-conductor diode, Static and Dynamic resistance of a diode, breakdown of PN junction, ideal diode, Zener diode, Tunnel diode, Varactor, diode, Light Emitting diode(LED) and Photodiode.	6
3	Rectifiers	Half wave and full wave rectifier, bridge rectifiers, ripple factor, rectification efficiency	5
4	Transistors	Introduction to transistors, types, CE,CB,CE-configuration, concept of α and β , and their relationship, characteristics of CE transistor, cut-off, saturation and active mode, concept of DC operating point.	8
5	Digital electronics	Number system and codes, Decimal and binary numbers, conversion of decimal to binary and vice versa, Basic building blocks in digital electronics, NOT, AND,OR, NAND, NOR, XOR ,X-NOR.	5
6	Electronics Instruments	Electronic voltmeter, Ammeter, Function Generator, Digital Multimeter and their applications, CRO and its applications	5
		Total	36

Text Book/Reference Books:

- 1) Basic Electronics-Debashish De
- 2) Foundation of Electronics-J.R Cogdell
- 3) Principles of Electronics- V. K. Mehta
- 4) Basic Electrical and Electronics Engineering- -Sukheja and Nagsarkar

Subject code: BES161105

Subject: Electricity and Magnetism

L-T-P: 2-2-0

Credit 3

Modules	Topics	Course Content	Hours
1	Electrostatics	Electrostatic Field, electric flux, Gauss's theorem of electrostatics. Applications of Gauss theorem- Electric field due to point charge, infinite line of charge, uniformly charged spherical shell and solid sphere, plane charged sheet, charged conductor. Electric potential as line integral of electric field, potential due to a point charge, electric dipole, uniformly charged spherical shell and solid sphere. Calculation of electric field from potential. Capacitance of an isolated spherical conductor. Parallel plate. Energy per unit volume in electrostatic field. Dielectric medium, Polarisation, Displacement vector. Gauss's theorem in dielectrics. Parallel plate capacitor completely filled with dielectric.	12
2	Magnetism	Magnetostatics: Biot-Savart's law & its applications- straight conductor, circular coil, solenoid carrying current. Divergence and curl of magnetic field. Magnetic vector potential. Ampere's circuital law. Magnetic properties of materials: Magnetic intensity, magnetic induction, permeability, magnetic susceptibility. Brief introduction of dia-, para- and ferro-magnetic materials.	10
3	Electromagnetic Induction	Faraday's laws of electromagnetic induction, Lenz's law, self and mutual inductance, L of single coil, M of two coils. Energy stored in magnetic field.	6
4	Maxwell's equations and Electromagnetic wave propagation	Equation of continuity of current, Displacement current, Maxwell's equations, energy density in electromagnetic field, electromagnetic wave propagation through vacuum and isotropic dielectric medium, transverse nature of EM waves, polarization.	8
Total			36

Text books/Reference Books:

- 1) Electricity and Magnetism by A Mahajan, A Rangwala
- 2) Introduction to Electrodynamics: David J. Griffiths
- 3) Electricity and Magnetism, Edward M. Purcell, 1986, McGraw-Hill Education.
- 4) Electricity and Magnetism, D C Tayal, 1988, Himalaya Publishing House
- 5) Electricity & Magnetism: B.Ghosh

Subject code: BES161106

Subject: Semiconductor devices and its application

L-T-P: 2-2-0

Credit 3

Modules	Topics	Course Content	Hours
1	Semiconductor Basics	Energy band in solids (insulators, semi-conductor and metals), effective mass, density of states, Intrinsic and extrinsic semiconductors, carrier concentration at normal equilibrium in intrinsic semiconductors, Fermi level for intrinsic semiconductors, donors, acceptors, majority carriers (electrons and holes), Mass action law, dependence of Fermi level on temperature and doping concentration. Diode: p-n junction diode, formation of depletion layer, space charge at a junction. Derivation of electrostatic potential difference at thermal equilibrium, depletion width and depletion capacitance of abrupt p-n junction. Diode equations and the V-I characteristic. Zener and Avalanche mechanism, Zener diode.	8
2	Bipolar Junction Transistors (BJT)	PNP and NPN transistors, basic transistor action, energy band diagram of transistor in thermal equilibrium, Early effect, input and output characteristics of CB, CE and CC configurations	5
3	Unijunction Transistor (UJT):	Construction, working and characteristics of UJT.	4
4	Thyristor Devices	Basic construction and Characteristics of Thyristor, Semiconductor Controlled Rectifier(SCR), Characteristics and two transistor model of SCR.	6
5	Field Effect Transistors (FET)	Construction of JFET, idea of channel formation, pinch-off voltage, characteristics of JFETs, Merits and Demerits of JFET MOSFET: MOS Diode, Basic Construction of MOSFET and working, Characteristics, enhancement and depletion modes. CMOS.	7
6	Semiconductor Fabrication Technology	Introduction to semiconductor technology. Basic fabrication steps: Wafer, epitaxial growth, oxidation, photolithography, etching, diffusion, ion implantation, film deposition and metallization.	6
Total			36

Text Books/Reference books:

- 1) Physics of semiconductor devices- S.M Sze John Wiley
- 2) Semiconductor devices- J. Singh, Mcgrawhil
- 3) Solid state Electronics- S.Wang.
- 4) An Introduction to Solid State Physics- Charles Kittel, Wiley Publishers

Subject code: PH161112

Subject: Physics-I Lab

L-T-P: 0-0-2

Credit 1

Experiment No.	Aim of the Experiment	Hours
1.	Determination of Rigidity modulus of a material of a given rod by Statical method	1
2.	Determination of moment of inertia of given solid about its own axis by using M. I. Table	1
3.	Determination of resistance of galvanometer using post office box.	1
4.	Determination of ratio of EMF of two cells using potentiometer	1
5.	Determination of Young's modulus using Searl's apparatus	1
6.	Determination of powers of lenses using an optical bench i) Concave lens II) Convex lens	2
7.	Determination of Horizontal components of Earth's magnetic field using magnetometer	1
8.	Determination of a) angle of incidence and deviation curve of a prism using spectrometer b) angle of minimum deviation and refractive index of a material of the prism	2
9.	Determination of coefficient of Viscosity of water by capillary flow method	1
10.	Revision of experiments and internal viva	1
	Total	12

Subject code: BES161113

Subject: Electronics Lab-I in Basic Electronics

L-T-P: 0-0-4

Credit: 2

Experiment No.	Aim of the Experiment	Hours
1	Familiarization with Electronic voltmeter, Ammeter, Function Generator, Digital Multimeter and CRO.	3
2	Verification of Ohm's law	3
3	To study the V-I characteristics of PN junction diode and draw its load line.	3
4	To study reverse bias characteristics of a zener diode.	3
5	Zener diode as voltage regulator.	3
6	To study HWR and FWR and measurement of ripple factor.	3
7	To study diode as shunt clipping element.	3
8	Realization of different Logic Gates.	3
	Total	24

Subject code: BES161116

Subject: Electronics Lab-II in Semiconductor devices

L-T-P: 0-0-4

Credit 2

Experiment No.	Aim of the Experiment	Hours
1	Static collector characteristics of a BJT in the common emitter configuration.	3
2	Static collector characteristics of a BJT in the common base configuration.	3
3	Static collector characteristics of a BJT in the common collector configuration.	3
4	Static drain characteristics of a n-channel Junction Field Effect Transistor in the common source configuration.	3
5	Transfer Characteristic of the given JFET.	3
6	Frequency response of BJT.	3
7	SCR characteristic.	3
8	UJT Characteristic.	3
	Total	24
