ASSAM SCIENCE AND TECHNOLOGY UNIVERSITY

Course Structure and Syllabus
for the First Semester B. Sc. (Applied Physics) 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	BAP161102	Computer Science I	2	2	0	3
3	HS161104	English communication and technical writing	2	2	0	3
4	BAP161103	Methodology of Science and Physics	2	0	0	2
5	BAP161105	General Physics I	3	2	0	4
6	BAP161106	General Physics II	3	2	0	4
Practical						
7	BAP161115	Physics Lab I	0	0	4	2
8	BAP161116	Physics Lab II	0	0	4	2
9	BAP161112	Computer Science lab I	0	0	2	1
Total			15	10	10	25
Total Contact Hours = 35						
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: BAP161102
Subject: Computer Science – I

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

Modules	Topics	Course Content	Hours
1	**Fundamentals**	Major components of a digital computer (A brief introduction of CPU, main memory, secondary memory devices and I/O devices), keyboard, monitor, mouse, printers, secondary storage devices (floppy disks, hard disks and optical disks), backup system and why it is needed ? Bootstrapping a computer. Representation of numbers and characters in computer. ASCII, EDCDIC and Gray codes. Interpreter, assembler, linker and loader, definition and concept of algorithm, flowchart.	**10**
2	**Number System**	Binary, hexadecimal, octal, BCD and conversions of number systems. Representations of signed integers, sign and magnitude, 1's complement and 2's complement representation, arithmetic operations using 2's complement representation and conditions for overflow/underflow and its detection	**8**
3	**Processor Logic Design**	Information representation, computer arithmetic and their implementation, control data path, data path components, design of ALU and data path, control unit, status register, accumulator.	**6**
4	**Memory**	Memory organization, static and dynamic memory, cache memory and memory hierarchy, cache memory access techniques, virtual memory.	**6**
5	**Operating System**	Introduction to Operating System, Operating System functions, general features evolution of OS, different types of OS (batched, multi programmed, real time, time sharing, distributed, parallel) operating system structure(simple, layered, virtual machine), OS services, proccesses.	**6**
		Total	**36**

Text Books/Reference Books:

1. Fundamentals of Computers by Rajaraman, Prentice Hall of India.
2. Operating System: Concept & Design by Milenkovie M., McGraw Hill.
3. Computer System Architecture by Mano, M. M.
4. Computer Organization & Design, by Chaudhury, P. Pal, PHI

Subject code: HS161104

Subject: English Communication and Technical Writing

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

Modules	Topics	Course Content	Hours
1	**Basic of Communications**	Need of Communication skills; Channels, Forms and dimension 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, reports writing strategies, analysis of a sample report	**8**
3	**Grammar and vocabulary**	Tenses and concepts of time, active and passive constructions, direct-indirect speeches, preposition, conditionals, parallel structure, modifiers, sentence transformation, vocabulary (idioms, confusable, one word substitute, Synonyms-antonyms)	**8**
4	**Career oriental communication**	Resume writing, curriculum vitae, statement of purpose, 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 email for business communication, standard email practices, language in email, using internet for collecting information, referencing while using internet materials for project reports.	**6**
6	**Language Laboratory**	a. Emphasizing Listening and comprehension skill, reading skill, sound structure of English and intonation patterns b. Language laboratory training in speaking skills covering oral presentations, mock interviews and model group discussion through the choice of appropriate programmes.	**5**
		Total	**36**

Text Books/Reference Books:

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

Subject code: BAP161103

Subject: Methodology of Science and Physics

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

Module	Topics	Course Content	Hours
1	**Methodology And Perspectives Of Sciences**	Types of knowledge: Practical, Theoretical, and Scientific knowledge, Information. What is Science; what is not science; laws of science. Basis for scientific laws and factual truths. Science as a human activity, scientific temper, empiricism, vocabulary of science, science disciplines. Revolution in science and Technology.	**6**
2	**Methods and tools of science**	Hypothesis: Theories and laws in science. Observations, Evidences and proofs, Posing a question; Formulation of hypothesis; Hypothetico-deductive model, Inductive model. Significance of verification (Proving), Corroboration and falsification (disproving), Auxiliary hypothesis, Ad-hoc hypothesis. Revision of scientific theories and laws, Importance of models, Simulations and virtual testing, Mathematical methods vs. scientific methods. Significance of Peer Review	**8**
3	**Methodology and Perspectives of Physics**	What does physics deal with? - brief history of physics during the last century-the inconsistency between experiments and theories- Birth of new science concepts . Example of quantum concepts – examples:- Design of an experiment, experimentation, Observation, data collection: Key breakthroughs in physics and scientific research – Example from Relativity - scientific imagination and the need for rigorous experimental evidence. Need for mathematical language for physics – Electronic computer as one of the greatest tools for combination of mathematics and physics – Role of invention of new - Scientific instruments- interaction between physics and life science – interaction between physics and technology.	**10**
		Total	**24**

Text books/Reference Books

1. Cultural Boundaries of Science, Gieryn, T F. Univ. of Chicago Press, 1999
2. The Golem: What Everyone Should Know About Science, Collins H. and T Pinch, Cambridge Uni. Press, 1993.
3. Conceptual Integrated Science, Hewitt, Paul G, Suzanne Lyons, John A. Suchocki & Jennifer Yeh, Addison-Wesley, 2007.
4. The inspiring History of Physics in the Last One Hundred Years: Retrospect and prospect Prof. Dr-lng . Lu Yong xiang, http :// www.twas .org.cn/twas/proLu.asp
5. Attitude of teachers towards physics and paranormal phenomena, HenrykSzyd Lowsky, www.Conceptsofphysics.net/IV -4-685.pdf.

Subject code: BAP161105

Subject: General Physics I

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

Module	Topics	Course Content	Hours
1.	**Elasticity**	Different type of elastic constants and relation among them. Energy in a strained body, torsion of a rod, torsional oscillation, bending of beam, bending moment, cantilever, depression of a cantilever considering the weight of the beam. Elastic properties, Young, bulk and rigidity moduli, yield stress, Poisson's ratio, compressibility, creep and fatigue, plasticity.	**10**
2.	**Fluids**	Surface Tension: Synclastic and anticlastic surface - Excess of pressure - Application to spherical and cylindrical drops and bubbles - variation of surface tension with temperature - Jaegar's method Viscosity: Viscosity - Rate flow of liquid in a capillary tube - Poiseuille's formula - Determination of coefficient of viscosity of a liquid - Variations of viscosity of a liquid with temperature lubrication. Physics of low pressure - production and measurement of low pressure - Rotary pump - Diffusion pump - Molecular pump - Knudsen absolute gauge - penning and pirani gauge – Detection of leakage.	**11**
3.	**Harmonic Oscillator**	Periodic Motion, Simple Harmonic Motion and Harmonic Oscillator, Energy of a Harmonic Oscillator, Examples of Harmonic Oscillator , Anharmonic Oscillator, Composition of Two Simple Harmonic Motions of Equal Periods in a Straight Line, Composition of Two Rectangular Simple Harmonic Motions of Equal Periods: Lissajous Figures, Damping Force, Damped Harmonic Oscillator, Examples of Damped Harmonic Oscillator ,Power Dissipation, Quality Factor, Forced Harmonic Oscillator	**10**
4.	**Waves**	Wave Motion, General Equation of Wave Motion, Plane Progressive Harmonic Wave, Energy Density for a Plane Progressive Wave, Intensity of a Wave, Transverse Waves in Stretched Strings, Modes of Transverse Vibrations of Strings, Longitudinal Waves in Rods and Gases, Fouriers Theorem, Wave Velocity and Group Velocity	**8**
5.	**Acoustics**	Intensity of Sound- Decibel and Bel, Loudness of Sound, Noise Pollution, Ultrasonics: Production of Ultrasonic Waves- Piezo Electric Crystal Method, Determination of Velocity of Ultrasonic Waves in a Liquid - Acoustic Grating , Application of Ultrasonic Waves, Reverberation, Sabine's Formula (Derivation not required), Absorption Coefficient, Acoustics of Buildings	**9**
		Total	**48**

Text Books/ Reference Books

1. An Introduction to Mechanics, D. Kleppner and R. J. Kolenkow
2. Properties of Matter, D.S. Mathur
3. Mechanics, .S. Hans, S.P. Puri
4. Physics Part-I, Halliday and Resnick
5. Properties of Matter and Acoustics by R.Murugeshan& Kiruthiga Sivaprasath 2005
6. Text book of Sound –Brij Lal& Subramaniam

Subject Code: BAP161106

Subject: General Physics II

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

Module	Topics	Course Content	Hours
1	**Infinite sequences and series**	Convergence and divergence, conditional and absolute convergence, ratio test for convergence. Functions of several real variables - partial differentiation, Taylor's series, multiple integrals. Random variables and probabilities - statistical expectation value, variance; Analysis of random errors: Probability distribution functions (Binomial, Gaussian, and Poisson)	**8**
2	**Vector analysis**	Gradient, Divergence and Curl, Line, Surface, and Volume integrals, Gauss's divergence theorem and Stokes' theorem in Cartesian, Spherical polar and cylindrical polar coordinates, Dirac Delta function.	**9**
3	**Matrices**	Hermitian adjoint and inverse of a matrix; Hermitian, orthogonal, and unitary matrices; Eigenvalue and eigenvector (for both degenerate and non-degenerate cases); Similarity transformation; diagonalization of real symmetric matrices.	**8**
4	**Electrostatics**	Gauss's law and its applications, Divergence and Curl of Electrostatic fields, Electrostatic Potential, Boundary conditions, Work and Energy, Conductors, Capacitors, Laplace's equation, Method of images, Boundary value problems in Cartesian Coordinate Systems, Dielectrics, Polarization, Bound Charges, Electric displacement, Boundary conditions in dielectrics, Energy in dielectrics, Forces on dielectrics.	**10**
5	**Magneto statics**	Lorentz force, Biot-Savart and Ampere's laws and their applications, Divergence and Curl of Magnetostatic fields, Magnetic vector Potential, Force and torque on a magnetic dipole, Magnetic materials, Magnetization, Bound currents, Boundary conditions	**5**
6	**Electrodynamics**	Ohm's law, Motional EMF, Faraday's law, Lenz's law, Self and Mutual inductance, Energy stored in magnetic field, Maxwell's equations, Continuity Equation, Poynting Theorem, Wave solution of Maxwell Equations	**8**
		Total	**48**

Text Books/ Reference Books

1. Mathematical methods for physicists, Arfken and Weber (Academic Press)
2. Mathematical Physics, Rajput and Yogprakash (Pragati Prakashan, Meerut)
3. Vector Analysis, Murray R. Spiegel (Schaum Series)
4. Electricity and Magnetism – Chatterjee and Rakshit.
5. Electricity and Magnetism – A. S. Mahajan and A. A. Rangwala (Tata McGraw-Hill).
6. Introduction to Electrodynamics – D. J. Griffith, (Prentice Hall, India Pvt. Ltd).

Subject Code: BAP161115

Subject: Physics Lab I

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

Experiment No.	Aim of the Experiment	Hours
1.	To measure the extension of an experimental wire due to different pulling forces using Searle's apparatus and hence determine the Young's modulus of the material of the wire.	**3**
2.	Study the variation of angle of twist of a given rod at different lengths from the fixed end, with torque & then determine the rigidity modulus of the material of the rod.	**3**
3.	To study the variation of time period of a bar pendulum about different point of suspension and use the result to find the value of g at a place.	**3**
4.	To determine the moment of inertia of a fly-wheel	**3**
5.	Determination of the frequency of a tuning fork with the help of a sonometer /Determination of frequency of AC mains using sonometer	**3**
6.	To determine the surface tension of fruit juice extracted from various citrus fruit using Jagers method.	**3**
7.	Determination of the surface tension of water by capillary rise method.	**3**
8.	To determine the spring constant and mass from vertical oscillations of a loaded spring and hence to determine the modulus of rigidity of the material of the spring.	**3**
	Total	**24**

Subject Code: BAP161116

Subject: Physics Lab II

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

Experiment No.	Aim of the Experiment	Hours
1	i. Identification of active and passive components of an electronic circuit. ii. Familiarization with operation of basic measuring and test equipment(analog and digital multimeters, function generator, Cathode ray oscilloscope) iii. To use a multimeter for identification of different terminals of (i) diode and (ii) transistor.	**4**
2	To find the value of resistor from colour code and verify by measuring the resistance by multimeter.	**1**
3	Determination of value of low resistance by potential drop method	**1**
4	Determination of internal resistance of a cell with the help of potentiometer	**2**
5	Investigation of series resonant LCR circuit, To draw resonance curve and to find out the resonance frequency and thus find the values of capacitance	**2**
6	To determine the temperature of the filament of a torch bulb by studying the change of its resistance with c	**2**
7	Determination of (i) an unknown resistance and (ii) resistance per unit length of an wire by Carey Foster method.	**2**
8	To convert a given galvanometer into a voltmeter of given range and then calibrate it with help of an ammeter and standard resistance.	**3**
9	To determine the horizontal component of earth's magnetic field with the help of a tangent galvanometer and copper voltameter.	**3**
10	To convert a given galvanometer into an ammeter of given range and then calibrate it with the help of a copper voltameter.	**2**
11	Determination of High resistance by substitution method.	**2**
	Total	**24**

Subject Code: BAP161112

Subject: Computer Science Lab I

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

Experiment No.	Aim of the Experiment	Hours
1.	Microsoft word document	2
2.	MS Excel	2
3.	C program to print your name	1
4.	C program to implement different types of arithmetic operators	1
5.	C program to calculate area and circumference of a circle	1
6.	C program to find greatest of 3 nos.	1
7.	C program to convert temperature to Fahrenheit	1
8.	C program to find factorial of a number	1
9.	C program to calculate the sum of the marks of five subjects and find percentage	1
10.	C program to reverse a given number	1
	Total	**12**

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