ASSAM SCIENCE AND TECHNOLOGY UNIVERSITY

Guwahati

Course Structure and Syllabus

(From Academic Session 2018-19 onwards)

B.Tech 1st Semester (Group B)

For the branches:

- **Electrical Engineering (EE)**
- **Computer Science and Engineering (CSE)**
- **Electronics and Communication Engineering (ECE)**
- **Electronics and Telecommunication Engineering (ETE)**
- **Instrumentation Engineering (IE)**
- **Power Electronics and Instrumentation (PEI)**
- **Electrical and Electronics Engineering (EEE)**

NOTE: Three weeks Mandatory Induction Program need to be done before the commencement of the B.Tech 1st semester classes as per the AICTE mandate

Mandatory Induction Program

3 weeks duration
• Physical activity • Creative Arts • Universal Human Values • Literary • Proficiency Modules • Lectures by Eminent People • Visits to local Areas • Familiarization to Dept./Branch & Innovations

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B.Tech 1st Semester (Group B)

Semester I/ B.TECH

NOTE: Three-weeks mandatory Induction programme is to be done before the commencement of the classes as per the AICTE mandate

Sl. No.	Sub-Code	Subject	Hours per Week			Credits
			L	T	P	C
Theory						
1	PH181101	Physics-101	3	1	0	4
2	MA181102	Mathematics-I	3	1	0	4
3	CE181103	Engineering Graphics and Design	1	0	4	3
4	ME181104	Engineering Mechanics	3	0	0	3
5	HS181105	Sociology	2	0	0	2
Practical						
1	PH181111	Physics-101 Lab	0	0	2	1
2	ME181114	Engineering Mechanics Lab	0	0	2	1
		TOTAL	12	2	8	**18**
Total Contact Hours per week : 22						
Total Credits: 18						

Course Code	Course Title	Hours per week L-T-P	Credit C
PH181101	**Physics-101**	**3-1-0**	**4**

MODULE 1: Introduction to Electromagnetism (8 Lectures)

Introduction to Gradient, Divergence and Curl, Laplace's and Poisson's equation for electrostatic potential. **(2 lectures)**

Biot-Savart law, Ampere's law, Inconsistency in Ampere's law, Continuity equation, Displacement current, Maxwell's equations with significance. **(3 lectures)**

Classification of magnetic materials – Diamagnetism, Paramagnetism, Ferromagnetism, Domain theory, Hysteresis loop, Hysteresis loss, Soft and Hard magnetic materials. **(3 lectures)**

MODULE 2: Optics (7 Lectures)

Aberration in lenses, Spherical and Chromatic Aberration, Method of minimization of Spherical and Chromatic Aberration. **(3 Lectures)**

Interference of light by division of wave front (brief discussion) & division of amplitude, Interference due to reflected light in plane parallel film, Interference in variable thickness (wedge shaped) film, Newton's rings. **(4 Lectures)**

MODULE 3: Lasers, Fibre Optics and Holography (9 Lectures)

Induced absorption, spontaneous and stimulated emission, Einstein's coefficients, population inversion, pumping, meta-stable state, principle of LASER, characteristics of a laser beam, Gas (He-Ne) laser, Solid state (Nd:YAG) laser and semiconductor laser, Applications of lasers. **(4 Lectures)**

Optical fibre - Principle and Structure, Propagation of light in optical fibres, Numerical aperture and angle of acceptance, Classification of optical fibres – Fiber optics materials, Single mode and Multimode optical fibres, Step Index and Graded Index optical fibres, Losses in fibres, Optical fibre communication system (Block diagram only), Introduction to Holography. **(5 Lectures)**

MODULE 4: Quantum Mechanics (5 Lectures)

Wave nature of particles, Uncertainty principle, Wave function and wave packets, Time dependent & time independent Schrodinger equation, Solution of Schrödinger's equation for one dimensional problem: Particle in a box.

MODULE 5: Solid, Semiconductors and Superconductivity (9 Lectures)

Free electron theory of metals, Density of States, Fermi level, Kronig Penny Model (Qualitative) and origin of energy bands: Metals, Semiconductors and Insulators, Solar Cell, LED, Hall effect. **(5 Lectures)**

Properties of Superconductors; Meissner effect, Critical Magnetic Field, Isotope effect, Persistent current, Magnetic levitation, Type-1 & Type-2 superconductors and their comparison, BCS theory of superconductivity (qualitative only). **(4 Lectures)**

Note: *The syllabus of Physics PH181101 for Group B is designed as per the AICTE directives to teach different topics of Physics to different branches of Engineering to cater to their specific needs. However, in order to give the students a complete essence of Physics, the following topics may be taught in brief (maximum 4 hours) in tutorial classes, or may be encouraged to learn these topics by using online resources e.g. NPTEL lectures etc. and assignments may be given to ensure their learning. These topics, however, are not to be included in end semester examinations:*

- *Central forces, conservative and non-conservative forces, Definition of Torque, Principle of conservation of angular momentum;*
- *Definition of Viscosity, Stoke's law, Terminal velocity, Streamline and Turbulent flow (Qualitative);*
- *Definitions of Stress, Strain, the three moduli of elasticity and Poisson's Ratio.*

Text Books:

1. Applied Physics for Engineers – Neeraj Mehta (PHI Learning Pvt. Limited)
2. A text Book of Engineering Physics – Dr. M.N. Avadhanulu and Dr. P.G. Kshirsagar (S. Chand and Company Pvt. Limited)

Reference Books:

1. Introduction to Electrodynamics – D. J. Griffiths (Prentice Hall)
2. A Detailed text book of Engineering – Dr. S.P. Basavaraju (Subhas Stores, Bangalore)

Course Outcome: After successful completion of the course, the students will be able to:

CO1: Apply the theoretical fundamentals of electromagnetism and optics to solve Engineering problems.
CO2: Relate the applications of lasers, Fibre optics and Holography to Engineering problems.
CO3: Explain the different aspects of Quantum Mechanics.
CO4: Explain the properties of metals, semi-conductors and super conductors as required for Engineering applications.

Course Code	Course Title	Hours per week L-T-P	Credit C
MA181102	**Mathematics-I**	**3-1-0**	**4**

CALCULUS AND LINEAR ALGEBRA

MODULE 1: Calculus (8 lectures)

Reduction formulae, applications of definite integrals to evaluate surface areas and volumes of solids of revolution, idea of improper integrals, Beta and Gamma functions and their properties.

MODULE 2: Calculus (8 lectures)

Successive differentiation, standard forms, Leibnitz's theorem (without proof), Taylor's and Maclaurin's theorem with remainders, indeterminate forms and L' Hospital's rule, Curvature and Radius of curvature (both in Cartesian and Polar co-ordinates).

MODULE 3: Sequences and series (6 lectures)

Idea of convergence of sequence and series, Fourier series, Half range sine and cosine series, Parseval's theorem.

MODULE 4: Multivariable Calculus (8 lectures)

Partial derivatives, Euler's theorem, Total derivatives, Maxima, Minima and saddle points, Method of Lagrange multipliers, Double and Triple Integrals and its applications to find areas and volumes.

MODULE 5: Linear Algebra (10 lectures)

Inverse and rank of a Matrix, Linear independence of vectors, rank-nullity theorem, system of linear equations, Symmetric, skew-symmetric and orthogonal matrices, Eigen values and eigen vectors, Diagonalization of matrices, Cayley-Hamilton theorem (without proof), Orthogonal Transformation.

Suggested Text/ Reference Books:

1. Erwin Kreyszig, Advanced Engineering Mathematics, 9th Edition, John Wiley & Sons, 2006.
2. G.B. Thomas and R.L. Finney, Calculus and Analytic geometry, 9th Edition, Pearson, Reprint, 2002.
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. D. Poole, Linear Algebra: A Modern Introduction, 2nd Edition, Brooks/Cole, 2005.

6. N.P. Bali and Manish Goyal, A text book of Engineering Mathematics, Laxmi Publications, Reprint, 2008.
7. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 36th Edition, 2010.

Course Outcome: After successful completion of the course, the students will be able to:

CO1: apply the techniques of differential and integral calculus to solve simple Engineering problems.
CO2: Interpret the significance of Beta and Gamma functions.
CO3: apply Rolle's Theorem, power series and Fourier series to Engineering problems.
CO4: apply multi-functional variables, matrices and linear algebra as tools to solve Engineering problems.

Course Code	Course Title	Hours per week L-T-P	Credit C
CE181103	Engineering Graphics and Design	1-0-4	3

MODULE 1: Introduction to Engineering Drawing (8 Lectures)

i. Principles of Engineering Graphics and their significance, usage of Drawing instruments.
ii. Lettering: Single stroke letter – Vertical and inclined capital and small letter,
iii. Scales: Plain scale and vernier scale.
iv. Curves: Conic sections – Ellipse, parabola, hyperbola, different methods of construction of conic sections, tangents and normal to conics.

MODULE 2: Orthographic Projections (14 Lectures)

i. Principles of Orthographic Projections- Conventions
ii. Projection of points : Introduction of projection, quadrants, 1st , 2nd , 3rd and 4th angle projection of points.
iii. Projection of lines (First angle only) : Line parallel to one or both planes, line perpendicular to a plane, line inclined to one plane and parallel to other, line inclined to both plane.
iv. Projections of planes (First angle only): Plane perpendicular to one plane and parallel to other, plane perpendicular to both plane, plane inclined to one plane and perpendicular to other.
v. Projection of solids (First angle only) : Axis perpendicular to one plane and parallel to other, axis parallel to both plane, axis inclined to one plane and parallel to other, axis inclined to both plane.

MODULE 3: Sections and Sectional Views of Right Angular Solids (4 Lectures)

Section of solids: Section plane parallel to one plane and perpendicular to other, section plane inclined to one plane and perpendicular to other.

MODULE 4: Isometric Projections (4 Lectures)

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.

MODULE 5: Introduction of Computer Graphics (6 Lectures)

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.; 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). Drawing simple shapes such as circle, parabola, etc. Drawing geometric solids; Drawing annotation, solid, surface, and wireframe models.

MODULE 6: Demonstration of simple team design (Students Project as group work) (4 Lectures)

Creation of engineering models and their presentation in standard 2D blueprint form, 3D wire-frame and shaded solids; meshed topologies for engineering analysis. Drawing of floor plans, front elevation and sectional elevation showing floor level to ceiling of a simple two storied building with doors and windows.

NOTE:

1. **Assessment of student based on above syllabus comprises of three parts**
    a. Theory examination covering Module 1 to Module 4
    b. Practical Examination covering Module 5
    c. Project covering Module 6

Text/Reference Books:

1. Bhat, N.D.& M. Panchal (2008), Engineering Drawing, Charotar Publishing House
2. Shah, M.B. & B.C. Rana (2008), Engineering Drawing and Computer Graphics, Pearson Education
3. Dhawan, R.K. (2007), A Text Book of Engineering Drawing, S. Chand Publications
4. Narayana, K.L. & P Kannaiah (2008), Text book on Engineering Drawing, Scitech Publishers.
5. Shah, M.B. & Rana B.C. (2008), Engineering Drawing and Computer Graphics, Pearson Education
6. User manual of CAD software.

Course Outcome: After successful completion of the course, the students will be able to:

CO1: Explain the basic principles of Engineering Graphics.

CO2: Apply the principles of orthographic and isometric problems to represent simple Engineering objects.

CO3: Apply the principle of sectioning to represent different views of Right Angular Solids.

CO4: Create simple shapes like Circle, parabola, geometric solids etc. using CAD software.

CO5: Demonstrate team work spirit through creation of Engineering models and their presentations.

Course Code	Course Title	Hours per week L-T-P	Credit C
ME181104	**Engineering Mechanics**	**3-0-0**	**3**

MODULE 1: Equilibrium of Rigid Bodies (6 Lectures)

Introduction, Free body diagram (FBD), Types of supports and their reactions, System of forces, Resultant of coplanar concurrent forces and non-concurrent force systems, Conditions of equilibrium, (i) concurrent forces in space (ii) non-concurrent forces in space.

MODULE 2: Analysis of Structures (3 Lectures)

Method of joint, method of sections, graphical methods.

MODULE 3: Friction (3 Lectures)

Introduction, laws of Coulombs friction, equilibrium of bodies involving dry friction; inclined plane, ladder friction, wedge friction.

MODULE 4: Centre of Gravity and Moment of Inertia (6 Lectures)

(i) Centre of gravity and centroid; location of centroid and centre of gravity (ii) Moment of inertia of plane area, Parallel axis theorem, perpendicular axis theorem, mass moment of inertia, polar moment of inertia, radius of gyration, product of inertia, M.I. of simple and composite bodies.

MODULE 5: Lifting Machines (4 Lectures)

Introduction, Principles of machines, reversibility of machines, lever, pulley, simple wheel and axle.

MODULE 6: Virtual Work and Energy Method (4 Lectures)

Introduction, virtual displacement, principle of virtual work, application of virtual work.

MODULE 7: Impulse, Momentum, Work and Energy (4 Lectures)

Linear impulse and momentum, Principle of work-energy conservation.

Text Books:

1. Engineering Mechanics by IH Shames, PHI.
2. Engineering Mechanics, Mariam and Craig, Wiley.

Reference Books:

1. Engineering Mechanics by S. Timoshenko and D.H. Young, McGraw Hill Int.
2. Engineering Mechanics by R.K. Banshal, Laxmi Publication (P) Ltd.
3. Engineering Mechanics by K.L. Kumar, McGraw Publishing Co.
4. Engineering Mechanics by Hibbler.

5. Engineering Mechanics by D.P Sharma, Pearson.
6. Engineering Mechanics Statics and Dynamics by A Nelson, McGraw Hill.
7. Engineering Mechanics by S.S. Bhavikatti, New Age International Publishers.

Course Outcome: After successful completion of the course, the students will be able to:

CO1: Explain the construction of Free Body Diagrams of rigid bodies in equilibrium, subjected to coplanar concurrent and non-concurrent forces.

CO2: Analyse structures by the method of joints, sections and graphically.

CO3: Apply the concepts of C.G. and M.I. to find the C.G. and M.I. of simple and composite bodies.

CO4: Explain the working principle of Lifting Machines.

CO5: Apply the principle of Virtual work and Work-Energy Conservation to solve simple Engineering problems.

Course Code	Course Title	Hours per week L-T-P	Credit C
HS181105	Sociology	2-0-0	2

MODULE 1: Understanding of Sociology (5 Lectures)

Introduction to sociology: Meaning and definition of sociology, nature and scope of sociology, significance of sociology; understanding of society and social institutions: family, community, group, culture and civilization, marriage, family, religion.

MODULE 2: Gender and Society (4 Lectures)

Concept of gender, differences between sex and gender, changing gender roles in society, gender equality and inequality, gender and poverty, gender discrimination.

MODULE 3: Social Change (5 Lectures)

Meaning and definition of social change, nature and characteristics of social change, modernization, industrialization, information and technology. Social disorganization and social problems (over population, poverty, unemployment, corruption and black money.

MODULE 4: Industrial Disputes (5 Lectures)

Meaning and definition of industrial disputes, causes and methods of settlement of industrial disputes. Trade union- definition of trade union, functions of trade union, problems of trade union in India. Indian factories Act, 1948.

MODULE 5: Human Resources (5 Lectures)

Meaning of human resources, significance of human resources, meaning of manpower planning, concept of productivity, factors of productivity, factors affecting productivity, workers' participation in management, unilateral and cooperative participation.

Textbooks/ References:

1. C.N. Shankar Rao: Principles of Sociology, New Delhi: S.Chand & Co. Ltd., 2006.

2. Mamoria C.B. , Mamoria S and Gankar. Dynamics of Industrial Relations in India, Himalaya Publishing House, New Delhi.

3. John, Mary E. Women's studies in India. New Delhi: Penguin, 2008.

4. Tong, R. Feminist Thought. Colorado: Westview Press, 2009.

5. Ram Ahuja - Social Problems in India, Jaipur: Rawat Publications, 2001.

6. M.N.Srinivas: Caste in Modern India, Oxford University Press, 1992.

7. Principles of Sociolgy by R.N. Sharma.

8. Labour problems and social welfare by R.C.Saxena.

9. Labour problems and social welfare by U.C.Kulshrestha.

Course Outcome: After successful completion of the course, the students will be able to:

CO1: Develop their sociological thinking to demonstrate sociological understandings of phenomena, for example, how individual biographies are shaped by social structures, social institutions, cultural practices, and multiple axes of difference and/or inequality.

CO2: Identify the major concepts and perspectives of sex-gender systems and practices in contemporary society.

CO3: Develop the ability of critical thinking through the ability to analyze and evaluate social, political, and/or cultural changes in society.

CO4: Exhibit the knowledge of sociological perspective of industry, conflict resolution and labour/management relation in industry.

CO5: Analyse the significance of human resources and its participation in various sectors of society.

Course Code	Course Title	Hours per week L-T-P	Credit C
PH181111	**Physics-101 Lab**	**0-0-2**	**1**

List of Experiments:

1. To find the Young's Modulus of Elasticity of the material of a wire by Searle's apparatus.
2. To find the value of the acceleration due to gravity by using: Bar Pendulum /Kater's Pendulum.
3. To determine the radius of curvature of the curved surface of the Plano convex lens or the wavelength of the source of light by Newton's Ring Method.
4. To determine the value of Mechanical Equivalent of heat, J by electrical method (using Joule's Calorimeter).
5. To find the Horizontal component of the Earth's magnetic field by using magnetometers.
6. To find the current flowing in an external circuit by using a potentiometer.
7. To find the powers of two given lenses (concave and convex), by using an optical bench.
8. To draw the characteristics curves of a Semiconductor Diode (p-n junction diode).
9. To find the value of a low resistance by the drop of potential method using a Meter Bridge.
10. To find the angle of acceptance and hence calculate the numerical aperture of an optical fibre.

Text Books:

1. A Text Book on Practical Physics – K.G. Mazumdar and B. Ghosh (Sreedhar Publishers).
2. A Text book of Practical Physics - Samir Kumar Ghosh (New Central Book Agency).

Course Outcome: After successful completion of the course, the students will be able to:

CO1: Carry out experiments to determine Young's Modulus of Elasticity of a wire and acceleration due to gravity using bar pendulum.
CO2: Determine the radius of curvature of curved surface of the plano-convex lens and wavelength of light source by Newton's Ring Method.
CO3: Determine the value of Mechanical equivalent of heat, horizontal component of the Earth's magnetic field and current flowing in external circuit by using a potentiometer.
CO4: Determine the power of two given lenses (Concave and Convex)
CO5: Carry out experiments to draw the characteristics curve of a semiconductor diode, find the value of low resistance, the angle of acceptance and numerical aperture of an optical fibre.

Course Code	Course Title	Hours per week L-T-P	Credit C
ME181114	**Engineering Mechanics Lab**	**0-0-2**	**1**

List of Experiments:

1. To verify the law of polygon of forces for a numbers of coplanar forces in equilibrium.
2. Parallel Forces Apparatus:
   A. To show experimentally the inverse relationship between reactive forces at support and the distance of the point of application of loads from supports.
   B. To find the reactive forces at the supports using:

      (i) Experimentally, (ii) Analytical method

3. Rolling Friction Apparatus:
   Experimental Computation of Co-Efficient of Friction between an Inclined Plane (Glass) and Trolley (Iron).
4. Square Threaded Screw Jack

   A. To determine the Velocity Ratio, Mechanical Advantage and Efficiency of a Square Threaded Screw Jack
   B. To construct the Curves showing relations of P – W, MA – W, η- W
5. To verify the Law of Moments by using a Bell Crank Lever
6. To verify the equilibrium of forces with the help of force polygon apparatus
7. To determine the co-efficient of friction between the slider and the inclined plane (sliding friction)

Course Outcome: After successful completion of the course, the students will be able to:

CO1: Establish the law of polygon of forces and equilibrium of forces through experimentation.

CO2: Determine the reactive forces at support and its relationship with the distance of the point of application of loads from support.

CO3: Determine the co-efficient of Rolling and Sliding friction on an inclined plane through experimentation.

CO4: Determine the velocity ratio, Mechanical advantage and efficiency of a square threaded screw jack.

CO5: Verify the law of moments by using a Bell crank lever.

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