



केन्द्रीय प्रौद्योगिकी संस्थान कोकराझार
CENTRAL INSTITUTE OF TECHNOLOGY KOKRAJHAR

Deemed to be University, MoE, Govt. of India
Kokrajhar, Assam 783370

www.cit.ac.in

COURSE STRUCTURE

AND

SYLLABUS FOR

DIPLOMA PROGRAMMES

1st year (Semester II)

(APPLICABLE FROM AY 2024-2025 ONWARDS)

CENTRAL INSTITUTE OF TECHNOLOGY KOKRAJHAR

Course structure for 2nd semester Diploma programme	3
01-DMA201	5
02-DPH 201	7
03-DCS201	9
04-DEE201	11
05-DME201	13
06-DPH 271	15
07-DCS271	17
08-DEE271	19
09-DME271	21
10-DCH201	23



**COURSE STRUCTURE
DIPLOMA PROGRAMMES
1st year
Semester II**

Sl. No.	Course Code	Course Name	L	T	P	C
01.	DMA201	Mathematics II	3	1	0	4
02.	DPH201	Applied Physics II	2	1	0	3
03.	DCS201	Introduction to IT Systems	2	1	0	3
04.	DEE201	Fundamentals of Electrical & Electronics Engineering	2	1	0	3
05.	DME201	Engineering Mechanics	2	1	0	3
06.	DPH271	Applied Physics II Lab	0	0	2	1
07.	DCS271	Introduction to IT Systems Lab	0	0	2	1
08.	DEE271	Fundamentals of Electrical & Electronics Engineering Lab	0	0	2	1
09.	DME271	Engineering Mechanics Lab	0	0	2	1
10	DCH201	Environmental Science	2	0	0	0
Contact Hours: 34			13	5	8	20

Legends:	
L	Lecture
T	Theory
P	Practical
C	Credits

Department of Mathematics
Central Institute of Technology Kokrajhar
Deemed to be University, Under MoE, Govt. of India
BTR, Assam-783370

(Proposed syllabus of the Diploma 2nd Semester)

Subject Code	Subject Name	L-T-P	Credit
DMA201	Mathematics-II	2-1-0	3

Course Objectives:

This course is designed to give a comprehensive coverage at an introductory level to the subject of matrices, Integral Calculus, Coordinate geometry, Basic elements of Vector Algebra and First Order Ordinary Differential Equations.

Course Contents:

UNIT-I: Determinants and Matrices : Elementary properties of determinants up to 3rd order, consistency of equations, Cramer's rule. Algebra of matrices, Inverse of a matrix, matrix inverse method to solve a system of linear equations in 3 variables.

UNIT-II: Integral Calculus : Integration as inverse operation of differentiation. Simple integration by substitution, by parts and by partial fractions (for linear factors only). Use of formulas $\int_0^{\pi/2} \sin^n x dx$, $\int_0^{\pi/2} \cos^n x dx$, and $\int_0^{\pi/2} \sin^m x \cos^n x dx$ for solving problems, where m and n are positive integers. Applications of integration for

- (i) Simple problem on evaluation of area bounded by a curve and axes.
- (ii) Calculation of Volume of a solid formed by revolution of an area about axes. (Simple problems).

UNIT - III: Co-ordinate Geometry : Equation of straight line in various standard forms (without proof), intersection of two straight lines, angle between two lines. Parallel and perpendicular lines, perpendicular distance formula. General equation of a circle and its characteristics.

To find the equation of a circle, given:

- (i) Centre and radius,
- (ii) Three points lying on it

and (iii) Co-ordinates of end points of a diameter;

Definition of conics (Parabola, Ellipse, Hyperbola) their standard equations without proof. Problems on conics when their foci, directrices or vertices are given.

UNIT - IV: Vector Algebra: Definition, notation and resolution of a vector into rectangular components. Addition and subtraction of vectors. Scalar and vector products of 2 vectors. Simple problems related to work, moment and angular velocity

UNIT-V: Differential Equations : Solution of first order and first degree differential equation by variable separation method (simple problems).

Course Outcomes: By the end of the course the students are expected to learn

- (i) The students are expected to acquire necessary background in Determinants and Matrices so as to appreciate the importance of the Determinants are the factors that scale different parameterizations so that they all produce same overall integrals, i.e. they are capable of encoding the inherent geometry of the original shape.
- (ii) The cumulative effect of the original quantity or equation is the Integration.
- (iii) The coordinate geometry provides a connection between algebra and geometry through graphs of lines and curves.
- (iv) Tell the difference between a resultant and a concurrent force to model simple physical problems in the form of a differential equation, analyze and interpret the solutions

TEXTBOOK:

1. Mathematics Textbook for Class XII Part I + Part II, 2019 edition, Publisher: NCERT
2. NCERT mathematics Class 11 and 12 text Books. (Latest edition)

REFERENCES:

1. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, New Delhi, 40th Edition, 2007.
2. G. B. Thomas, R. L. Finney, Calculus and Analytic Geometry, Addison Wesley, 9th Edition, 1995.
3. S.S. Sabharwal, Sunita Jain, Eagle Parkashan, Applied Mathematics, Vol. I & II, Jalandhar.
4. Comprehensive Mathematics, Vol. I & II by Laxmi Publications, Delhi.
5. Reena Garg & Chandrika Prasad, Advanced Engineering Mathematics, Khanna Publishing House, New Delhi

SEMESTER: II

Course title: Applied Physics II (Theory)

Course code: DPH 201

Category: Basic Science Course

L T P C
2 1 0 3

Contact Hours: 34

MODULE-1: Reflection and Refraction (6L)

- 1.0** Reflection, laws of reflection, Reflection on spherical mirror, real and virtual image, mirror formula, sign conventions, formation of images in spherical mirrors, numerical problems.
- 1.1** Refraction, laws of refraction, refractive index, critical angle, refraction through lens, lens formula, formation of images in lenses, lens maker's formula (derivation not required), refraction through prism, Mayer's formula, critical angle, total internal reflection, relation between critical angle and refractive index, numerical problems.

MODULE 2: ELECTROSTAICS (5L)

- 2.0** Concept of charge, Coulomb's law, concept of electric field, Electric line of force, electric dipole, dipole moment, electric filed intensity due to dipole at end-on and broad-on position, Potential at a point due to a point charge, relation between intensity and potential with deduction of the formula.
- 2.1** Capacity of a condenser, series and parallel combination, numerical problems.

MODULE 3: CURRENT ELECTRICITY (8L)

- 3.0** Potential difference and electric current, Ohm's law, resistance, specific resistance, conductance, effects of temperature on resistance, Series and parallel combination of resistance, measurement of resistance using colour code, numerical problems.
- 3.1** Difference between emf. and potential difference; internal resistance of cell. Difference between primary and secondary cells with examples, grouping of cells

- 3.2 Heating Effect of Current: Joule's law, electricity energy and power, numerical problems

MODULE 4: MAGNETISM (4L)

- 4.0 Natural and artificial magnets, concepts of magnetic poles, Inverse square law, magnetic field, magnetic lines of forces, magnetic intensity, magnetic dipole, dipole moment, magnetic intensity due to magnetic dipole at end – on and broad – side on position, couple on a magnet in a uniform field, Tangent law.

MODULE 5: ELECTROMAGNETISM (5L)

- 5.0 Magnetic effect of current, Biot Savart's law, application of Biot's Savart's law in straight and circular conductor, Fleming's left hand and right hand rules, effect of current flowing through two parallel conductors.
- 5.1 Electro Magnetic induction: self and mutual induction, e. m. f. induced in a coil due to magnet, Faraday's laws of electro – magnetic induction, Lenz Law.

MODULE 6: MODERN PHYSICS (6L)

- 6.0 Bohr's atom model and concept energy levels, ionization and excitation potentials, X-rays, Production (Coolidge tube) continuous and characteristic-X-rays, soft and hard X-rays, and use, Concept of Photons, Photo electric effect, Einstein's photoelectric equation, laws of photoelectric effect.
- 6.1 Laser: spontaneous and stimulated emission; applications of lasers. Introduction to optical fibers, mechanism of light propagation, applications.

Suggested Books.

1. Modern Approach to Physics Part I & II, Dilip Sarma, N G Chakraborty, and K N Sharma, Kalyani Publisher, New Delhi.
2. Applied Physics Part I & II, Manpreet Singh, Dr. Major Singh, and Mrs. Hitashi Gupta, S K Kataria & Sons- New Delhi.
3. Basic Applied Physics, R K Gaur, Dhanpat Rai Publication- New Delhi

Paper Code: DCS201

Credit: 3

Paper Name: Introduction to IT Systems

L-T-P: 2-1-0

Total Contact Hours: 36

Course Objectives:: This course is intended to make new students comfortable with computing environment - Learning basic computer skills, Learning basic application software tools, Understanding Computer Hardware, Cyber security awareness

UNIT 1: Basic Internet skills: Understanding browser, efficient use of search engines, awareness about Digital India portals (state and national portals) and college portals. General understanding of various computer hardware components – CPU, Memory, Display, Keyboard, Mouse, HDD and other Peripheral Devices

Contact Hours: 8

UNIT 2: Introduction to Operating System, Types and Role of OS. OS Installation (Linux and MS Windows), Unix Shell and Commands, vi editor.

Contact Hours: 8

UNIT 3: HTML4, CSS, making basic personal webpage.

Contact Hours: 8

UNIT 4: Office Tools: OpenOffice Writer, OpenOffice Spreadsheet (Calc), OpenOffice Impress.

Contact Hours: 6

UNIT 5: Information security best practices and basics of C programming.

Contact Hours: 6

Books/ References:

- R.S. Salaria, Computer Fundamentals, Khanna Publishing House
- Ramesh Bangia, PC Software Made Easy – The PC Course Kit, Khanna Publishing House
- Online Resources, Linux man pages, Wikipedia.
- Mastering Linux Shell Scripting: A practical guide to Linux command-line, Bash scripting, and Shell programming, by Mokhtar Ebrahim, Andrew Mallett.
- E. Balagurusamy, Programming in ANSI C, 8/e., McGraw-Hill Education.
- Yashwant Kanetkar, Let us C, BPB Publication.

Course outcomes:

At the end of the course student will be able to comfortably work on computer, install and configure OS, assemble a PC and connect it to external devices, write documents, create worksheets, prepare presentations, protect information and computers from basic abuses/ attacks.

Paper code: DEE201

Paper name: Fundamentals of Electrical & Electronics Engineering

Total contact hours: 36

Credit: 3

L-T-P: 2-1-0

Module 1:

Contact hours: 8L

DC Circuits: Definitions of active, passive, linear, non-linear circuits elements and networks, Kirchoff's laws, Nodal and mesh analysis, voltage and current sources, network theorems, superposition. Thevenin's, Norton's, maximum power transfer, Millman's, and reciprocity theorems, analysis of simple circuits.

Module 2:

Contact hours: 8L

Single phase AC circuits: generation of single-phase sinusoidal EMF, instantaneous, average, and effective value, form and peak factor, examples of other alternating waveforms and average and effective value calculations, concept of phasor and phasor diagrams, lagging and leading of phasors, pure resistive, inductive and capacitive circuits, power factor, complex power, R-L, R-C and R-L-C series circuits, RL, RC, RLC low pass, high pass, band pass filter.

Module 3:

Contact hours: 8L

Semiconductor Devices: Review of atomic structure, Intrinsic and Extrinsic semiconductors, P- type and N-type materials, P-N junction, biasing, characteristic curve, load line, Zener diode, Zener diode as voltage regulator, tunnel diode, varactor and PIN diode.

Module 4:

Contact hours: 6L

Bipolar transistor: Construction and schematic representation of PNP and NPN transistors, formation of PNP / NPN junctions, energy band diagram; transistor mechanism and principle of transistors. Different types of biasing system, bias stabilization, analysis of CE, CB & CC configuration, their I/P & O/P characteristics, transistor rating and specifications, voltage gain, current gain of common emitter transistor.

Module 5:

Contact hours: 6L

Rectifier Circuits: Half wave and full wave rectifier (Qualitative only): ripple factor, rectification efficiency, Peak Inverse Voltage, Filtering (passive) and voltage regulation (Qualitative only): Capacitor filter, Inductor filter, T- filter and π -filter.

Books / References:

1. W. H. Hayt, J. E. Kemmerly, and S. M. Durbin, Engineering Circuit Analysis, 8th edition. McGraw-Hill, 2013.
 2. D.C. Kulshreshtha, "Basic Electrical Engineering", McGraw Hill, 2009.
 3. Albert Malvino & David Bates, "Electronic Principles", Tata McGraw Hill Publication, 2010.
 4. A.K. Maini, "Analog Circuits", Khanna Publishing House, Ed.2018.
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Paper Code: DME 201

Paper Name: Engineering Mechanics

Total contact hours: 36 Hrs

Credit: 03

L-T-P: 2-1-0

Course objectives:

The following are the objectives of this course:

- To obtain the resultant of various forces
- To calculate support reactions through conditions of equilibrium for various structures
- To understand the role of friction in equilibrium problems
- To know the fundamental laws of machines and their applications to various engineering problems

Module 1: Basic of Engineering Mechanics

Significance and relevance of engineering mechanics, statics, and dynamics; Space, time, mass, particle, flexible body and rigid body; Scalar and vector quantity; Units of measurement (SI units) - Fundamental units and derived units.

Module 2: Force System

Force – units, representation as a vector and by Bow's notation, characteristics and effects of a force; Principle of transmissibility of force, Force system and its classification; Resolution of a force – Orthogonal components of a force; Composition of forces – Resultant, analytical method for determination of resultant for concurrent, non-concurrent and parallel co-planar force systems – Law of triangle, parallelogram and polygon of forces; Moment of a force, Varignon's principle.

Module 3: Equilibrium of Forces

Equilibrium of force, Free body diagram, Analytical and graphical methods of analysing equilibrium; Lami's theorem – statement and explanation, Application in various engineering problems; Types of beam supports (simple, hinged, roller and fixed) and loads acting on beam (vertical and inclined point load, uniformly distributed load, couple); The beam reaction for the cantilever, simply the supported beams with or without overhang subjected to the combination of point load and uniformly distributed load.

Module 4: Friction

Friction and its relevance in engineering, types and laws of friction, limiting friction, coefficient of friction, angle of friction, angle of repose, and the relation between coefficient of friction and angle of friction; The equilibrium of bodies on a horizontal surface is subjected to force parallel to and inclined to the plane; Equilibrium of bodies on an inclined plane subjected to force parallel to the plane only.

Module 5: Centroid and Centre of Gravity

The centroid of geometrical plane figures (square, rectangle, triangle, circle, semi-circle, quarter circle); Centroid of composite figures composed of not more than three geometrical figures; Centre of

gravity of simple solids (cube, cuboid, cone, cylinder, sphere, hemisphere), Centre of gravity of composite solids composed of not more than two simple solids.

Module 6: Simple Lifting Machines

Simple lifting machines, load, effort, mechanical advantage, applications and advantages, velocity ratio, efficiency of machines, law of machine; Ideal machine, friction in machine, maximum mechanical advantage and efficiency, reversible and non-reversible machines, conditions for reversibility; Velocity ratios of simple axle and wheel, differential axle and wheel, worm and worm wheel, simple screw jack, Weston's differential pulley block, and geared pulley block.

Books / References:

1. Bansal, R.K., Engineering Mechanics, Laxmi Publication (P) Ltd, 4th Edition, 2016.
2. Kumar, K.L. and Kumar V., Engineering Mechanics, McGraw Hill, 4th Edition, 2017.
3. Timoshenko, S. & Young, D. H., Engineering Mechanics, McGraw Hill, 5th Edition, 2017.
4. Meriam, J. L., and Kraige, L.G., Engineering Mechanics: Statics, Vol. 1. John Wiley & Sons, 9th edition, 2018.
5. Hibbler, R.C., Engineering Mechanics: Principles of Statics and Dynamics, Pearson Press, 14th Edition, 2017.

Course outcomes:

After completing this course, students will be able to:

- Identify the force systems for given conditions by applying the basics of mechanics
- Determine unknown force(s) of different engineering systems
- Apply the principles of friction in various conditions for useful purposes
- Find the centroid and centre of gravity of various components in engineering systems
- Select the relevant, simple lifting machine(s) for the given purposes

Course title: Applied Physics II (Practical)

Course code: DPH271

Category: Basic Science Course

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

List of Experiments

1. To draw I-D curve and to determine the refractive index of the material of a prism.
 2. To find equivalent resistance using voltmeter with
 - I. Three resistances connected in series
 - II. Three resistances connected in parallel
 3. To determine the refractive index of the material of the glass slab by pin method.
 4. To determine the focal length of a convex lens by U-V method.
 5. To observe the variation of potential difference (V) across a given resistance (R) by changing Current (I) through it. Hence draw I-V graph and verify Ohm's law.
 6. Place a bar magnet in the magnetic Meridian and draw the lines of force with
 - (i) North-pole pointing towards the north direction
 - (ii) South-pole pointing towards the north direction.
 7. To find resistance of a given wire using meter bridge and hence determine the resistivity (specific resistance) of its material.
 8. To study reflection and image formation by a plane mirror using pin method.
 9. To find the focal length of a convex lens by the plane mirror method.
 10. To locate the poles of a bar magnet and measure its magnetic length.
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Paper Code: DCS271

Credit: 1

Paper Name: Introduction to IT Systems Lab

L-T-P: 0-0-2

Total Contact Hours: 32

Unit 1: Understanding browser, efficient use of search engines, awareness about Digital India portals.

Contact Hours: 4

Unit 2: OS Installation (Linux and MS Windows), Unix Shell and Commands, vi editor. Hours: 8

Unit 3: HTML4, CSS, making basic personal webpage.

Contact Hours: 8

UNIT 4: Office Tools: OpenOffice Writer, OpenOffice Spreadsheet (Calc), OpenOffice Impress.

Contact Hours: 6

UNIT 5: Information security best practices and basics of C programming.

Contact Hours: 6

Books/ References:

- R.S. Salaria, Computer Fundamentals, Khanna Publishing House
- Ramesh Bangia, PC Software Made Easy – The PC Course Kit, Khanna Publishing House
- Online Resources, Linux man pages, Wikipedia.
- Mastering Linux Shell Scripting: A practical guide to Linux command-line, Bash scripting, and Shell programming, by Mokhtar Ebrahim, Andrew Mallett.
- E. Balagurusamy, Programming in ANSI C, 8/e., McGraw-Hill Education.
- Yashwant Kanetkar, Let us C, BPB Publication.

1. Basic safety precautions. Introduction and use of measuring instruments – voltmeter, ammeter, rheostat and wattmeter, oscilloscope, function generator.
 2. Make a measured resistance from a given rheostat
 3. Verification of Kirchhoff's laws and Superposition theorem
 4. Verification of Thevenin's theorem
 5. RLC series circuit resonance.
 6. P-N Junction
 7. Half-wave and Full-wave rectifier circuit
 8. V- I characteristics of transistors
 9. Voltage gain of common emitter transistor.
 10. Current gain of common emitter transistor.
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Paper Code: DME 271

Paper Name: ENGINEERING MECHANICS LAB

Total contact hours: 24 Hrs.

Credit: 01

L-T-P: 0-0-2

Course objectives:

The following are the objectives of this course:

- To obtain the resultant of various forces
- To calculate support reactions through conditions of equilibrium for various structures
- To understand the role of friction in equilibrium problems
- To know the fundamental laws of machines and their applications to various engineering problems

List of practicals to be performed:

1. Determine the resultant of two concurrent forces by applying the Triangle law of forces using a force table.
2. Determine the resultant of two concurrent forces by applying a Parallelogram law of forces using a force table.
3. Determine the resultant of the concurrent force system by applying the Polygon law of forces using a force table.
4. Verification of Lami's theorem.
5. To determine the resultant of the parallel force system graphically.
6. To determine support reactions for simply supported beams.
7. Obtain support reactions of the beam using a graphical method.
8. Determine the coefficient of friction for motion on horizontal and inclined planes.
9. Determine the centroid of geometrical plane figures.
10. To find the mechanical advantage, velocity ratio, efficiency, and law of machine for differential axle and wheel.
11. To find the mechanical advantage, velocity ratio, efficiency, and law of the machine for a simple screw jack.
12. Derive the law of the machine using a worm and worm wheel.

Books / References:

1. Bansal, R.K., Engineering Mechanics, Laxmi Publication (P) Ltd, 4th Edition, 2016.
2. Kumar, K.L. and Kumar V., Engineering Mechanics, McGraw Hill, 4th Edition, 2017.
3. Timoshenko, S. & Young, D. H., Engineering Mechanics, McGraw Hill, 5th Edition, 2017.
4. Meriam, J. L., and Kraige, L.G., Engineering Mechanics: Statics, Vol. 1. John Wiley & Sons, 9th edition, 2018.
5. Hibbler, R.C., Engineering Mechanics: Principles of Statics and Dynamics, Pearson Press, 14th Edition, 2017.

After completing this course, students will be able to

- Identify the force systems for given conditions by applying the basics of mechanics
- Determine unknown force(s) of different engineering systems
- Apply the principles of friction in various conditions for useful purposes
- Find the centroid and centre of gravity of various components in engineering systems
- Select the relevant, simple lifting machine(s) for the given purposes

Diploma 2nd Semester

(Mandatory non-credit course)

Paper code: DCH201

Paper name: Environmental Sciences

Credit: 0

Total contact hours: 24

L-T-P: 2-0-0

Module1: Ecosystem, population dynamics and environment

6L

Basic idea of environment and basic concepts related to perspectives. Man, society and environment and their inter relationship.

Ecosystem, biotic and a biotic component. Open system, closed system, species, population, community. Ecological balance and consequences of change.

Mathematics of population growth and associated problems. Different types of resources, renewable, non-renewable and potentially renewable resources and effects of population growth on resources and environment. Environmental impact assessment.

Module 2: Renewable sources of Energy

6L

Biomass: Overview of biomass as energy source. Thermal characteristics of biomass as fuel. Anaerobic digestion. Biogas production mechanism. Utilization and storage of biogas. Wind energy: Current status and future prospects of wind energy. Wind energy in India.

Environmental benefits and problem of wind energy.

New Energy Sources: Need of new sources. Different types new energy sources. Applications of (Hydrogen energy, Ocean energy resources, Tidal energy conversion.) Concept, origin and power plants of geothermal energy

Module 3: Air, Noise pollution and Environmental Management

6L

Different layers of atmosphere, Definition of air pollution and pollutants, Primary and secondary pollutants, Natural and manmade sources of air pollution (Refrigerants, I.C., Boiler) Toxic chemicals in the air, suspended particulate matter, CO, CO₂, SO₂, oxides of Nitrogen. Greenhouse effect and Climate change, global warming, CFC and it's impact on ozone layer depletion, acid rain and impacts on human communities and agriculture.

Air quality act 2004, air pollution control act 1981 and water pollution and control act 1996. Structure and role of Central and state pollution control board. Concept of carbon credit, carbon footprint, Environmental management of fabrication industry, ISO14000: Implantation in industries.

Noise pollution: Noise pollution (Regulation and Control) Rules, 2000, sources of pollution, measurement of pollution level, Effects of Noise pollution, concept of decibel (dB), noise classification and control of noise pollution.

Module 4: Water and Soil Pollution

6L

Sources of water pollution, Types of water pollutants, Characteristics of water pollutants Turbidity, pH, total suspended solids, BOD and COD.

Causes, Effects and Preventive measures of Soil Pollution: Causes-Excessive use of Fertilizers, Pesticides and Insecticides.

Waste Water Treatment: Primary methods: sedimentation, froth floatation, Secondary methods: Activated sludge treatment, Trickling filter, Bioreactor, Tertiary Method: Membrane separation technology, RO (reverse osmosis).

Solid waste generation- Sources and characteristics of: Municipal solid waste, biomedical waste. Metallic wastes and Non-Metallic wastes (lubricants, plastics, rubber) from industries. Collection and disposal: MSW (Sanitary landfill), Hazardous waste.

Text Book & References:

1. Introduction to Environmental Engineering and Science, Pearson, Gilbert M. Masters and Wendell P. Ela
2. Aldo Vieira, Da Rosa, Fundamentals of renewable energy processes, Academic Press Oxford, UK; 2013. ISBN: 9780123978257.
