CHEMICAL ENGINEERING

SEMESTER III

Course Structure

S. No.	Subject Code	Subject	L	T	P	Cr.
		Theory				
1.		Math III	3	1	0	4
2.		Material Engineering	3	0	0	3
3.		Fluid Particle Operations	3	0	0	3
4.		Fluid Mechanics	3	0	0	3
5.		Heat Transfer	3	0	0	3
6.		Environmental Science	3	0	0	0
Total						16
		Practical				
1.		Communication skills Lab	0	0	2	1
2.		Fluid Mechanics Lab	0	0	2	1
3.		Heat Transfer Lab	0	0	2	1
4.		Fluid Particle Operations Lab	0	0	2	1
5.		Extra Activities (NSO/NSS/NCC/YOGA/CRATIV ARTS/MINI PROJECT)	0	0	2	1
Total						5
Grand Total Credits			16 + 5			21

31.05.19

(Dr. S. P. Singh)
Prof. & Head
Deptt. of Chemical Engineering
BIT, Sindri, Dhanbad, Jharkhand
PIN-828123

CHEMICAL ENGINEERING

SEMESTER IV

Course Structure

S. No.	Subject Code	Subject	L	T	P	Cr.
		Theory				
1.		Electronics and Instrumentation Engineering	3	0	0	3
2.		Chemical Engineering Thermodynamics	3	0	0	3
3.		Industrial Chemical Calculations	3	0	0	3
4.		Chemical Technology	4	0	0	4
5.		Transport Phenomenon	3	0	0	3
6.		Engineering Economics	3	0	0	0
Total						**16**
		Practical				
1.		Electronics and Instrumentation Engineering Lab	0	0	2	1
2.		Chemical Technology Lab	0	0	2	1
3.		Thermodynamics Lab	0	0	2	1
4.		Extra Activities (NSO/NSS/NCC/YOGA/CREATIV ARTS/MINI PROJECT)	0	0	2	1
5.		Internship/Task Training/ Industrial Training	0	0	2	1
Total						**5**
Grand Total Credits			**16 + 5**			**21**

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FLIUD AND PARTICLE OPERATIONS (CL 4105)

Lectures: 4 Periods/week
University Examination: 3 hours.

Sessional Marks: 30
University Examination Marks: 70

Semester IV

Prerequisite: None

Syllabus

UNIT-I **Lectures 10**

Size reduction: Principles of crushing & Grinding, Grindability characteristics of materials for crushing, Type of crushers, grinders and Disintergraters for coarse, intermediate and fine grinding, open and close circuit grinding, laws of crushing.

UNIT-II **Lectures 5**

Screening: Standard screens, Industrial screens, classification and performance of screens, Screen Analysis.

UNIT-III **Lectures 5**

Classifiers: Dry and wet classifiers, spitz-kasten and other types Tabling, Jigging & Hydro cyclones.

UNIT-IV **Lectures 10**

Flotation: Principle and operation of flotation cells, Reagents used in flotation, flotation machines and Industrial applications.
Sedimentation: Theory of sedimentation, Design and operation of Batch & continuous thickeners.

UNIT-V **Lectures 10**

Flow of solids through fluids: Free and hindered settling, stoke's law & Newton's Law used for separation of particles.
Filtration: Theory of filtration, batch and continuous filtration equipments, plate & frame filters, Rotary-Drum filters & leaf filters, filter Aid, Optimum time cycle and washing of filter cake.

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Text Books/Reference Books:

1. McCabe W. L., Jullian Smith C. and Peter Harriott - Unit operations of Chemical Engineering, 7th Edition, McGraw-Hill international edition, 2005.

2. Coulson J.M., Richardson J.F, Chemical Engineering, Vol. II, 4th Edition, Elsevier India, 2006.

FLUID MECHANICS FOR CHEMICAL ENGINEERING (CL 3102) (CL 3102)

Lectures: 4 Periods/week *Sessional Marks: 30*
University Examination: 3 hours. *University Examination Marks: 70*

Semester III

Syllabus

UNIT I Lectures 9

1. Introduction: Fluid continuum, density specific gravity, viscosity, Newtonian and non-Newtonian Fluids, kinematic viscosity, variation of viscosity with temperature and pressure, surface tension, capillary action, vapour pressure, thermodynamic property of gases, isothermal process, isentropic, adiabatic process, incompressible and compressible fluids
2. Fluid statics: pressure at a point, variation of static pressure, piezometric head, absolute and gauge pressure.

UNIT II Lectures 6

1. Pressure measurements: mechanical pressure gauge, simple manometer, differential, micro and inclined manometer.
2. Kinematic of fluid motion: classification of flow, steady and non-steady flow, one two and three dimension flow, laminar and turbulent flow, stream line, path line and streak line, introduction to stream function and velocity potential.

UNIT III Lectures 6

Dynamics of fluid flow: concept of system and control volume, the equation of continuity and motion, Euler equation of motion, Bernoulli equation for a real fluid, practical application of Bernoulli equation – pitot tube, venturimeter, entrance cone, coefficient of discharge, factors influencing coefficient of discharge, water flow through an opening, air anemometer, rotameter and flow meter.

UNIT IV Lectures 6

Dimensional analysis: use of Rayleigh method, Buckingham π- theorem, dynamic similarity, geometric similarity and kinematic similarity, dimensional groups and their physical significance. Reynold number, Froude number, Euler number, Mach number, Weber number etc.
Velocity distribution in a laminar flow for parallel plates and circular tubes, Hagen-Poiseuille equation.

UNIT V Lectures 9

Interphase transport in isothermal system; definition of friction factor, friction factor for flow in tubes, pressure drop required for a given flow rate. Flow rate for a pressure drop.

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f-Re plot, definition for drag coefficient for flow around sphere, C vs R.D.P. plot. Determination of diameter of a falling sphere, friction factor for packed bed- Ergun equation.

Lectures 6

UNIT V

Pumps: centrifugal pumps- classification, single and multistage pumps, pumps in series and parallel, suction and delivery pipes, basic equation applied in centrifugal pumps, velocity diagram at outlet, loss of head due to changed discharge and cavitations in pumps, operating characteristics of centrifugal pumps

Reciprocating pumps: introduction, working of Reciprocating pumps, double acting pumps, instantaneous rate of discharge, effects of friction and inertial pressure

Text Books/Reference Books:

- Fluid mechanics, Victor L. Streeter, Wylie, 9th Edition, Tata Mc- Graw Hill, 2010
- Fluid mechanics and hydraulic machine, Dr. R. K. Bansal, 9th Edition, Laxmi Publication, 2005.

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HEAT TRANSFER OPERATIONS (CL 3103)

Lectures: 4 Periods/week
University Examination: 3 hours.

Sessional Marks: 30
University Examination Marks: 70

Semester III

Prerequisite: None

Syllabus

Course Plan

Unit I — **Lecture 10**

Introduction (1L)

Conduction convection & radiation. General laws of heat transfer.

Steady-State Heat conduction-1 dimension (7L)

Fourier's law, Thermal Conductivity – its variation with temperature & Pressure and its relationship with electrical conductivity. Heat transfer through composite walls and cylinders. insulation and R value, Overall Heat –Transfer coefficient, Critical thickness of insulation. conduction-convection system, Fins, Thermal contact resistance

Un-steady state Conduction (2L)

Introduction, Lumped system

Unit II — **Lecture 9**

Principles of Convection (5L)

Introduction, viscous, Inviscid Flow, Laminar boundary layer on flat plate, Energy equation of the boundary layer, Thermal boundary layer, Turbulent boundary layer, Relation between fluid friction and Heat Transfer

Natural convection (4L)

Introduction, Free-convection heat transfer on Vertical planes, cylinders, sphere, combined free and forced convection.

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Lecture 9

Unit III

Empirical and Practical Relations for forced convection (4L)

Introduction, Empirical relations for pipe and tube flow, Flow across cylinder and sphere, liquid metal heat transfer-brief

Radiation Heat Transfer (4L)

Physical Mechanism, Properties, radiation shape factor and relation, nonblack bodies, infinite parallel surface, shield, Absorbing and transmitting medium, radiation exchange with seculars surfaces, radiation heat transfer coefficient.

Unit IV **Lecture 12**

Condensation and boiling (4L)

Condensation heat transfer phenomena, film condensation inside horizontal and vertical tube, boiling heat transfer, the heat pipe.

Heat exchanger (8L)

Overall- heat transfer coefficient, Fouling factor, Types of heat exchanger, LMTD, Effectiveness-NTU method, Heat exchanger design considerations,

Suggested text book

1. "Heat Transfer", J. P. Holman, McGraw Hill, ninth Edition

Suggested reference book

1. "Heat Transmission", W. H. McAdams, McGraw Hill, 3rd Edition.
2. "Process Heat Transfer", D. Q. Kern, McGraw Hill

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Chemical Engineering Thermodynamics (CL 3101)

Lectures: 4 Periods/week *Sessional Marks: 30*
University Examination: 3 hours. *University Examination Marks: 70*

Semester III

Prerequisite: None

Detailed Syllabus

Unit I **Lectures 12**

Fundamentals of thermodynamics:
Review of laws of thermodynamics & their applications, thermodynamic system, thermodynamic state and state function, heat, internal energy and work, thermodynamic equilibrium, reversible and irreversible processes, phase rule, thermodynamic analysis of the process, terminologies of thermodynamics, variables and quantities of thermodynamics, equations of state.

Unit II **Lectures 12**

Thermodynamic properties of fluids and their inter-relations

Thermodynamic relations: phase rule, Clapeyron equation, Maxwell equation, Joule Thomson coefficient, Kirchhoff Equation, specific heat relations, Helmholtz potential

Unit III **Lectures 8**

Heat Engine cycles: Power plant cycles, Rankine cycle, the Otto Engine, the Diesel Engine, the combustion gas cycle.

Unit IV **Lectures**
8

Refrigeration Cycles: The Carnot Cycle, The Air Refrigeration Cycle. The Vapor Compression cycle, Absorption Refrigeration machine and Heat pump.

TEXTBOOK

1. Introduction to Chemical Engineering Thermodynamics, Smith, J.M., Van Ness, H.C., and Abbott, M.M., 7th Edition, McGraw Hill.

Reference Books:

1. Chemical Engineering Thermodynamics, Y.V. C. Rao, Universities press.
2. A Textbook of Chemical Engineering Thermodynamics, K. V. Narayanan, Publisher PHI Learning Pvt. Ltd., 2004.

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Industrial Chemical Calculation (CL 4104)

Lectures: 4 Periods/week — *Sessional Marks: 30*
University Examination: 3 hours. — *University Examination Marks: 70*

Semester IV

Prerequisite: Basics of Thermodynamics

Detailed Syllabus

UNIT I — **Lectures 6**

Units and dimensions, Stoichiometric and composition relations. Mathematical and engineering calculations, units dimension conversion, conversion of equations, conservation of mass, mass and volume relationship in chemical reactions. Mole percent, weight percent. Basis of calculation, excess reactant, limiting reactant. Degree of completion. Density, specific gravity, normality, molality and molarity.

UNIT II — **Lectures 7**

Behavior of ideal gases: ideal gas law, gauge pressure, absolute pressure, density, molecular weight of gases, gas mixtures, average molecular weight of gas mixtures, Dalton's law, Amagat's law and their application, partial pressure, pure component volume, solving problem.

UNIT III — **Lectures 7**

Vapor pressure: liquefication and liquid state, vaporization, condensation, dynamic equilibrium, equilibrium vapor pressure, superheat and quality, boiling point, effect of temperature on vapor pressures, Clausius –Clapeyron equation.

UNIT IV — **Lectures 6**

Humidity and saturation: Humidity, saturation, relative saturation, percentage saturation, humid heat, dew point, wet bulb and dry bulb temperature, humidity chart.

UNIT V — **Lectures 9**

Material balance: Input- output method, steady state, key component, material balance with chemical reaction and without chemical reaction, simultaneous equation, distillation, adsorption, recycle, by-pass and purge calculations, application of computer in solving material balance problems.

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UNIT V

Lectures 9

Energy balance: Introduction to energy balance, Heat Capacity, entropy, specific heat, internal energy, first law of thermodynamics, second law of thermodynamics

Text Books/Reference Books:

1. Chemical Process Principles, O.A. Hougen, K.M. Watson, R.A. Ragatz,2nd Edition, CBS, 2004
2. Basic principles and calculations in Chemical Engineering, David M. Himmelblau and James B. Riggs, 2nd Edition, Prentice Hall, 2012.

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Chemical Technology (CL-4106)

Lectures: 4 Periods/week
University Examination: 3 hours.

Sessional Marks: 30
University Examination Marks: 70

Semester IV

Prerequisite: None

Syllabus

UNIT- I **Lectures 12**

Introduction: Chemical industries-facts and figures, Unit operation and unit process concepts, chemical processing and role of chemical engineers.

Sulfuric Acid: Different raw materials, Methods of Production.

Nitrogen Industry: Ammonia, Reaction equilibrium of ammonia synthesis, Ammonium sulphate, Nitric acid, Ammonium nitrate, Urea; Methods of production, characteristic specifications, storage and handling.

UNIT- II **Lectures 8**

Phosphorus Industry: Phosphorous, Phosphoric acid, Sodium and Ammonium phosphates, single and triple superphosphates; Methods of production, storage and handling.

Chloro-Alkali Industry: Soda ash, Caustic soda, Bleaching powder; methods of production, storage and handling.

UNIT- III **Lectures 8**

Petrochemicals: Constituents and classifications, products of Refining, petrochemicals methods, synthetic gas, petrochemicals from Ethane, Ethylene & Acetylene, petrochemicals form Aromatics, Butanes, Butanes,

Oil & fats, Vegetable oils, animal fats, and waxes, soap and detergents, synthetic detergents, organic surface coatings.

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Lectures 10

UNIT- IV

Plastics: Polymerization fundamentals, thermosetting resins, thermoplastic resins, thermo plastics based on celluloses, laminate & synthetic fibers, viscose and cuproammonium Rayon, cellulose Acetates, nylons, Polyesters spun fibers, melt dry wet finishing of textiles.

Lectures 6

UNIT- V

Paper & pulp, production of pulp for paper, Recovery of chemical from paper manufacture, paper Board.
Sugar & starch: manufacture of sugar, starch and related products.

Text Books/Reference Books:

1. Shreve's Chemical Process Industries, Austin, G.T., McGraw Hill, 5th edition 1985.

2. Dryden's Outline of chemical technology Ed. By M.Gopal Rao and M. Sitting, 3rd edition, East West Press.

3. Chemical Process Industries , Vol.-II, CBS Publication & Distributors.

Transport Phenomena

Sessional Marks: 30
University Examination Marks: 70

Lectures: 3 Periods/week
University Examination: 3 hours.

Prerequisite: Heat Transfer, Fluid Mechanics

Syllabus

Lectures 8

UNIT I

Introduction

Classification of Transport Process.

Principles of Momentum Transport

Molecular Transport of Momentum, concept of Newton's Law of Viscosity, Convective momentum transport, Shell Momentum balances and Velocity Distribution in Laminar Flow-Flow of a Falling film, Flow through a Circular Tube, Flow Through an annulus, Flow of Two adjacent immiscible Fluids.

Lectures 8

UNIT II

Equation of Change

Equations of changes for isothermal, non-isothermal, and multi component mixtures

Turbulent transport

Laminar turbulent transition; basic characteristic features of turbulent flow; time smoothed equation of changes; Eddy viscosity, thermal conductivity and diffusivity; distribution of velocity, temp., and concentration in turbulent flows.

Lectures 12

UNIT III

Principles of Steady State Energy Transport

Introduction to thermal conductivity and mechanisms of Energy transport, Shell energy balances, and temperature distributions in solids and Laminar Flow- Electrical Heat Source, Nuclear heat Source, Chemical Heat Source, Composite walls, concentric cylinders and Cooling Fin

Principles of Mass Transport

Mechanisms of mass transport, Equation of Molecular Mass Transport, Molecular Diffusion in Gases, Mass flux and molecular Transport by diffusion and Convection, Shell Mass Balances, Diffusion through-the stagnant gas film, Heterogeneous Chemical Reaction, Homogeneous chemical Reaction.

Lectures 8

UNIT IV

Interphase transport

Friction factor; Heat transfer coefficient; mass transfer coefficient.

Macroscopic balances and its applications in analysis and solution of process engineering Problems

Momentum, heat and mass transfer analogies

Analogies among momentum heat and mass transfer.

Suggested text book

1. R. Byron Bird, "Transport Phenomena", 2nd Edition, John Wiley & Sons (Asia) pvt. Ltd.

Suggested reference book

1. Christie John Geankoplis, "Transport Processes and Separation Process Principles", 4th Edition, PHI Learning Private Limited., New Delhi
2. W.J.Thomson, "Introduction to Transport Phenomena", Pearson Education Asia, New Delhi, 2001.
3. Incropera, "Fundamentals of Heat and Mass Transfer", 6th Edition, John Wiley & Sons (Asia) pvt. Ltd.

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ENGINEERING ECONOMICS

3 0 0 3

L T P C

OBJECTIVES: • To enable students to understand the fundamental economic concepts applicable to engineering and to learn the techniques of incorporating inflation factor in economic decision making.

UNIT I

INTRODUCTION TO ECONOMICS 8

Introduction to Economics- Flow in an economy, Law of supply and demand, Concept of Engineering Economics – Engineering efficiency, Economic efficiency, Scope of engineering economics - Element of costs, Marginal cost, Marginal Revenue, Sunk cost, Opportunity cost, Break-even analysis - V ratio, Elementary economic Analysis – Material selection for product Design selection for a product, Process planning.

UNIT II

VALUE ENGINEERING 10

Make or buy decision, Value engineering – Function, aims, Value engineering procedure. Interest formulae and their applications –Time value of money, Single payment compound amount factor, Single payment present worth factor, Equal payment series sinking fund factor, Equal payment series payment Present worth factor- equal payment series capital recovery factor - Uniform gradient series annual equivalent factor, Effective interest rate, Examples in all the methods.

UNIT III

CASH FLOW 9

Methods of comparison of alternatives – present worth method (Revenue dominated cash flow diagram), Future worth method (Revenue dominated cash flow diagram, cost dominated cash flow diagram), Annual equivalent method (Revenue dominated cash flow diagram, cost dominated cash flow diagram), rate of return method, Examples in all the methods.

UNIT IV

REPLACEMENT AND MAINTENANCE ANALYSIS 9

Replacement and Maintenance analysis – Types of maintenance, types of replacement problem, determination of economic life of an asset, Replacement of an asset with a new asset – capital recovery with return and concept of challenger and defender, Simple probabilistic model for items which fail completely.

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UNIT V

DEPRECIATION 9

Depreciation- Introduction, Straight line method of depreciation, declining balance method of depreciation-Sum of the years digits method of depreciation, sinking fund method of depreciation/ Annuity method of depreciation, service output method of depreciation-Evaluation of public alternatives- introduction, Examples, Inflation adjusted decisions – procedure to adjust inflation, Examples on comparison of alternatives and determination of economic life of asset.

TOTAL: 45

PERIODS OUTCOMES : Upon successful completion of this course, students will acquire the skills to apply the basics of economics and cost analysis to engineering and take economically sound decisions.

TEXT BOOKS:

1. Panneer Selvam, R, "Engineering Economics", Prentice Hall of India Ltd, New Delhi, 2001.

REFERENCES:

1. Chan S.Park, "Contemporary Engineering Economics", Prentice Hall of India, 2011.

2. Donald.G. Newman, Jerome.P.Lavelle, "Engineering Economics and analysis" Engg. Press, Texas, 2010.

3. Degarmo, E.P., Sullivan, W.G and Canada, J.R, "Engineering Economy", Macmillan, New York, 2011.

4. Zahid A khan: Engineering Economy, "Engineering Economy", Dorling Kindersley, 2012

ME6811 PROJECT WORK L T P

31.05.19

Jharkhand University of Technology Jharkhand, Ranchi

Proposed Syllabus for B. Tech 3rd Semester

Civil Engineering

Civil Engineering

3rd semester course structure

Sl. No.	Course Code	Subject	L	T	P	Credit
01	CE301	Civil Engineering Materials And Construction	3	1	0	3
02	CE302	Surveying & Geomatics -I	3	1	0	3
03	ME303	Strength Of Materials	3	1	0	3
04	BSC301	Mathematics-III	3	1	0	4
05	BSC303	Engineering Geology	3	1	0	3
06	BSC302	Environmental Science	2	0	0	0
01	CE301P	Civil Engg Material Testing Lab.	0	0	3	1
02	CE302P	Field Surveying Lab	0	0	3	1
03	CE303P	Engineering Geology Lab And Strength Of Materials Lab	0	0	3	1
04	EX301	Extra Activities (NSO/NSS/NCC/Yoga / Creative Arts/Mini Project)	0	0	2	1
05	HS301	Communication Skill Lab	0	0	2	1
Total credit						**21**

PROPOSED SYLLABUS FOR ALL BRANCHES EXCEPT CSE & IT

2nd year, III Semester, UG course Engg. & Tech Jharkhand University of Technology

BSC301 MATHEMATICS III

Module -1

Laplace Transformation: Laplace Transformation and its properties, Periodic function, Unit step function and impulse function .Inverse Laplace Transformation, Convolution Theorem, Applications of Laplace transforms in solving certain initial value problems & simultaneous differential equations. **(8L/1.5Q)**

Module-2

Numerical Method: Finite difference, Symbolic relations, Interpolation and Extrapolation, Newton - Gregory forward and backward formula, Lagrange's formula, Inverse Interpolation by Lagrange's formula. Numerical Differentiation and Numerical Integration, Newton Cotes Quadrature formula, Trapezoidal rule. Simpson's 1/3" rule, Simpson's 3/8" rule. **(10L/1.5Q)**

Module -3

Z-Transform & Inverse Z-Transform- Properties - Initial and Final value theorems, Convolution theorem- Difference equations. Solution of difference equations using Z-Transformation. **(6L/1.5Q)**

Module -4

Fourier Series & Fourier Transform: Expansion of - Algebraic, Exponential &Trigonometric functions in Fourier series, Change of interval, Even and odd function, half range sine and cosine series, Complex form of Fourier series.

Fourier Transformation and inverse Fourier Transformation, Fourier sine & cosine transforms. Convolution theorem for Fourier transforms with simple illustrations. **(8L/1.5Q)**

Module 5

Partial Differential Equations: Formation of partial differential equations, Linear partial differential equations of first order, Lagrange's linear equation, Non-linear equations of first order, Charpit's method Solution of one-dimensional Wave equation & Heat equation by the method of separation of variables and its applications. **(8L/1Q)**

Note-Question no.1 will be compulsory, objective type with 7 sub-parts comprising of the whole syllabus.

Text Books

1. Irwin Kreyszig, Advanced Engineering Mathematics, 9th Edition, John Wiley & Sons,
2. Ramana R. V ., Higher Engineering Mathematics, Tata McGraw Hill New Delhi,2010.
3. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 44th Edition,

Reference Books

1. R. J. Beerends .H. G. Ter Morsche, J. C. Van Den Berg. L. M. Van De Vrie, Fourier and Laplace Transforms, Cambridge University Press.
2. Sastry S.S. Introductory Methods of Numerical Analysis, PHI

CIVIL ENGINEERING MATERIALS AND CONSTRUCTIONS

Course code –CE 301

Module I: Introduction to Engineering Materials covering, Cements, M-Sand, Concrete (plain, reinforced and steel fibre/glass fibre-reinforced, light-weight concrete, High Performance Concrete, Polymer Concrete) Ceramics, and Refractories, Bitumen and asphaltic materials, Timbers, Glass and Plastics Structural Steel and other Metals, Paints and Varnishes, Acoustical material and geo-textiles, rubber and asbestos, laminates and adhesives, Graphene, Carbon composites and other engineering materials including properties and uses of these **(8 Hours)**

Module II: Introduction to Material Testing covering, What is the "Material Engineering"?; Mechanical behaviour and mechanical characteristics; Electricity-principle and characteristics; Plastic deformation of metals; Tensile test-standards for different material(brittle, quasi-brittle, elastic and so on) True stress-strain interpretation of tensile test; hardness tests; Bending and torsion test; strength of ceramic; Internal friction, creep-fundamentals and characteristics; Brittle fracture of steel- temperature transition approach; Background of fracture mechanics; Discussion of fracture toughness testing-different materials; concepts of fatigue of materials; Structural integrity assessment procedure and fracture mechanics **(8Hours).**

Module III: Standard Testing & Evaluation Procedures covering, Laboratory for mechanical testing; Discussion about mechanical testing; Naming systems for various irons, steels and nonferrous metals; Discussion about elastic deformation; Plastic deformation; Impact test and transition temperatures; Fracture mechanics- background; Fracture toughness- different materials; Fatigue of material; Creep. **(8 Hours)**

Module IV: Constructions: Brick Masonry; Types of bond, construction of walls, partition wall, cavity wall, advantages, disadvantages and construction procedure. D.P.C.: Purpose, types, materials and procedures, Foundation: Function, types, their stability and foundation in black cotton soil, proportioning of footings, plastering and composition, method of plastering, types of plastering, pointing construction procedure, Washing: White washing, color washing, distemper and snowcem, Roof: Flat roof, inclined roof, shells and domes, various types of roof covering materials. Floor: Types i.e. wooden, IPS, Terrazzo, marbles, tiles, synthetic mats. Construction of IPS and Terrazzo floor. Door and Windows types and fixtures including ventilators and lintel. Door and windows from PVS material and MDF. Stairs: Types and proportioning, Lifts and escalators **(16 Hours).**

Suggested Readings

1. Chudley,R.,Greeno(2006),'Building Construction Handbook'(6th ed.),R.Butterworth Heinemann
2. Building Materials, S.Bhavikutti.
3. Building Materials,M.L.Gambhir.
4. Civil Engineering Materials, S.C.Rangwala, Charotar Publishing House. Various related updated & recent standards of BIS, IRC, ASTM, RILEM, AASHTO,etc. corresponding to materials used for Civil Engineering applications

5. Kyriakos Komvopolous (2011), Mechanical Testing of Engineering Materials, Cognella
6. E.N.Dowling(1993), Mechanical Behaviour of Materials, PHI
7. American Society for Testing and Materials (ASTM),Annual Books of ASTM Standards (post 2000)
8. Civil Engineering Materials and Construction Practices, R.K.Gupta, Jain Brothers,New Delhi.

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SURVEYING AND GEOMATICS I

Course code –CE 302

Module I

Introduction: Importance of Surveying, Types of Surveying, Principle, Scales, Plan and Map, Shrinkage of Maps, Mapping Concepts, Map Projections, Total Station uses and application, Chain Surveying: Purpose, Chaining, accessories, Ranging and its types, Error, Chaining on uneven ground, Tape corrections, Survey stations and lines, Well-conditioned triangle, basic problems, obstacles in chaining, field book. **[7 Hrs]**

Module II:

Compass Surveying: Introduction and Purpose, True Meridian, Magnetic Meridian Geographical Meridian, True Bearing, Magnetic Bearing, Whole circle &Quadrantal Bearing, Prismatic Compass and Surveyors Compass, Magnetic Declination, Isogonic and Agonic Lines, Local Attraction and its adjustments. **[4 Hrs]**

Module III:

Plane Table Surveying: Equipment and uses, principle, methods of plane tabling, closing error and its adjustment, two point problem and three point problem. **[5 Hrs]**

Module IV

Levelling: Types of levelling: Temporary Adjustment of Dumpy level, Methods of levelling, Level book and computation, missing data, curvature and refraction corrections, reciprocal levelling. Contouring: Definition, Methods of Contouring and plotting of contour.**[6 Hrs]**

Module V

Theodolite traversing: Scope, Types, temporary adjustment of transit theodolite, measurement of horizontal& Vertical angles, Method of repetition & Direction, errors and its elimination, method of traversing, calculation of latitude and departure, balancing of traverse **[6 Hrs]**

Module VI

Tacheometric Survey: Instruments used, Principle, determination of tacheometric constant, Methods of Tacheometry: Stadia Method and Tangential Method. **[4 Hrs]**

Module VII

Classification of Curves: Simple curve, Combined curve, Compound curve, reverse curve, transition curve, Methods of layout, offsets from chord produced, Rankine's Method, Transition Curve, super-elevation, length of transition curve, characteristics, equation, shift, tangent length, and curve length of combined curve, setting out of simple and transition curve.
[12Hrs]

Text Books:

1. Duggal, S.K. Surveying Vol. I and II, Tata McGraw Hill, 2004.
2. Punmia, B.C. Surveying Vol.I and II, Standard Publishers, 1994.
3. Arora, K. R. Surveying Vol. I and II, Standard Book House, 1996
4 N.N Basak.. Surveying and levelling

STRENGTH OF MATERIALS

(ME, PROD, CE)
Course code -ME 303

Objectives:

- To understand the nature of stresses developed in simple geometries such as bars, cantilevers, beams, shafts cylinders and spheres for various types of simple loads.
- To calculate the elastic deformation occurring in various simple geometries for different types of loading.

Contents:

Module-I

Deformation in solids-Hooks law, stress and strain-tension, compression and shear stresses – elastic constants and their relations-volumetric, linear and shear strains-principal stresses and principal planes-mohr's circle **(8 Hrs)**

Module-II

Beams and types transverse loading on beams-shear force and bending moment diagrams-Types of beam supports, simply supported and over hanging beams, cantilevers. Theory of bending of beam, bending stresses distribution and neutral axis, shear stress distribution, point and distributed loads**.** **(8Hrs)**

Module-III

Moment of inertia about the axis and polar moment of inertia, deflection of beam using double integration method, computation of slopes and deflection in beams, Maxwell's reciprocal theorem**.** **(8Hrs)**

Module-IV
Torsion, stresses and deformation in circular and hollow shafts, stepped shafts, deflection of shafts fixed at both ends, stresses and deflection of helical spring**.**
(8Hrs)

Module -V
Axial and hoop stresses in cylinders subjected to internal pressure, deformation of thick and thin cylinders, deformation in spherical shells subjected to internal pressure**. (8Hrs)**

Course Outcomes:

- After completing this course, the students should able to recognize various type of load applied on machine components of simple geometry and understand the nature of internal stresses that will develop within the components.
- The students will be able to evaluate the strains and deformation that will results due to the elastic stresses develop within the material for simple type of loading.

Test Books:

1. Egor P. Popov,Engineering Mechanics of solids,Prentice Hall of india,New Delhi,2001.
2. R.Subramanian, Strength of Materials,Oxford University Press,2007.

Ferdinand P.Been, Russel Johnson Jr and Jhon J.Dewole, Mechanism of materials, Tata McGrawHill Publication Co. Ltd., New Delhi 2005.

ENGINEERING GEOLOGY

Course code –BSC 303

Module 1:
Introduction-Branches of geology useful to civil engineering, scope of geological studies in various civil engineering projects. Department dealing with his subject in India and their scope of work- GSI, Granite Dimension Stone Cell, NIRM. Mineralogy- Mineral, Origin and composition. Physical properties of minerals, susceptibility of minerals to alteration, basic of optical mineralogy, (**6 hours**)

Module II:
Strength Behaviour of Rocks- Stress and Strain in rocks. Concept of Rock Deformation & Tectonics. Dip and Strike. Outcrop and width of outcrop. Inliers and Outliers. Main types of discontinuities according to size. Fold –Types and nomenclature, Criteria for their recognition in field. Faults: Classification, recognition in field, effects on outcrops. Joints & Uncormity; Types,

Stresses responsible, geotechnical importance. Importance of structural elements in engineering operations. Consequences of failure as land sliding, Earthquake and
Subsidence, Strength of Igneous rock structures (**6 hours**)

Module III:
Geological Hazards- Rock Instability and Slope movement:
Concept of sliding blocks. Different controlling factors. Instability in vertical rock structures and measures to prevent collapse. Types of landslide. Prevention by surface drainage, slope reinforcement by Rock bolting and Rock Anchoring, retaining wall, Slope treatment. Case study on black clay. Ground water: Factors controlling water bearing capacity of rock. Previous & impervious rocks and ground water. Lowering of water table and Subsidence. Earthquake: Magnitude and intensity of earthquake. Seismic sea waves. Revelation from Seismic Records of structure of earth. Case Study on Elevation and Subsidence in Himalayan region in India.
Seismic Zone in India. (**6 hours**)

Module IV: Geology of dam and reservoir site- Required geological consideration for selecting dam and reservoir site. Failure of Reservoir. Favourable and unfavourable conditions in different types of rocks in presence of various structural features, precautions to be taken to counteract unsuitable conditions, significance of discontinuities on the dam site and treatment giving to such structures. (**4 hours)**

Module V: Introduction and nature of soils: Soil problems in Civil Engineering, Types of soil, formation, structure and mineralogical and composition, Physical and Engineering Properties of soil, Atterberg Limit, Grain size analysis, by sieving and sedimentation, Activity of clay, All type of Classification of soil, Engineering properties of soil.**(6 hours)**

Module VI: Soil hydraulic and seepage analysis: Darcy's law, Measurement of Permeability, Factors affecting permeability and neutral pressure and effective pressure. (**4 hours**)
Seepage analysis: Laplace's equation, methods of obtaining flow nets, flow net for isotropic and anisotropic soil and their applications. (**3 hours**)

Consolidation and compaction: Definition, measurement, mechanism and analysis of data.
(**4 hours)**
Shear strength of soil: Shear strength parameters of soil and laboratory methods for their determination. Liquefaction of soil. (**4 hours) Suggested Readings:**

1. Engineering and General Geology, Prabin Singh, 8th ed. (2010), S K Kataria and sons.
2. Text Books of Engineering Geology, N.Cheena Kesavulu,2nd Edition(2009)
3. Geology for Geotechnical Engineers, J.C.Harvey, Cambridge University Press(1982)
4. Soil Mechanics and Foundation Engineering, B.C.Punmia, Laxmi Publication
5. Basic and Applied Soil Mechanics, Gopal Ranjan, A.S.R. Rao, New Age Publisher
6. Advanced Soil Mechanics, B.M.Das,Taylor and Francis.

ENVIRONMENTALSCIENCE

Course code –BSC 302

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(COMMON FOR ALL BRANCH)

Module-1

Concept and scope of Environment science, components of environment, environmental segment and their importance. **(2 Hrs)**

Module-II

Ecology: Ecosystem and its characteristics features, structure and function of forest ecosystem, grassland ecosystem, desert ecosystem and aquatic ecosystem, ecological balance and consequences of imbalance. **(4 Hrs)**

Module-III

Atmosphere: Atmospheric composition, energy balance, climate, weather, depletion of ozone layer, greenhouse effect, acid rain, particles, ions and radicals in the atmosphere, chemical and photochemical reactions in the atmosphere. **(4 Hrs)**

Module-IV

Air pollution and control: Air pollutants, sources and effect of air pollutants, primary and secondary pollutants, photochemical smog, fly ash, inorganic and organic particulate matter. Air quality standards, sampling, monitoring and control measures for pollutants.
(4 Hrs)

Module-V

Water pollution and control: Aquatic environment, water pollution, sources and their effect, lake and ground water pollution, eutrophication, water quality standard and water pollution control measures, waste water treatment.

Module-VI **(4 Hrs)**

Land pollution; Lithosphere, composition of soil, acid base and ion exchange reactions in soil, soil erosion, landslides, desertification, pollutants (municipal, industrial, commercial, agricultural , hazardous solid wastes), origin and effects, collection and disposal of solid wastes, recovery and conversion methods.

(5 Hrs)

Module-VII

Noise pollution; Noise classification and its sources, effects and measurement, noise pollution hazards, standards and noise pollution control. **(2 Hrs)**

Books and References:

1. Master, G.M Introduction to environment engineering and science, Pearson Education.
2. Nebel, B.J., Environment science, Prentice Hall Inc.
3. Odum, E.P. Ecology: The link between the natural and social sciences. IBH Publishing Company Delhi
4. De, A.K. Environmental Chemistry, Merrut.
5. Sharma B.K Envrionmental Chemistry, Krishna Prakashan Media Merrut.
6. Kaushik, A and Kaushik, C.P. Perspectives in Environmental studies, New Age International Publication.
7. Menon, S.E. Environmental Chemistry.

CIVIL ENGINEERINGMATERIAL TESTING LAB Course Code CE301P

List of Experiments

1. Test on Bricks: Shape and size of supplied brick, Water absorption of brick, Compressive strength of bricks.

2. Test on Fine Aggregates: Moisture Content, Specific Gravity, Bulk Density, Sieve Analysis

3. Test on Course Aggregates: Fineness modulus, Crushing Values

4. Test on Cement: Fineness of cement, Soundness of given cement, Specific gravity of cement, Standard consistency of cement, Initial and final setting time of cement.

5. Test on Soil: Sieve Analysis, Specific Gravity, Liquid & Plastic Limits

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FIELD SURVEYING LAB

Course code CE 302P

List of Experiments

1. Study of different Levels and Levelling staff. Practice for temporary adjustment. To find out the reduced levels of given points using Dumpy level. (Reduction by Height of Collimation method)
2. Study of a Tilting (LOP.) Level and to find out the levels of given points (Reduction of data by Rise and Fall method).
3. Visit to Lab, For the study of:-
   (a) Map in the making p Survey of India publication
   (b) Conventional Symbol charts and different types of maps
4. To establish a Benchmark by Check Levelling with a LOP. level and 'closing the work at the staring Bench mark.
5. To perform Fly Levelling with a LO.P. Level.
6. To draw the longitudinal rid cross- sections profiles along a given route.
7. Practice for Temporary adjustments of a Vernier Theodolite and taking Horizontal the work at the starting measurements. By Reiteration method.
8. To plot the coordinates at a given scale on Plane Table and their field checking.
9. To solve two Point and Three Point Problems in Plane Tabling.
10. To carry out Triangulation and Trilateration of a given area (2-3 turns are needed).

ENGINEERING GEOLOGY LAB & STRENGTH OF MATERIAL LAB

Course code CE 303P

ENGINEERING GEOLOGY LAB

List of Experiments

1. Study of rock forming and Economic minerals, study of different rocks
2. Methods of completing the outrop of rocks on a map
3. Drawing the geological sections of geological maps
4. Inter-relation of geological maps rind sections with respect to subsurface Structure.
5. Problems of locating sites of projects like Dams, Tunnels Highways et. In the geological sections.

STRENGTH OF MATERIAL LAB

List of Experiments

1. Tensile Test: To prepare the tensile test upon the given specimen (Mild Steel).
2. Compression Test To determine the compressive strength of the given specimen.
3. Torsion Test: To perform the Torsion test on given specimen.
4. Impact Test: To determine the impact toughness of. The given material.
5. Brinell hardness Test: To determine the hardness of the given specimen. 6. Vicker's Hardness Test: To determine, the hardness of the given specimen.
7. Rockwell Hardness Test: To determine the hardness of the given specimen.

COMMUNICATIONSKILL LAB

Course code HS301

This lab paper involves interactive practice sessions in Language Lab along with some class lectures to enable the students to be confident enough in language and professional sphere of life.

Module I: Listening Comprehension

To comprehend spoken material in standard Indian English/ British English & American English

- Current situation in India regarding English
- American English Vs. British English

Module II: Phonetics & Phonology

- Introduction to Phonetics & Phonology
- Organs of Speech/ Speech Mechanism
- Pronunciation, Intonation, Stress and Rhythm, Syllable division
- Consonants/Vowels/Diphthongs Classification

Module III: Common Everyday Situations: Conversations and Dialogues

Module IV: Communication at Workplace

Module V: Telephonic Conversation

- Introduction
- Listening/Speaking
- Telephonic Skills Required
- Problems of Telephonic Conversation
- Intensive Listening

Module VI: Interviews

- The Interview Process
- Purpose/Planning/Two-way Interaction/Informality
- Pre-interview Preparation Techniques
- Projecting a Positive Image
- Answering strategies

Module VII: Formal Presentations

- Introduction
- Nature/Importance of Presentation
- Planning
- Objective with central idea, main ideas, role of supporting materials
- Handling Stage Fright

Module VIII: Forms of Technical Communication: Technical Report: Definition & importance; Thesis/Project writing: structure & importance; synopsis writing: Methods; Technical research Paper writing: Methods & style; Seminar & Conference paper writing; Expert Technical Lecture: Theme clarity; Analysis & Findings; C.V./Resume writing; Technical Proposal: Types, Structure & Draft.

Module IX: Technical Presentation: Strategies & Techniques Presentation: Forms; interpersonal Communication; Class room presentation; style; method; Individual conferencing: essentials: Public Speaking: method; Techniques: Clarity of substance; emotion; Humour; Modes of Presentation; Overcoming Stage Fear; Audience Analysis & retention of audience interest; Methods of Presentation: Interpersonal; Impersonal; Audience Participation: Quizzes & Interjections.

Module X: Technical Communication Skills: Interview skills; Group Discussion: Objective & Method; Seminar/Conferences Presentation skills: Focus; Content; Style;

Argumentation skills: Devices: Analysis; Cohesion & Emphasis; Critical thinking; Nuances: Exposition narration & Description; effective business communication competence: Grammatical; Discourse competence: combination of expression & conclusion; Socio-linguistic competence: Strategic competence: Solution of communication problems with verbal and nonverbal means.

NOTE: At least ten experiments are to be performed, minimum seven experiments should be performed from above list. Remaining three experiments may either be performed from the above list or designed & set by the concerned institution as per the scope of the syllabus

Jharkhand University of Technology Jharkhand, Ranchi

Proposed Syllabus for B. Tech 4th Semester

Civil Engineering

Civil Engineering

4th semester course structure

Sl. No.	Course code.	Subject	L	T	P	Credit
01	CE401	Surveying & Geomatics – II	3	1	0	3
02	CE402	Fluid Mechanics & Fluid Machines	3	1	0	3
03	CE403	Structural Analysis –I	3	1	0	3
04	CE404	Concrete Structure –I	3	1	0	3
05	EC404	Electronics & Instrumentation Engg.	3	1	0	3
06	EN401/ IT402/ CE405	Engineering Economics / Cyber Security/Disaster Preparedness & Planning	2	0	0	0
01	CE402P	Fluid Mechanics & Fluid Machines Lab	0	0	3	1
02	CE404P	Concrete Structure Lab	0	0	3	1
03	CE406P	CAD Building Drawing Lab	0	0	3	1
04	EX401	Extra Activities (NSO/NSS/NCC/Yoga / Creative Arts/Mini Project)	0	0	2	1
05	IN401	Internship/ Tour & Training/Industrial Training	0	0	0	2
Total credit						**21**

SURVEYING AND GEOMATICS II Course Code:

CE401

Module I:

Triangulation and Trilateration- Principle of Triangulation& trilateration, Types of Triangulations, Signals, selection of station &base line, base line measurement, choices instruments and accessories, extension of base line, corrections, satellite station, reduction to centre, inter visibility, [9hrs]

Module II

Trigonometric levelling: Curvature & Refraction Correction, axis signal corrections. Method of Single &reciprocal Observations &their relative advantage, (4 hrs)

Module III

Theory of errors and adjustment of figures: Types of errors, theory of propagation of errors, law of weights, weighted observation, method to calculate most probable values, least square, normal equation, method to correlate, adjustment of plane and geodetic figures. [7hrs]

Module IV:

Modern Field Survey Systems: Principle of EDM, types of EDM instruments, Distomat, Total station- parts, accessories, advantages and application, Measurement of distance using EDM, Types of waves, modulation of frequency, resolution of ambiguity, Errors in Total station survey, Introduction to GPS- segment, measurement, errors and biases. [8hrs]

Module V

Photogrammetry Surveying: Introduction, basic concepts, perspective geometry of aerial photograph, relief and tilt displacements, terrestrial photogrammetry, flight planning, stereoscopy, ground control extension for photographic mapping- aerial triangulation, No. of Photographs, mosaic. [6hrs]

Module VI:

Remote Sensing: Introduction and Definition of remote sensing terms, Remote sensing system, electromagnetic radiation and spectrum, atmospheric window, different types of platforms, sensors and their characteristics, orbital parameters of a satellite, multi concept in remote sensing. {*Only Introductions of all above*} [6hrs]

Text Books-

Elements of photogrammetry by P.R. wolf.

Introduction to remote sensing by J.B. campbell

FLUID MECHANICS & FLUID MACHINES Course Code: CE402

Module I: Basic concepts and Definitions- Distinction between a fluid and a solid Density, Specific weight, Specific gravity, Kinematic and dynamic viscosity, variation of viscosity with temperature, Newton law of viscosity; vapor pressure, boiling point, cavitations; surface tension, capillarity, Bulk modulus of elasticity, compressibility (4 hrs)

Module II: Fluid Statics- Fluid Pressure: Pressure at a point, Pascal's law, pressure variation with temperature, density and altitude. Piezometer, U-Tube Manometer, Single Column Manometer, U-Tube Differential Manometer, Micromanometers, pressure gauges, Hydrostatic pressure and force: horizontal, vertical and Inclined surfaces. Buoyancy and stability of floating bodies (6 hrs)

Module III: Fluid Kinematics- Classification of fluid flow: steady and unsteady flow; uniform and non- uniform flow; laminar and turbulent flow; rotational and irrotational flow; compressible and incompressible flow; ideal and real fluid flow; one, two and three dimensional flows; Stream line,

path line, streak line and stream tube; stream function. velocity potential function. One, two and three dimensional continuity equations in Cartesian coordinates (6 hrs)

Module IV: Fluid Dynamics – Surface and body forces: Equations of motion- Euler's equation; Bernoulli's equations- derivation; Energy Principle; Practical applications of Bernoulli's equation: venturi meter, orifice meter and pitot tube; Momentum principle; Forces exerted by fluid flow on pipe bend; Vortex Flow – Free and Forced (8 hrs)

Module V: Boundary layer theory, laminar and turbulent flow and flow through pipes (6 hrs)

Module VI: Dimensional Analysis and Dynamics Similitude- Definitions of Reynolds Number, Froude Number, Mach Number, Weber Number and Euler Number; Buckingham's π- Theorem . (4 hrs)

Module VII: Fluid machines; Impact of Jets; Introduction to Turbines and Pumps (8 hrs)

Text/Reference Books:

1. Fluid Mechanics and Machinery, C.S.P. Ojha, R. Berndtsson and P.N. Chandramouli, Oxford University Press 2010
2. Hydraulics and Fluid Mechanics, P.M. Modi and S.M. Seth, Standard Book House.
3. Theory and Applications of Fluid Mechanics, K. Subramanya, Tata McGraw Hill
4. Fluid Mechanics with Engineering Applications, R.L. Daugherty, J.B. Franzini and E.J. Finnemore, International Student Edition, Mc Graw Hill.
5. Elementary fluid mechanics, Dr. R.J. Garde.
6. Fluid Mechanics, R.K. Bansal.

STRUCTURAL ANALYSIS I Course Code: CE403

Module I: Introduction concept of energy principles, safety, sustainable development in performance; what makes a structure; principles of stability, equilibrium; Materials and Structural Design. Introduction to the analysis and design of structural systems. Analyses of determinate and indeterminate trusses, beams and frames, and design philosophies for structural engineering. Laboratory experiments dealing with the analysis of determinate and indeterminate structures: (8 hrs)

Module II: Planning and Design Process; Materials, Loads and Design Safety; Behaviour and Properties of Concrete and Steel; Wind and Earthquake Loads System Design Concepts Design Project Discussions; Cable Structures; Prestressed Concrete Bridges; Constructability and Structural Control; Fire Protection (6 hrs)

Module III: Trusses: General theory; Classification, solution of plane determinate trusses, principle of virtual work and their applications for determination of deflection of determinate plane trusses (6 hrs)

Module IV: Three pinned structures, calculation of bending moment shear force axial force for three hinged arches and diagram of the same. Dead load, stress in three pinned determinate trusses (6 hrs)

Module V: Influence line, basic concepts of moving load and influence line, influence line for actions; shear force and bending moments of determinate beams; absolute maximum shearing forces and bending moment; influence lines for three hinged arches. (6 hrs)

Module VI: Analysis of structure by unit load method and conjugate beam method; Continuous and fixed beam: Theorem of three moments; analysis of fixed beams; settlement of support. (8 hrs)

Suggested Readings:

1. Smith, J.C., Structural Analysis, Harpor and Row, Publishers, New York.
2. Structural Analysis I and II S.S. Bhavikatti, S.Chand Publishers
3. Theory and Problem in Structural Analysis, L.S. Negi, Tata Mcgraw Hills.
4. Structural Analysis, Ramon, v. Jarquio, CRC Press.
5. Structural Analysis, A. Ghali and A.M. Neville, CRC Press

CONCRETE STRUCTURE- I Course Code: CE404

Module I: Study of the strength, behaviour, and design of indeterminate reinforced concrete structures, Load and stresses, load combinations, working stress and limit state approach. (4 hours)

Module II: Analysis and design of sections in bending – working stress and limit state method. Rectangular and T- sections, Beams with reinforcement in compression. One-way slab. Design for shear and bond, Mechanism of shear and bond failure, Design of shear using limit state concept. Development length of bars; Design of sections in torsion. Design of two-way slabs; staircase, Placement of reinforcement in slabs; (16 hours)

Module III: Design of stairs and staircase (6 hours)

Module IV: Design of compression members, Short column, Columns with uni-axial and biaxial bending; Long columns, use of design charts (8 hours)

Module V: Design of foundation; Wall footing, isolated and combined footing for columns. All designs to be as per the most recent BIS standards as applicable (8 hours)

Suggested Readings

2. IS 456:2000 and IS 3370 (Part IV), BIS 2000

3. Design of Reinforced Concrete Structure (Limit State), A.K Jain, Nemchand Bros.
4. Limit state design of Reinforced Concrete (II) P.C. Verghese, PHI publisher
5. Limit state Design, B.C. Punmia, Laxmi Publications

ELECTRONICS AND INSTRUMENTATIONENGINEERING

Course code – EC404

(For Civil, Mech. & Production Engineering).

Module 1: Basic Electronic Components

Active and Passive Components, Types of resistors and Colour coding, Capacitors, Inductors applications of Resistor, Capacitor and Inductor, Relay, LDR, Basic Integrated Circuits (IC 7805, 7809, 7812, 555 etc.). Measuring Instruments like CRO, Power supply, multi-meters etc.

Module II: Semiconductors, Diode and Transistors:

Difference between Insulators, Semiconductors and Conductors, Mobility and Conductivity, Intrinsic and Extrinsic Semiconductors, Fermi Level, Energy band, P-N Junction Diode, construction, working, characteristics and diode equation Application of Diode, Rectifier: Half Wave, Full Wave and Bridge Rectifier, Zener Diode and its Applications, Varactor Diode, Schottky Diode, Regulated Power Supply using Zener Diode and Regulated ICs, LED, Photodetector, Construction, Working, Modes and Configuration of BJT, Input and Output Characteristics of all Configurations, Comparison of all Configuration & Modes, BJT as a Switch and as an Amplifier. JFET Construction, working and characteristics. MOSFET Construction, working and Characteristics, Types of MOSFET,

Module III: Digital Electronics Fundamentals:

Difference between analog and digital signals, Boolean algebra, Basic and Universal Gates, Symbols, Truth tables, logic expressions, Logic simplification using K- map, Logic ICs, half and full adder/subtractor, multiplexers, demultiplexers, flip-flops, shift registers, counters, Block diagram of microprocessor/microcontroller and their applications.

Module IV: Electronic Instruments:

Measurement of Temperature, RTD, Thermistors, LVDT, Strain Gauge, Piezoelectric Transducers, Digital Shaft Encoders, Tachometer, Hall effect sensors. Sensors and Transducers for physical parameters: temperature, pressure, torque, flow. Speed and Position Sensors. Electronic Display Device, Digital Voltmeters, Digital Energy meter, CRO, measurement of voltage and frequency,

Lissajous Patterns, Plotting B-H curve of a magnetic material, Wave Analysers, Harmonic Distortion Analyzer. Digital Energy Meter. Measurements of R, L and
C. Digital Multi-meter, True RMS meters, Clamp-on meters, Meggers. Digital Storage Oscilloscope.

Module V: Electronic Communication Systems:
The elements of communication system, IEEE frequency spectrum and Transmission media: wired and wireless, need of modulation, AM and FM modulation schemes, Mobile communication systems: cellular concept and block diagram of GSM system, Ultrasonic wave & its application in distance measurement.

Text Books

1. Basic Electronics and Linear Circuits by N. N. Bhargava, D. C. Kulshreshtha and S. C. Gupta, TMH Publications.
2. Op-Amps and Linear Integrated Circuits by Ramakant A. Gayakwad, PHI Publications.
3. Electronic Devices and Circuits by Godse and Bakshi Technical, Vol-1 Technical Publication Pune.
4. Floyd ," Electronic Devices" Pearson Education 9th edition, 2012.
5. R.P. Jain , "Modern Digital Electronics", Tata Mc Graw Hill, 3rd Edition, 2007.
6. Frenzel, "Communication Electronics: Principles and Applications", Tata Mc Graw Hill, 3rd Edition, 2001

Reference Books

1. Integrated Devices & Circuits by Millman & Halkias, TMH Publications.
2. Electronics Devices and Circuit Theory by R. Boylestad & L. Nashelsky, Pearson Publication
3. Electronic Communication System by G. Kennedy, TMH Publications.
4. Basic Electronics by Sanjeev Kumar & Vandana Sachdeva, Paragaon International Publication

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CYBER SECURITY

Course code –IT 402

Module I: Introduction to Cybercrime: Introduction, Cybercrime, and Information Security, Who are Cybercriminals, Classifications of Cybercrimes, and Cybercrime: The legal Perspectives and Indian Perspective, Cybercrime and the Indian ITA 2000, A Global Perspective on Cybercrimes.

Module II: Cyber Offenses: How Criminals Plan Them: Introduction, How Criminals plan the Attacks, Social Engineering, Cyber stalking, Cyber Cafe and Cybercrimes, Botnets: The Fuel for Cybercrime, Attack Vector, Cloud Computing.

Module III: Cybercrime : Mobile and Wireless Devices: Introduction, Proliferation of Mobile and Wireless Devices, Trends in Mobility, Credit card Frauds in Mobile and Wireless Computing Era, Security Challenges Posed by Mobile Devices, Registry Settings for Mobile Devices, Authentication service Security, Attacks on Mobile/Cell Phones, Mobile Devices: Security Implications for Organizations, Organizational Measures for Handling Mobile, Organizational Security Policies an Measures in Mobile Computing Era, Laptops.

Module – IV: Tools and Methods Used in Cybercrime : Introduction, Proxy Servers and Anonymizers, Phishing, Password Cracking, Keyloggers and Spywares, Virus and Worms, Trojan Horse and Backdoors, Steganography, DoS and DDoS attacks, SQL Injection, Buffer Overflow.

Module V: Cyber Security: Organizational Implications Introduction, Cost of Cybercrimes and IPR issues, Web threats for Organizations, Security and Privacy Implications, Social media marketing: Security Risks and Perils for Organizations, Social Computing and the associated challenges for Organizations.

TEXT BOOK:

- Cyber Security: Understanding Cyber Crimes, Computer Forensics and Legal Perspectives, Nina Godbole and Sunil Belapure, Wiley INDIA.

REFERENCE BOOK:

- Cyber Security Essentials, James Graham, Richard Howard and Ryan Otson, CRC Press.
- Introduction to Cyber Security , Chwan-Hwa(john) Wu,J.David Irwin.CRC Press T&F Group

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ENGINEERING ECONOMICS

Course code –EN 401

COURSE OUTLINE:

The basic purpose of this course is to provide a sound understanding of concepts and principles of engineering economy and to develop proficiency with methods for making rational decisions regarding problems likely to be encountered in professional practice.

Module -1

Introduction of Engineering Economics and Demand Analysis: Meaning and nature of Economics, Relation between science, engineering, technology and economics; Nature of Economic problem, Production possibility curve, Concepts and measurement of utility, Law of Diminishing Marginal Utility, Law of equi-marginal utility – its practical application and importance.

Meaning of Demand, Individual and Market demand schedule, Law of demand, shape of demand curve, Elasticity of demand, measurement of elasticity of demand, practical importance & applications of the concept of elasticity of demand.

Module -II

Meaning of production and factors of production; Law of variable proportions, Returns to scale, Internal and External economics and diseconomies of scale.

Various concepts of cost – Fixed cost, variable cost, average cost, marginal cost, money cost, real cost, opportunity cost. Shape of average cost, marginal cost, total cost, Cost curves.

Module III

Meaning of Market, Types of Market – Perfect Competition, Monopoly, Oligopoly, Monopolistic Competition (Main features of these markets)

Pricing Policies- Entry Deterring policies, Predatory Pricing, Peak load Pricing. Product Life cycle

Firm as an organisation- Objective of the Firm, Type of the Firm, Vertical and Horizontal Integration, Diversification, Mergers and Takeovers.

Module -IV

Nature and characteristics of Indian economy (brief and elementary introduction), Privatization – meaning, merits and demerits. Globalisation of Indian economy – merits and demerits. Elementary Concepts of VAT, WTO, GATT & TRIPS agreement, Business cycle, Inflation

RECOMMENDED BOOKS:-

1. R.Paneer Seelvan: Engineering Economics, PHI
2. Managerial Economics, D.N.Dwivedi, Vikash Publication
3. Managerial Economics, H.L. Ahuja, S. Chand and Co. Ltd.
4. Managerial Economics, Suma Damodaran, Oxford.

5. R.molrishnd Ro T.V S 'Theory of firms : Economics and Managerial Aspects'. Affiliated East West Press Pvt Ltd New Delhi

6. Managerial Economics, H. Craig Petersen &W. Cris Lewis, Pearson Education.

DISASTER PREPAREDNESS& PLANNING

Course Code: CE405

Module 1: Introduction - Concepts and definitions: disaster, hazard, vulnerability, risks severity, frequency and details, capacity, impact, prevention, mitigation).

Module 2: Disasters - Disasters classification; natural disasters (floods, draught, cyclones, volcanoes, earthquakes, tsunami, landslides, coastal erosion, soil erosion, forest fires etc.); manmade disasters (industrial pollution, artificial flooding in urban areas, nuclear radiation, chemical spills, transportation accidents, terrorist strikes, etc.); hazard and vulnerability profile of India, mountain and coastal areas, ecological fragility.

Module 3: Disaster Impacts - Disaster impacts (environmental, physical, social, ecological, economic, political, etc.); health, psycho-social issues; demographic aspects (gender, age, special needs); hazard locations; global and national disaster trends; climate change and urban disasters.

Module 4: Disaster Risk Reduction (DRR) - Disaster management cycle – its phases; prevention, mitigation, preparedness, relief and recovery; structural and non-structural measures; risk analysis, vulnerability and capacity assessment; early warning systems, Post-disaster environmental response(water, sanitation, food safety, waste management, disease control, security, communications); Roles and responsibilities of government, community, local institutions, NGOs and other stakeholders; Policies and legislation for disaster risk reduction, DRR programmes in India and the activities of National Disaster Management Authority.

Module 5: Disasters, Environment and Development - Factors affecting vulnerability such as impact of developmental projects and environmental modifications (including of dams, land-use changes, urbanization etc.), sustainable and environmental friendly recovery; reconstruction and development methods.

Text/Reference Books:

1. http://ndma.gov.in/ (Home page of National Disaster Management Authority) 2. http://www.ndmindia.nic.in/ (National Disaster management in India, Ministry of Home Affairs).
3. Pradeep Sahni, 2004, Disaster Risk Reduction in South Asia, Prentice Hall.

4. Singh B.K., 2008, Handbook of Disaster Management: Techniques & Guidelines, Rajat Publication.
5. Ghosh G.K., 2006, Disaster Management, APH Publishing Corporation
6. Disaster Medical Systems Guidelines. Emergency Medical Services Authority, State of California,
EMSA no.214, June 2003
7. Inter-Agency Standing Committee (IASC) (Feb. 2007). IASC Guidelines on Mental Health and Psychosocial Support in Emergency Settings. Geneva: IASC

FLUID MECHANICS & FLUID MACHINES LAB

Course Code: CE402P

List of Experiments

1. To determine experimentally the metacentric height of a ship model
2. To verify the momentum equation experimentally.
3. To determine the coefficient of discharge of an orifice (or a month piece) of a given shape.
4. Determine the coefficient of velocity and the coefficient and the contraction of the orifice (or the mouth piece).
5. To verify Darcy's law and to find out the coefficient of permeability of the given medium
6. To study the transition from laminar to turbulent flow and to determine the lower critical Reynolds number,
7. To study the velocity distribution in a pipe and also compute the discharge by integrating the velocity profile.
8. To calibrate a venturi meter and to study the variation of coefficient of discharge with the Reynolds number.
9. To calibrate an orifice meter and study the variation of the coefficient of discharge with the Reynolds number.
10. To study the variation of friction factor "F" for turbulent flow in smooth and rough commercial pipes

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CONCRETE STRUCTURE LAB

Course Code: CE404P

List of Experiments

1. Initial drying shrinkage, moisture movement, and coefficient of expansion of concrete.
2. Stress strain curve of concrete.

3. Behaviour of under reinforced and over reinforced R.C. beams in flexure.
4. Behaviour of R.C. beams, with and without shear reinforcement in shear.
5. Bond strength between steel bar and concrete
   a) in a beam specimen and
   b) By pull-out test.
6. a) Fineness of cement by Air Permeability method.
   b) Soundness of cement by Le-Chatalier's Apparatus
   c) Compressive strength of cement.
7. a) water content for standard consistency of cement.
   b) Initial and final setting times of cement.
9. Moisture content and bulking of fine aggregate 9.Fineness modulus of coarse and fine aggregates.
10. Workability of cement concrete by
   a) Slump test, and b) compaction factor test.
11. Concrete mix design for a given concrete strength and slump by LS. Code method ----------
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CAD BUILDING DRAWING LAB

Course Code: CE406P

List of Experiments

1. Introduction to AutoCAD basic commands, Code provision of IS-696 regarding Lines, Lettering and Dimensioning.
2. Drawing of Scales (Plane Scales, Diagonal Scales, Vernier Scales and Scales of Chords),
3. Construction of simple geometrical figures and Engineering curves.
4. Orthographic Projections: Projection of a point situated in various quadrants, projections of straight lines, true length, true inclinations and traces of a straight lines, auxiliary projections, auxiliary inclined and Auxiliary vertical planes, projection of plane figures.
5. Projection of simple solids, Auxiliary projection of solids, section of solids, true shape of section.
6. Development of surfaces: prisms, pyramids, cylinders, cones, spheres, pipe bends.
7. Isometric projection: Principles, Isometric scales, Isometric projection of plane figures and simple solids.
8. function and types of building (Residential, Industrial and Institutional)

Line plan. Development of plan from a line plan

NOTE: At least ten experiments are to be performed, minimum seven experiments should be performed from above list. Remaining three experiments may either be performed from the above list or designed & set by the concerned institution as per the scope of the syllabus

Jharkhand University of Technology Jharkhand, Ranchi

Proposed Syllabus for B.Tech 3rd Semester

Mechanical Engineering

&

Production Engineering

Mechanical Engineering

3rd semester course structure

Sl. No.	Course Code	Subject	L	T	P	Credit
01	ME301	Thermodynamics	3	1	0	3
02	ME302	Fluid Mechanics	3	1	0	3
03	ME303	Strength Of Materials	3	1	0	3
04	MT301	Materials Engineering	3	1	0	3
05	BSC301	Mathematics-III	3	1	0	4
06	BSC302	Environmental Science	2	0	0	0
01	ME301P	Thermodynamics Lab	0	0	3	1
02	ME302P	Fluid Mechanics Lab	0	0	3	1
03	ME303P	Strength Of Materials Lab	0	0	3	1
04	EX301	Extra Activities (NSO/NSS/NCC/Yoga / Creative Arts/Mini Project)	0	0	2	1
05	HS301	Communication Skill Lab	0	0	2	1
		Total credit				21

Production Engineering

3rd semester course structure

Sl. No.	Course Code	Subject	L	T	P	Credit
01	ME301	Thermodynamics	3	1	0	3
02	ME302	Fluid Mechanics	3	1	0	3
03	ME303	Strength Of Material	3	1	0	3
04	MT301	Materials Engineering	3	1	0	3
05	BSC301	Mathematics-III	3	1	0	4
06	BSC302	Environmental Science	2	0	0	0
01	ME302P	Fluid Mechanics Lab	0	0	3	1
02	ME303P	Strength Of Material Lab	0	0	3	1
03	MT301P	Materials Engineering Lab	0	0	3	1

04	EX301	Extra Activities (NSO/NSS/NCC/Yoga / Creative Arts/Mini Project)	0	0	2	1
05	HS301	Communication Skill Lab	0	0	2	1
Total credit						**21**

PROPOSED SYLLABUS FOR ALL BRANCHES EXCEPT CSE & IT

2nd year, III Semester, UG course Engg. & Tech Jharkhand University of Technology

BSC301 MATHEMATICS III

Module -1

Laplace Transformation: Laplace Transformation and its properties, Periodic function, Unit step function and impulse function. Inverse Laplace Transformation, Convolution Theorem, Applications of Laplace transforms in solving certain initial value problems & simultaneous differential equations**. (8L/1.5Q)**

Module-2

Numerical Method: Finite difference, Symbolic relations, Interpolation and Extrapolation, Newton - Gregory forward and backward formula, Lagrange's formula, Inverse Interpolation by Lagrange's formula. Numerical Differentiation and Numerical Integration, Newton Cotes Quadrature formula, Trapezoidal rule. Simpson's 1/3" rule, Simpson's 3/8" rule. **(10L/1.5Q)**

Module -3

Z-Transform & Inverse Z-Transform- Properties - Initial and Final value theorems, Convolution theorem- Difference equations. Solution of difference equations using Z-Transformation. **(6L/1.5Q)**

Module –IV Fourier Series & Fourier Transform: Expansion of - Algebraic, Exponential &Trigonometric functions in Fourier series, Change of interval, Even and odd function, half range sine and cosine series, Complex form of Fourier series.

Fourier Transformation and inverse Fourier Transformation, Fourier sine & cosine transforms. Convolution theorem for Fourier transforms with simple illustrations. **(8L/1.5Q)**

Module V

Partial Differential Equations: Formation of partial differential equations, Linear partial differential equations of first order, Lagrange's linear equation, Non-linear equations of first order, Charpit's method Solution of one dimensional Wave equation & Heat equation by the method of separation of variables and its applications. **(8L/1Q)**

Note-Question no.1 will be compulsory, objective type with 7 sub-parts comprising of the whole syllabus.

Text Books

1. Irwin Kreyszig, Advanced Engineering Mathematics, 9th Edition, John Wiley & Sons,
2. Ramana R. V ., Higher Engineering Mathematics, Tata McGraw Hill New Delhi,2010.
3. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 44th Edition,

Reference Books

1. R. J. Beerends .H. G. Ter Morsche, J. C. Van Den Berg. L. M. Van De Vrie, Fourier and Laplace Transforms, Cambridge University Press.
2. Sastry S.S. Introductory Methods of Numerical Analysis, PHI

THERMODYNAMICS

(ME, PROD) Course
code -ME 301

Objectives:

- To learn about work and heat interactions, and balance of energy between system and its surroundings.
- To learn about application of I law of various energy conversion devices.
- To evaluate the changes in properties of substances in various processes.
- To understand the difference between high grade and low grade energies and II law limitations on energy conversion.

Contents:

Module -I

Fundaments- system and control volume; property; state and process; Exact & inexact differentials; Work-thermodynamic definition of work; examples; displacement work; path dependence of displacement work and illustrations for simple processes; electrical, magnetic, gravitational, spring and shaft work. **(5hrs)**

Module – II

Temperature , definition of thermal equilibrium and zeroth law; Temperature scales; various thermometers-definition of heat; examples of heat/work interaction in systems-first law for cycle & non-cyclic processes; concept of total energy E; Demonstration that E is a property; Various modes of energy; internal energy and enthalpy**.(5hrs)**

Module – III

Definition of pure substance, ideal gases and ideal gas mixture, real gases and real gas mixtures, compressibility charts-Properties of tow phase system-const. temperature and const. pressure heating of water; Definitions of standard states; PV-T surface; use of steam tables and R134a tables; saturation tables; superheated tables; identification of states and determination of properties, Mollier's chart. (8hrs)

Module – IV

First law of flow processes-Derivation of general energy equation for a control volume; Steady state flow processes including throttling; Examples of steady flow devices; unsteady processes; Examples of steady and unsteady I law applications for system and control volume. **(5hrs)**

Module -V

Second law- Definitions of direct and reverse heat engines; Definitions of thermal efficiency and COP; Kelvin-plank and Clausius statements; Definition of reversible process; internal and external irreversibility; Carnot cycle; Absolute Temperature Scale. **(5hrs)**

Module-VI

Clausius inequality; Definition of energy S; Demonstration that entropy S is a property; Evaluation of S for solids, liquids, ideal gases and ideal gas mixtures undergoing various processes; Determination of S from steam tables-Principle of increase of entropy; Illustration of processes in T-S co-ordinates; Definition of Isentropic efficiency for compressors, turbines and nozzles-Irreversibility and availability, availability function for systems and control volume undergoing different processes, Lost work. Second law analysis for a control volume. Energy balance equation and Energy analysis. **(8hrs)**

Module -VII

Thermodynamic cycles- Basic Rankine cycle; Basic Brayton cycle; Basic vapour compression cycle and comparison with Carton cycle. **(4hrs)**

Course Outcomes:

1. After completing this course, the students will be able to apply energy balance to systems and control volumes, in situations involving heat and work interactions.
2. Students can evaluate changes in thermodynamic properties of substances.
3. The student will be able to evaluate the performance of energy conversion devices.
4. The students will be able to differentiate between high grade and low grade energies.

Text Books:

1. Sonntag R.E., Borgnakke C. and Van wylen G. J., 2003- 6th edition, *Fundamentals of thermodynamics*, John Wiley and sons.
2. Jones, J.B. and Duggan R.E., 1996, *Engineering Thermodynamics*, PrenticeHall of India.
3. Morgan, M.J and Shapiro, H.N., 1999, *Fundamentals of Engineering Thermodynamics*, John Wiley and Sons.
4. Nag P.K.,1995, *Engineering Thermodynamics*, Tata McGraw-Hill Publishing Co. Ltd.

FLUID MECHANICS

Course Code-ME302

Module I

Fluids and Their Properties: Introduction of fluid, fluid classifications, hypothesis of continuum, Shear stress in a moving fluid, molecular structure of material, fluid density, viscosity, causes of viscosity in gases and liquids, surface tension, capillary effect, vapor pressure, cavitation, compressibility and the bulk modulus

Module II

Pressures and Head: Types of Pressure, Pascal's law of pressure at a point, variation of pressure vertically in a fluid under gravity, equality of pressure at the same level in a static fluid, general equation for the variation of pressure due to gravity from a point to point in a static fluid, pressure and head, the hydrostatic paradox, pressure measurements using Elastic Pressure
Transducers, Force Balance Pressure gauge, Electrical Pressure Transducers

Module III

Static Forces on Surface and Buoyancy: Fluid static, action of fluid pressure on surface, resultant force and centre of pressure on a plane surface under uniform pressure, resultant force and centre of pressure on a plane surface immersed in a liquid, pressure diagrams, forces on a curved surface due to hydrostatic pressure, buoyancy, equilibrium of floating bodies, stability of a submerged body, stability of floating bodies, determination of the metacentric height, determination of the position of the metacentre relative to the centre of buoyancy

Module IV

The Energy Equation and its Application: Momentum and fluid flow, Momentum equation for 2D and 3-D flow along a stream line, momentum correction factor, Euler's equation of motion along a stream line, Mechanical energy of a flowing fluid – Bernoulli's theorem, kinetic energy correction factor, pitot tube, determination of volumetric flow rate via pitot tube, changes of pressure in tapering pipe, principle of venturi meter, pipe orifices, theory of small orifices discharging to atmosphere, theory of large orifices, Rotameter, elementary theory of notches and weirs, flow in a curved path

Module V

Dimensional Analysis And Similarities: Dimension reasoning, dimensional homogeneity, dimensional analysis using Rayleigh's method, Buckingham π-theorem, significance of dimensionless, use of dimensionless numbers in experimental investigation, geometric similarity,

dynamic similarity, Kinematic similarity, model testing-Model laws, Undistorted and Distorted models.

Module VI

Viscous Flow: Reynolds number and Reynolds experiment, flow of viscous fluid through circular pipe- Hagen Poiseuille formula, Flow of viscous fluid between two parallel fixed plates, power absorbed in viscous flow through - journal, foot step and collar bearing, movement of piston in dash pot, methods of measurement of viscosity Turbulent Flow: Expression for coefficient of friction -Darchy Weishbach Equation, Moody diagram resistance of smooth and rough pipes shear stress and velocity distribution in turbulent flow through pipes.

Module VII

Flow through pipes: Major energy losses, Minor energy losses, Hydraulic gradient and total energy lines, Pipes in series and parallel, Equivalent pipes, Siphon, power transmission through pipe, Flow through nozzle at end of pipe, Water hammer in pipes

Compressible Flow: Basic equations for one dimensional compression, Pressure wave propagation, sound velocity in fluid, Mach number, Stagnation properties

Reference Books:

1. Fluid Mechanics and Fluid Power Engineering by D.S. Kumar, S.K.Kataria & Sons
2. Fluid Mechanics and Hydraulic Machines by R.K. Bansal, Laxmi Publications 3. Fluid Mechanics and Hydraulic Machines by R.K. Rajput, S.Chand & Co.
4. Fluid Mechanics by Frank .M. White, McGraw Hill Publishing Company Ltd.
5. Fundamentals of Fluid Mechanics by Munson, Wiley India Pvt. Ltd
6. Fluid Mechanics by A. K. Mohanty, PHI Learning Pvt. Ltd.
7. Laboratory Manual Hydraulics and Hydraulic Machines by R V Raikar

Course Outcome: After learning the course the students should be able to: Understand the basic concept of fluid mechanics.

- Understand statics, dynamics and various approaches to fluid mechanics.
- Understand fundamentals of flow through pipes
- Understand basics of compressible flow
- Correlate fundamentals of fluid mechanics with various mechanical systems

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STRENGTH OF MATERIALS

(ME, PROD, CE)

Course code -ME 303

Objectives:

- To understand the nature of stresses developed in simple geometries such as bars, cantilevers, beams, shafts cylinders and spheres for various types of simple loads.
- To calculate the elastic deformation occurring in various simple geometries for different types of loading.

Contents:

Module-1

Deformation in solids-Hooks law, stress and strain-tension, compression and shear stresses –elastic constants and their relations-volumetric, linear and shear strains principal stresses and principal planes-mohr's circle **(8hrs)**

Module-II

Beams and types transverse loading on beams-shear force and bending moment diagrams-Types of beam supports, simply supported and over hanging beams, cantilevers. Theory of bending of beam, bending stresses distribution and neutral axis, shear stress distribution, point and distributed loads**. (8hrs)**

Module-III

Moment of inertia about the axis and polar moment of inertia, deflection of beam using double integration method, computation of slopes and deflection in beams,

Maxwell's reciprocal theorem**. (8hrs)**

Module-IV

Torsion, stresses and deformation in circular and hollow shafts, stepped shafts, deflection of shafts fixed at both ends, stresses and deflection of helical spring**.**

(8hrs)

Module -V

Axial and hoop stresses in cylinders subjected to internal pressure, deformation of thick and thin cylinders, deformation in spherical shells subjected to internal pressure**.(8hrs)**

Course Outcomes:

- After completing this course, the students should able to recognize various type of load applied on machine components of simple geometry and understand the nature of internal stresses that will develop within the components.
- The students will be able to evaluate the strains and deformation that will results due to the elastic stresses develop within the material for simple type of loading.

Test Books:

1. Egor P. Popov,Engineering Mechanics of solids,Prentice Hall of india,New Delhi,2001.
2. R.Subramanian, Strength of Materials,Oxford University Press,2007.

Ferdinand P.Been, Russel Johnson Jr and Jhon J.Dewole, Mechanism of materials, Tata McGrawHill Publication Co. Ltd., New Delhi 2005.

MATERIAL ENGINEERING

(ME, PROD) Course
code -MT 301

Course Objectives:

To increasing demand of the available materials, coupled with new applications and requirements has brought about many changes in the style of their uses. To develop the basic knowledge of metals, polymers composites and ceramics other than conventional metals and alloys to apply them to advance engineering applications.

Module - I

Introduction – Crystalline and Non crystalline solids, Classification of Engineering materials and their selections, Bonding in solids: Ionic, Covalent and Metallic bonding. (5hrs)

Module – II

Crystal Structure- Space lattices, Bravais lattices, Crystal system, Unit Cell, Metallic crystal structures: SC, BCC, FCC, HCP structures, Miller notations of planes and directions, Imperfections in crystal: Point defects, Line surface defects.
Dislocations: Edge and Screw dislocation, Burgers vectors. (12 hrs)

Module – III

Metallic Materials – Metals and alloys, ferrous materials- introduction to Iron carbon Diagram, steel and their Heat treatment, Properties and applications. Different types of heat treatment processes. Non-ferrous alloys: - Copper based alloys. Al based alloys, other important nonferrous alloys, properties and applications. (10hrs)

Module – IV

Polymers- Basic concepts of Polymers Science, polymer classifications. Crystallinity of polymers, Copolymers, Thermoplastic and Thermosetting polymers, Elastomers, Properties and Applications. (5hrs)

Module – V

Ceramics- Basic concepts of ceramics science, traditional and new ceramics. Oxide and Non-Oxide ceramics, Ceramics for high temperature applications. Glass, applications of ceramics, and glass. (5hrs)

Module -VI

Composite materials- Definition, general characteristics. Particles reinforced and fibre reinforced composite materials, MMC, CMC, PMC, properties and applications. (5hrs)

Text Books:

1. Elements of Material Science by Van Vlack
2. Material Science by O.P. Khanna
3. Material Science and Engineering by V. Raghavan 4. Material Science by R. K.Sharma and R.S. Sedha

Reference Books:
1. Material Science and Engineering by Wiliam D. Callister

Course Outcomes:

At the end of this course, the students would be able to:

- Select different materials other than conventional metals and alloys for specific engineering applications.
- To solve the materials problems associated with the weight reduction through the appropriate choice of metals, polymers, ceramics and composites.
- Selection criterion for polymers and composites for various engineering applications.

ENVIRONMENTAL SCIENCE

Course code –BSC 302

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(COMMON FOR ALL BRANCH)

Module-1

Concept and scope of Environment science, components of environment, environmental segment and their importance. **(2 Hrs)**

Module-II

Ecology: Ecosystem and its characteristics features, structure and function of forest ecosystem, grassland ecosystem, desert ecosystem and aquatic ecosystem, ecological balance and consequences of imbalance. **(4 Hrs)**

Module-III

Atmosphere: Atmospheric composition, energy balance, climate, weather, depletion of ozone layer, greenhouse effect, acid rain, particles, ions and radicals in the atmosphere, chemical and photochemical reactions in the atmosphere.

Module-IV (4 Hrs)

Air pollution and control: Air pollutants, sources and effect of air pollutants, primary and secondary pollutants, photochemical smog, fly ash, inorganic and organic particulate matter. Air quality standards, sampling, monitoring and control
measures for pollutants.
(4 Hrs)

Module-V

Water pollution and control: Aquatic environment, water pollution, sources and their effect, lake and ground water pollution, eutrophication, water quality standard and water pollution control measures, waste water treatment.

Module-VI (4 Hrs)

Land pollution; Lithosphere, composition of soil, acid base and ion exchange reactions in soil, soil erosion, landslides, desertification, pollutants (municipal, industrial, commercial, agricultural , hazardous solid wastes), origin and effects, collection and disposal of solid wastes, recovery and conversion methods.

Module-VII

Noise pollution; Noise classification and its sources, effects and measurement, noise pollution hazards, standards and noise pollution control. **(2 Hrs)**

Books and References:

1. Master, G.M Introduction to environment engineering and science, Pearson Education.
2. Nebel, B.J., Environment science, Prentice Hall Inc.
3. Odum, E.P. Ecology: The link between the natural and social sciences. IBH Publishing Company Delhi
4. De, A.K. Environmental Chemistry, Merrut.
5. Sharma B.K Envrionmental Chemistry, Krishna Prakashan Media Merrut.
6. Kaushik, A and Kaushik, C.P. Perspectives in Environmental studies, New Age International Publication.
7. Menon, S.E. Environmental Chemistry.

MATERIALS ENGINEERING LAB

MT301P

List of experiments

1. To study the Metallurgical Microscope.
2. To study the lattice structure of various types of unit cells, observe the mille indices for various planes & directions in unit cells.
3. To study the microstructure of cast iron, cold work forged, rolled condition.
4. To study the microstructure of mild steel.
5. To study the microstructure of brass solder underancaed.
6. To verify Hall effect.
7. To verify the fracture, characteristics of ductile & brittle materials.
8. To determine the chemical composition of a few common alloys.
9. To determine the percentage of carbon & sulphur contents in a alloy with Fe as main constituent.
10. Estimation of percentage carbon composition of mild steel.

FLUID MECHANICS LAB

Course Code-ME302P

1. To determine the coefficient of impact for vanes.
2. To determine coefficient of discharge of an orifice meter.
3. To determine the coefficient of discharge of Notch (V and Rectangular types).
4. To determine the friction factor for the pipes.
5. To determine the coefficient of discharge of venturi meter.
6. To determine the coefficient of discharge, contraction & velocity of an orifice.
7. To verify the Bernoulli's Theorem.
8. To find critical Reynolds number for a pipe flow.
9. To determine the meta-centric height of a floating body.
10. To determine the minor losses due to sudden enlargement, sudden contraction and bends.
11. To show the velocity and pressure variation with radius in a forced vertex flow.
12. Verification of momentum theory by impact of Jet
13. To study the performance characteristics of a Pelton Turbine
14. Determine the operating characteristic of a reaction turbine
15. Determine the operating characteristic of a reciprocating pump
16. Verification of momentum theory by impact of Jet

Strength of Material Lab

ME303P

Name of the Experiment

1.Tensile test: To prepare the tensile test upon the given specimen (Mild Steel)
2. Compression test: To determine the compressive strength of the given specimen
3.Torsion test: To perform the Torsion test on the given specimen.
4.Impact test: To determine the Impact toughness of the given material
5.Brinell hardness test: To determine the hardness of the given specimen
6.Vicker, s Hardness test: To determine the hardness of the given specimen
7.Rockwell Hardness test: To determine the hardness of the given specimen.
8.To determine the shear strength of a mild steel specimen by Double Shear Test
9.To determine the modulus of rigidity of a solid circular rod by conducting Torsion Test.
10.To obtain tensile strength, modulus of elasticity, percentage elongation and percentage reduction in area. of cross-section.

COMMUNICATIONSKILL LAB

Course code HS301

This lab paper involves interactive practice sessions in Language Lab along with some class lectures to enable the students to be confident enough in language and professional sphere of life.

Module I: Listening Comprehension

- To comprehend spoken material in standard Indian English/ British English & American English
- Current situation in India regarding English

American English Vs. British English

Module II: Phonetics & Phonology

- Introduction to Phonetics & Phonology
- Organs of Speech/ Speech Mechanism
- Pronunciation, Intonation, Stress and Rhythm, Syllable division
- Consonants/Vowels/Diphthongs Classification

Module III: Common Everyday Situations: Conversations and Dialogues
Module IV: Communication at Workplace

Module V: Telephonic Conversation

- Introduction
- Listening/Speaking
- Telephonic Skills Required
- Problems of Telephonic Conversation
- Intensive Listening

Module VI: Interviews

- The Interview Process
- Purpose/Planning/Two-way Interaction/Informality
- Pre-interview Preparation Techniques
- Projecting a Positive Image
- Answering strategies

Module VII: Formal Presentations

- Introduction
- Nature/Importance of Presentation
- Planning
- Objective with central idea, main ideas, role of supporting materials
- Handling Stage Fright

Module VIII: Forms of Technical Communication: Technical Report: Definition & importance; Thesis/Project writing: structure & importance; synopsis writing: Methods; Technical research Paper writing: Methods & style; Seminar & Conference paper writing; Expert Technical Lecture: Theme clarity; Analysis & Findings; C.V./Resume writing; Technical Proposal: Types, Structure & Draft.

Module IX: Technical Presentation: Strategies & Techniques Presentation: Forms; interpersonal Communication; Class room presentation; style; method; Individual conferencing: essentials: Public Speaking: method; Techniques: Clarity of substance; emotion; Humour; Modes of Presentation; Overcoming Stage Fear; Audience Analysis & retention of audience interest; Methods of Presentation: Interpersonal; Impersonal; Audience Participation: Quizzes & Interjections.

Module X: Technical Communication Skills: Interview skills; Group Discussion: Objective & Method; Seminar/Conferences Presentation skills: Focus; Content; Style; Argumentation skills: Devices: Analysis; Cohesion & Emphasis; Critical thinking; Nuances: Exposition narration & Description; effective business communication competence: Grammatical; Discourse competence: combination of expression & conclusion; Socio-linguistic competence: Strategic competence: Solution of communication problems with verbal and nonverbal means.

Jharkhand University of Technology Jharkhand, Ranchi

Proposed Syllabus for B.Tech 4th Semester

Mechanical Engineering

&

Production Engineering

Mechanical Engineering

4th semester course structure

Sl. No.	Course code.	Subject	L	T	P	Credits
01	ME401	Theory Of Machines	3	1	0	3
02	ME402	Fluid Machines	3	1	0	3
03	ME403	Applied Thermodynamics	3	1	0	3
04	ME404	Manufacturing Process-I	3	1	0	3
05	EC404	Electronics & Instrumentation Engg.	3	1	0	3
06	EN401/ IT402	Engineering Economics / Cyber Security	2	0	0	0
01	ME401P	Theory Of Machines Lab	0	0	3	1
02	ME403P	Applied Thermodynamics Lab	0	0	3	1
03	ME404P	Manufacturing Process-I Lab	0	0	3	1
04	EX401	Extra Activities (NSO/NSS/NCC/Yoga/ Creative Arts/Mini Project)	0	0	2	1
05	IN401	Internship/ Tour & Training/Industrial Training	0	0	0	2
Total credits						**21**

Production Engineering

4th semester course structure

Sl. No.	Course code.	Subject	L	T	P	Credit
01	PE401	Manufacturing Process-I	3	1	0	3
02	PE402	Industrial Management & Plant Engineering	3	1	0	3
03	PE403	Heat Transfer	3	1	0	3
04	ME401	Theory Of Machines	3	1	0	3
05	EC404	Electronics & Instrumentation Engg.	3	1	0	3
06	EN401/ IT402	Engineering Economics / Cyber Security	2	0	0	0
01	PE401P	Manufacturing Process – I Lab	0	0	3	1
02	ME401P	Theory Of Machines Lab	0	0	3	1
03	EC404P	Instrumentation Lab	0	0	3	1
04	EX401	Extra Activities (NSO/NSS/NCC/Yoga / Creative Arts/Mini Project)	0	0	2	1

05	IN401	Internship/ Tour & Training/Industrial Training	0	0	0	2
Total credit						**21**

THEORY OF MACHINE

(ME, PROD) Course
code -ME 401

Objective:

- To understand the kinematics and rigid-body dynamics of kinematically driven machine components
- To understand the motion of linked mechanism in terms of the displacement, velocity and acceleration at any point in a rigid link
- To understand the kinematics of gear trains

Contents:

Module -1

Classification of mechanisms- Basic kinematic concepts and definition – Degree of freedom, mobility-Grashof 's law, Kinematic inversions of four bar chain and slider crank chains-Limit proportions-Mechanical advantage-Transmission angle – Description of some common mechanisms-Quick return mechanism, Straight line generators-Universal Joint- Rocker mechanism**(8hrs)**

Module-II

Displacement, velocity and acceleration analysis of simple mechanisms, graphical velocity analysis using instantaneous centres, velocity and acceleration analysis using loop closure equation-kinematics analysis of simple mechanisms-slider crank mechanism dynamics-Coincident points- Coriolis component of acceleration – introduction to linkage synthesis-three position graphical synthesis for motion and path generation**(8hrs)**

Module-III

Classification of cams and followers –Terminology and definitions –Displacement diagrams –Uniform velocity, parabolic, simple harmonic and cycloidal motions derivatives of follower motion-specified counter cams-circular and tangents cams –

pressure angle and undercutting, sizing of cams, graphical and analytical disc cam profile synthesis for roller and flat face followers**(8hrs)**

Module – IV

Involute and cycloidal gear profiles, gear parameters, fundamental law of gearing and conjugate action, spur gear contact ratio and interference/undercutting –helical, bevel, worm, rack & pinion gears, epicyclic and regular gear train kinematics**(8hrs)**

Module – V

Surface contacts-sliding and rolling friction- friction drives- bearings and lubrication-friction clutches-belt and rope drives-friction in brakes**(8hrs)**

Course outcomes:

- After completing this course, the students can design various types of linkage mechanism for obtaining specific motion and analyse them for optimal functioning.

Text Book:

1.Thomas Bevan, Theory of machines,3rd edition, CBS Publishers &Distributors,2005.

2.Cleghorn W.L., Mechanisms of Machines, Oxford University Press,2005.

3.Robert L. Norton, Kinematics and Dynamics of machinery, Tata McGrawHill,2009.

4.Ghosh A. And Mallick A. K, Theory of Mechanism and Machines, Affiliated East-West Pvt.Ltd,New Delhi,1988.

FLUID MACHINE

(ME, PROD) Course
code -ME 402

Module I
Introduction: Impulse of Jet and Impulse Turbines:

Classification of Fluid Machines & Devices, Application of momentum and moment of momentum equation to flow through hydraulic machinery, Euler's fundamental equation. Introduction to hydrodynamic thrust of jet on a fixed and moving surface (flat & curve), Classification of turbines, Impulse turbines, Constructional details, Velocity triangles, Power and efficiency calculations, Governing of Pelton wheel. (8 hrs)

Module II
Reaction Turbines:

Francis and Kaplan turbines, Constructional details, Velocity triangles, Power and efficiency calculations, Degree of reaction, Draft tube, Cavitation in turbines, Principles of similarity, Unit and specific speed, Performance characteristics, Selection of water turbines. (8 hrs)

Module III
Centrifugal Pumps:

Classifications of centrifugal pumps, Vector diagram, Work done by impellor, Efficiencies of centrifugal pumps, specific speed, Cavitation & separation, Performance characteristics. (8 hrs)

Module IV
Positive Displacement and other Pumps:

Reciprocating pump theory, slip, Indicator diagram, Effect of acceleration, air vessels, Comparison of centrifugal and reciprocating pumps, Performance characteristics. (8 hrs)

Module V

Hydraulic accumulator, Hydraulic intensifier, Hydraulic Press, hydraulic crane, hydraulic lift, hydraulic RAM, Hydraulic coupling, Hydraulic torque converter, air lift pump, jet pump. (8 hrs)

BOOK

1. Hydraulic Machines by Jagdish Lal, Metropolitan book co. pvt. Ltd.
2. Hydraulic Machines by K Subramanya, Tata McGraw Hill
3. Fluid Mechanics and Machinery by C.S.P. Ojha, R. Berndtsson, P.N. Chandramouli, Oxford University Press.
4. Fluid Mechanics and Fluid Power Engineering by D S Kumar, S K Kataria & Sons
5. Fluid Mechanics and Turbo machines by Das, PHI
6. Fluid Power with Applications, by Esposito, Pearson
7. Fluid Mechanics and hydraulic machines by Modi & Seth, Standard Book House
8. Fundamentals of Turbomachinery by Venkanna B.K., PHI
9. Hydraulic Machines: Theory & Design, V.P. Vasandhani, Khanna Pub.
10. Fluid Mechanics and Hydraulic Machines by SukumarPati, Tata McGrew Hill.

APPLIED THERMODYNAMICS

Course Code-ME 403

Objectives:

1) To learn about of 1st law for reacting systems and heating value of fuels.
2) To learn about gas and vapor cycles and their first law and second law efficiencies.
3) To understand about the properties of dry and wet air and the principles of psychometry.
4) To learn about gas dynamics of air flow and steam through nozzles. 5) To learn the about reciprocating compressors with and without intercooling 6) To analyse the performance of steam turbines.

Module-1

Introduction to solid, liquid and gaseous fuels- Stoichiometry, exhaust gas analysis- First law analysis of combustion reactions- Heat calculations using enthalpy tables- Adiabatic flame temperature- Chemical equilibrium and equilibrium composition calculations using free energy. (8Hrs)

Module -II

Vapor power cycles Rankine cycle with superheat, reheat and regeneration, energy analysis Super-critical and ultra-super-critical Rankine cycle- Gas power cycles, Air standard Otto, Diesel and Dual cycles- Air standard Brayton cycle, effect of reheat, regeneration and intercooling – Combined gas and vapor power cycles- vapor compression refrigeration cycles, refrigerants and their properties(12hrs)

Module-III

properties of dry and wet air, use of psychrometric chart, processes involving heating/cooling and humidification/ dehumidification, dew point(4hrs)

Module-IV

Basics of compressible flow. Stagnation properties, Isentropic flow of a perfect gas through a nozzle, chocked flow, subsonic and supersonic flows- normal shocks-use of ideal gas tables for isentropic flow and normal shock flow- Flow of steam and refrigerant through nozzle, super saturation-compressible flow in diffusers, efficiency of nozzle and diffuser. (8hrs)

Module-V

Reciprocating compressors, staging of reciprocating compressors, optimal stage pressure ratio, effect of intercooling, minimum work for multistage reciprocating compressors. (5hrs)

Module-VI

Analysis of steam turbines, velocity and pressure compounding of steam turbine. (3hrs) **Outcomes:**

1. After completing this course the students will get a good understanding of various practical power cycles and heat pump cycles.

2. They will be able to analyse energy conversion in various thermal devices such as combustors, air coolers, nozzles, diffusers, steam turbines and reciprocating compressors.
3. They will be able to understand phenomena occurring in high speed compressible flows.

MANUFACTURING PROCESSES I

Course Code-ME 404

Objectives:
To motivate and challenge students to understand and develop an appreciation of the processes in correlation with material properties which change the shape, size and form of the raw materials into the desirable product by conventional or unconventional manufacturing methods.

Module-I
Conventional Manufacturing Processes: Casting and moulding: Metal casting processes and equipment, Heat transfer and solidification, shrinkage, riser design, casting defects and residual stresses. (5 Hrs.)

Module-II
Introduction to bulk and sheet metal forming, plastic deformation and yield criteria; fundamentals of hot and cold working processes; load estimation for bulk forming (forging, rolling, extrusion, drawing) and sheet forming (shearing, deep drawing, bending) principles of powder metallurgy. Metal Cutting: Single and multi-point cutting; Orthogonal cutting, various force components: Chip formation, Tool wear and tool life. Surface finish and integrity, Machinability, Cutting tool materials, cutting fluids coating; Turning, Drilling, Milling and finishing processes, Introduction to CNC machining (8 Hrs.)

Module-III
Additive manufacturing: Rapid prototyping and rapid tooling (3 Hrs.)

Module-IV
Joining/ fastening processes: Physics of welding, brazing and soldering; design considerations in welding. Solid and liquid state joining processes; Adhesive bonding (3 Hrs.)

Module-V
Unconventional Machining Processes: Abrasive Jet Machining, Water Jet Machining Abrasive Water Jet Machining, Ultrasonic Machining principles and process parameters (5 Hrs.)

Module-VI

Electrical Discharge Machining principle and processes parameters, MRR, surface finish tool wear, dielectric, power and control circuits, wire EDM; Electro-chemical machining (ECM), etchant & maskant, process parameters, MRR and surface finish. (8hrs)

Electrical Discharge Machining principle and processes parameters, MRR, surface finish tool wear, dielectric, power and control circuits, wire EDM; Electro-chemical machining (ECM), etchant & maskant, process parameters, MRR and surface finish. (8 Hrs.)

Module-VII

Laser Beam Machining (LBM), Plasma Arc Machining (PAM) and Electron Beam Machining (3 Hrs.)

Books and References:

1. Kalpakjian and Schmid, Manufacturing processes for engineering materials (5th Edition)- Pearson India, 2014.
2. Mikell P. Groover, Fundamentals of Modern Manufacturing: Materials, Processes, and Systems.
3. Manufacturing Technology by P.N. Rao., MCGRAW HILL INDIA.
4. Materials and Manufacturing by Paul Degarmo.
5. Manufacturing Processes by Kaushish, PHI.
6. Principles of Foundry Technology, Jain, MCGRAW HILL INDIA
7. Production Technology by RK Jain.
8. Degarmo, Black & Kohser, Materials and Processes in Manufacturing.

Course Outcomes: Upon completion of this course, students will be able to understand the different conventional and unconventional manufacturing methods employed for making different products.

ELECTRONICS AND INSTRUMENTATION ENGINEERING

Course code – EC404

(For Civil, Mech. and Production Engineering).

Module 1: Basic Electronic Components

Active and Passive Components, Types of resistors and Colour coding, Capacitors, Inductors applications of Resistor, Capacitor and Inductor, Relay, LDR, Basic Integrated Circuits (IC 7805, 7809, 7812, 555 etc.). Measuring Instruments like CRO, Power supply, multi-meters etc.

Module II: Semiconductors, Diode and Transistors:

Difference between Insulators, Semiconductors and Conductors, Mobility and Conductivity, Intrinsic and Extrinsic Semiconductors, Fermi Level, Energy band, P-N Junction Diode,

construction, working, characteristics and diode equation Application of Diode, Rectifier: Half Wave, Full Wave and Bridge Rectifier, Zener Diode and its Applications, Varactor Diode, Schottky Diode, Regulated Power Supply using Zener Diode and Regulated ICs, LED, Photodetector, Construction, Working, Modes and Configuration of BJT, Input and Output Characteristics of all Configurations, Comparison of all Configuration & Modes, BJT as a Switch and as an Amplifier. JFET Construction, working and characteristics. MOSFET Construction, working and Characteristics, Types of MOSFET,

Module III: Digital Electronics Fundamentals:
Difference between analog and digital signals, Boolean algebra, Basic and Universal Gates, Symbols, Truth tables, logic expressions, Logic simplification using K- map, Logic ICs, half and full adder/subtractor, multiplexers, demultiplexers, flip-flops, shift registers, counters, Block diagram of microprocessor/microcontroller and their applications.

Module IV: Electronic Instruments:
Measurement of Temperature, RTD, Thermistors, LVDT, Strain Gauge, Piezoelectric Transducers, Digital Shaft Encoders, Tachometer, Hall effect sensors. Sensors and Transducers for physical parameters: temperature, pressure, torque, flow. Speed and Position Sensors. Electronic Display Device, Digital Voltmeters, Digital Energy meter, CRO, measurement of voltage and frequency, Lissajous Patterns, Plotting B-H curve of a magnetic material, Wave Analysers, Harmonic Distortion Analyzer. Digital Energy Meter. Measurements of R, L and C.Digital Multi-meter, True RMS meters, Clamp-on meters, Meggers. Digital Storage
Oscilloscope.

Module V: Electronic Communication Systems:
The elements of communication system, IEEE frequency spectrum and Transmission media: wired and wireless, need of modulation, AM and FM modulation schemes, Mobile communication systems: cellular concept and block diagram of GSM system, Ultrasonic wave & its application in distance measurement.

Text Books

1. Basic Electronics and Linear Circuits by N. N. Bhargava, D. C. Kulshreshtha and S. C. Gupta, TMH Publications.
2. Op-Amps and Linear Integrated Circuits by Ramakant A. Gayakwad, PHI Publications.
3. Electronic Devices and Circuits by Godse and Bakshi Technical, Vol-1 Technical Publication Pune.
4. Floyd ," Electronic Devices" Pearson Education 9th edition, 2012.
5. R.P. Jain , "Modern Digital Electronics", Tata Mc Graw Hill, 3rd Edition, 2007.
6. Frenzel, "Communication Electronics: Principles and Applications", Tata Mc Graw Hill, 3rd Edition, 2001

Reference Books

1. Integrated Devices & Circuits by Millman & Halkias, TMH Publications.
2. Electronics Devices and Circuit Theory by R. Boylestad & L. Nashelsky, Pearson Publication
3. Electronic Communication System by G. Kennedy, TMH Publications.
4. Basic Electronics by Sanjeev Kumar & Vandana Sachdeva, Paragaon International Publication

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HEAT TRANSFER

Course code – PE403

Module I

Fundamental: Modes of heat transfer, effect of temperature on thermal conductivity of different solids, liquids and gases, derivation of generalized equation in Cartesian, cylindrical and spherical coordinates and its reduction to specific cases, General laws of heat transfer

Module II

Conduction: Fourier's law, One dimensional steady state conduction, heat conduction through plane and composite walls, cylinders and spheres, electrical analogy, critical radius of insulation for cylinder and sphere, overall heat transfer coefficient.

Transient heat conduction- lumped heat capacity analysis, time constant, transient heat conduction in solids with finite conduction and convective resistances Heat transfer from extended surface: Types of fin, heat flow through rectangular fin, infinitely long fin, fin insulated at the tip and fin losing heat at the tip, efficiency and effectiveness of fin, Biot number, Estimation of error in temperature measurement in a thermometer well

Module III

Convection: Newton's law of cooling, Dimensional analysis applied to forced and free convection, dimensionless numbers and their physical significance, empirical correlations for free and forced convection Continuity, momentum and energy equations, thermal and hydrodynamic boundary layer, Blasius solution for laminar boundary layer, General solution of Von-Karman integral momentum equation

Module IV

Radiation: Absorptivity, reflectivity and transmissivity, black, white and grey body, emissive power and emissivity, laws of radiation – Planck, Stefan-Boltzmann, Wein's displacement, Kirchhoff's law, intensity of radiation and solid angle, Lambert's cosine law Radiation heat exchange between black bodies, shape factor, heat exchange between non-black bodies- infinite parallel planes and infinite long concentric cylinders, radiation shield, heat exchange between two grey surfaces, electrical analogy

Module V

Heat exchanger: Classification, heat exchanger analysis, LMTD for parallel and counter flow exchanger, condenser and evaporator, overall heat transfer coefficient, fouling factor, correction factors for multi pass arrangement, effectiveness and number of transfer unit for parallel and counter flow heat exchanger, introduction of heat pipe and compact heat exchanger Two-phase heat transfer: Boiling of liquids, Pool boiling curve, different types of pool boiling, condensation of vapor. Film wise & drop wise condensation.

Reference Books:

1. Heat & Mass Transfer by P.K. Nag, McGraw Hill
2. Heat and Mass Transfer: Fundamentals and Application by Yunus Cengel, McGraw Hill
3. Fundamental of Heat and Mass Transfer by Incropera and Dewitt, Wiley Publication
4. Heat Transfer by Mills and Ganesan, Pearson Education
5. Heat Transfer by J P Holman, McGraw Hill
6. Heat and Mass Transfer by R K Rajput, S. Chand Publication
7. Heat Transfer: Principles and Applications by Dutta, Binay K, PHI Publication

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MANUFACTURING PROCESSES I

Course Code-PE 401

Objectives:

- To know about different manufacturing process and its Classification.
- To know about different machining operation and its parameters.
- To understand the functional and Constructions features of lathes.
- To understand the functional and constructional features of drilling, milling, planning machine etc.
- To know about the different finishing operations in machining.

Module-I

Introduction to different manufacturing process and its classification, Manufacturing System, 4M's of Manufacturing.

Module-II

Machine tool classification, spectrum of machining operation performed on machine tools, Types of cutting tools signature, cutting speed, feed and depth of cut, Cutting tool Material; Use of coolants during machining operation.

Module-III

Constructional features, specification, operations and drives of lathe, Classification of lathe working principles of Capstan and turret lathes. Tool layout and operation of Capstan and turret lathes.

Module-IV
Constructional features, specification, operations and drives of basic machine tools such as shaper, planer, slotter, drilling machine and boring machine.

Module-V
Constructional features, specification, operations and drives of milling machine. Milling machine classifications, indexing in milling operations.

Module-VI
Finishing operations; Grinding; Cylindrical; surface and centreless grinding, Broaching, lapping, honing and buffing.

Books and References:
1. Kalpakjian and Schmid, Manufacturing processes for engineering materials (5th Edition) Pearson India, 2014.
2. Mikell P. Groover, Fundamentals of Modern Manufacturing: Materials, Processes, and Systems.
3. Materials and Manufacturing by Paul Degarmo.
4. Manufacturing Processes by Kaushish, PHI.
5. Principles of Foundry Technology, Jain, MCGRAW HILL INDIA
6. Production Technology by RK Jain.
7. Degarmo, Black & Kohser, Materials and Processes in Manufacturing.

INDUSTRIAL MANAGEMENT & PLANT ENGINEERING

Course code – PE402

Module I
Business Organisation: Legal forms of Business organisation- types of ownership and their formation. Share and their classes, borrowing of capital through Debentures and Bonds.

Module II
The element of managerial functions- planning organising, staffing, Direction and control. Authority and responsibility, leadership and principles of co-ordination. Organisation structure and Organisation chart.

Module III
Marketing Management: Function of sales and marketing, Sales promotion, Advertising, Publicity and Product packaging.

Module IV
Human Resource Development: Main functions of personnel department, Handling of Industrial grievance through joint consultation and collective bargaining.

Module V

Objectives and Principles of facility design and their analysis. Factors affecting plant location, techno economic analysis, concept of location theory and models – design. Plant layout, types of layout problems, techniques and tools.

Module VI

Types of flow patterns, Material handling, types of load, Diagnosis and analysis of handling problems. Interrelationship between material handling and plant layout, Design of an integrated plant/facility layout.

References:

1. Engineering Management (Industrial Engineering & Management)/ S.C. Sharma & T.R. Banga, Khanna Book Publishing Co. (P) Ltd., Delhi (ISBN: 978-93-86173-072) 2. Industrial Engineering and Management/ P. Khanna, Dhanpatrai publications Ltd.
3. Production & Operation Management /PaneerSelvam /PHI.
4. Industrial Engineering Management/NVS Raju/Cengage Learning.
5. Industrial Engineering Management I Ravi Shankar/ Galgotia.

CYBER SECURITY

Course code –IT 402

Module I: Introduction to Cybercrime: Introduction, Cybercrime, and Information Security, Who are Cybercriminals, Classifications of Cybercrimes, and Cybercrime: The legal Perspectives and Indian Perspective, Cybercrime and the Indian ITA 2000, A Global Perspective on Cybercrimes.

Module II: Cyber Offenses: How Criminals Plan Them: Introduction, How Criminals plan the Attacks, Social Engineering, Cyber stalking, Cyber Cafe and Cybercrimes, Botnets: The Fuel for Cybercrime, Attack Vector, Cloud Computing.

Module III: Cybercrime : Mobile and Wireless Devices: Introduction, Proliferation of Mobile and Wireless Devices, Trends in Mobility, Credit card Frauds in Mobile and Wireless Computing Era, Security Challenges Posed by Mobile Devices, Registry Settings for Mobile Devices, Authentication service Security, Attacks on Mobile/Cell Phones, Mobile Devices: Security

Implications for Organizations, Organizational Measures for Handling Mobile, Organizational Security Policies an Measures in Mobile Computing Era, Laptops.

Module – IV: Tools and Methods Used in Cybercrime : Introduction, Proxy Servers and Anonymizers, Phishing, Password Cracking, Keyloggers and Spywares, Virus and Worms, Trojan Horse and Backdoors, Steganography, DoS and DDoS attacks, SQL Injection, Buffer Overflow.

Module V: Cyber Security: Organizational Implications Introduction, Cost of Cybercrimes and IPR issues, Web threats for Organizations, Security and Privacy Implications, Social media marketing: Security Risks and Perils for Organizations, Social Computing and the associated challenges for Organizations.

TEXT BOOK:

- Cyber Security: Understanding Cyber Crimes, Computer Forensics and Legal Perspectives, Nina Godbole and Sunil Belapure, Wiley INDIA.

REFERENCE BOOK:

- Cyber Security Essentials, James Graham, Richard Howard and Ryan Otson, CRC Press.
- Introduction to Cyber Security , Chwan-Hwa(john) Wu,J.David Irwin.CRC Press T&F Group

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ENGINEERING ECONOMICS

Course code –EN 401

COURSE OUTLINE:
The basic purpose of this course is to provide a sound understanding of concepts and principles of engineering economy and to develop proficiency with methods for making rational decisions regarding problems likely to be encountered in professional practice.

Module -1

Introduction of Engineering Economics and Demand Analysis: Meaning and nature of Economics, Relation between science, engineering, technology and economics; Nature of Economic problem, Production possibility curve, Concepts and measurement of utility, Law of Diminishing Marginal Utility, Law of equi-marginal utility – its practical application and importance.

Meaning of Demand, Individual and Market demand schedule, Law of demand, shape of demand curve, Elasticity of demand, measurement of elasticity of demand, practical importance & applications of the concept of elasticity of demand.

Module -II

Meaning of production and factors of production; Law of variable proportions, Returns to scale, Internal and External economics and diseconomies of scale.

Various concepts of cost – Fixed cost, variable cost, average cost, marginal cost, money cost, real cost, opportunity cost. Shape of average cost, marginal cost, total cost, Cost curves.

Module III

Meaning of Market, Types of Market – Perfect Competition, Monopoly, Oligopoly, Monopolistic Competition (Main features of these markets)

Pricing Policies- Entry Deterring policies, Predatory Pricing, Peak load Pricing. Product Life cycle

Firm as an organisation- Objective of the Firm, Type of the Firm, Vertical and Horizontal Integration, Diversification, Mergers and Takeovers.

Module -IV

Nature and characteristics of Indian economy (brief and elementary introduction), Privatization – meaning, merits and demerits. Globalisation of Indian economy – merits and demerits. Elementary Concepts of VAT, WTO, GATT & TRIPS agreement, Business cycle, Inflation

RECOMMENDED BOOKS: -

1. R.Paneer Seelvan: Engineering Economics, PHI
2. Managerial Economics, D.N. Dwivedi, Vikash Publication
3. Managerial Economics, H.L. Ahuja, S. Chand and Co. Ltd.
4. Managerial Economics, Suma Damodaran, Oxford.
5. R.molrishnd Ro T.V S 'Theory of firms : Economics and Managerial Aspects'. Affiliated East West Press Pvt Ltd New Delhi

6. Managerial Economics, H. Craig Petersen &W. Cris Lewis, Pearson Education.

APPLIED THERMODYNAMICS LAB

Course Code-ME 403P

List of Experiments: (At least 8 of the following)

1. Study of Fire Tube boiler.
2. Study of Water Tube boiler.
3. Study and working of Two stroke petrol Engine.
4. Study and working of Four stroke petrol Engine.
5. Determination of Indicated H.P. of I.C. Engine by Morse Test.
6. Prepare the heat balance sheet for Diesel Engine test rig.
7. Prepare the heat balance sheet for Petrol Engine test rig.
8. Study and working of two stroke Diesel Engine.
9. Study and working of four stroke Diesel Engine.
10. Study of Velocity compounded steam turbine.
11. Study of Pressure compounded steam turbine.
12. Study of Impulse & Reaction turbine.
13. Study of steam Engine model.
14. Study of Gas Turbine Model.

S. No.	Name of the Experiment
1	To study the construction and operation of a Cochran boiler
2	To study the construction and operation of a Babcock boiler
3	To study the construction and operation of a Lancashire boiler
4	To study the construction and operation of a vertical water tube boiler
5	To study about 2-Stroke petrol Engine
6	To study about 4-Stroke petrol Engine

7	To study about CI Engine (Diesel Engine)
8	Study of simple and compound Steam Engine
9	To determine the volumetric and isothermal efficiency
10	To determine the static efficiency and total efficiency

THEORY OF MACHINE LAB

ME401P

Name of the Experiment

1. To draw velocity diagram of four bar mechanism
2.To draw velocity diagram of slider crank mechanism.
3.To draw acceleration diagram of four bar mechanism
4.To draw acceleration diagram of slider crank mechanism
5.To study Different types of Cam profile
6.To draw displacement diagram, velocity diagram & acceleration diagram of cam follower
7.To draw a cam profile
8.To study Different types of Gears
9.To draw Involute gear profile.
10.To draw Cycloidal gear profile

MANUFACTURING PROCESS LAB

Course Code-ME404P (Mechanical)/ PE401P (Production)

List of Experiments: (At least 8 of the following along-with study of the machines/processes)

1. Shear-angle determination (using formula) with tube cutting (for orthogonal) on lathe machine.
2. Bolt (thread) making on Lathe machine.
3. Tool grinding (to provide tool angles) on tool-grinder machine.
4. Gear cutting on Milling machine.

5. Machining a block on shaper machine.
6. Finishing of a surface on surface-grinding machine.
7. Drilling holes on drilling machine and study of twist-drill
8. Study of different types of tools and its angles & materials.
9. Experiment on tool wear and tool life.
10. Experiment on jigs/Fixtures and its uses.
11. Gas welding experiment.
12. Arc welding experiment.
13. Resistance welding experiment.
14. Soldering & Brazing experiment.
15. Study and understanding of limits, fits & tolerances.
16. Study of temperature measuring equipment's.
17. Measurement using Strain gauge.
18. Experiment on dynamometers.
19. To study the displacement using LVDT.

Course Outcomes: Upon completion of this course, students will be able to understand the different conventional and unconventional manufacturing methods employed for making different products.

Jharkhand University of Technology Jharkhand, Ranchi

Proposed Syllabus for B.Tech 3rd Semester

Computer Science & Engineering
&
Information Technology

Computer Science & Engineering

3rd semester course structure

Sl. No.	Course Code	Subject	L	T	P	Credit
01	CS301	Data Structures And Algorithms	3	1	0	3
02	IT301	Object Oriented Programming	3	1	0	3
03	EC301	Basic Electronics	3	1	0	3
04	EC302	Digital Electronics And Logic Design	3	1	0	3
05	BSC301	Mathematics-III	3	1	0	4
06	BSC302	Environmental Science	2	0	0	0
01	CS301P	Data Structures And Algorithms Lab	0	0	3	1
02	IT301P	Object Oriented Programming Lab	0	0	3	1
03	EC302P	Digital Electronics & Logic Design Lab	0	0	3	1
04	EX301	Extra Activities (NSO/NSS/NCC/Yoga/ Creative Arts/Mini Project)	0	0	2	1
05	HS301	Communication Skill Lab	0	0	2	1
Total credit						**21**

Information Technology

3rd semester course structure

Sl. No.	Course Code	Subject	L	T	P	Credit
01	IT301	Object Oriented Programming	3	1	0	3
02	CS301	Data Structures And Algorithms	3	1	0	3
03	EC301	Basic Electronics	3	1	0	3

04	EC302	Digital Electronics And Logic Design	3	1	0	3
05	BSC301	Mathematics-III	3	1	0	4
06	BSC302	Environmental Science	2	0	0	0
01	IT301P	Object Oriented Programming Lab	0	0	3	1
02	CS301P	Data Structures And Algorithms Lab	0	0	3	1
03	EC302P	Digital Electronics & Logic Design Lab	0	0	3	1
04	EX301	Extra Activities (NSO/NSS/NCC/Yoga/ Creative Arts/Mini Project)	0	0	2	1
05	HS301	Communication Skill Lab	0	0	2	1
Total credit						**21**

PROPOSED SYLLABUS FOR CSE

2nd year, III Semester UG course Engg. & Tech Jharkhand University of Technology

BSC301 MATHEMATICS III (CSE & IT)

Module -I

Laplace Transformation: Laplace Transformation and its properties, Periodic function, Unit step function and impulse function .Inverse Laplace Transformation, Convolution Theorem, Applications of Laplace transforms in solving certain initial value problems & simultaneous differential equations**. (8L/1.5Q)**

Module- II

Numerical Method: Finite difference, Symbolic relations, Interpolation and Extrapolation, Newton - Gregory forward and backward formula, Lagrange's formula, Inverse Interpolation by Lagrange's formula. Numerical Differentiation and Numerical Integration, Newton Cotes Quadrature formula, Trapezoidal rule. Simpson's 1/3" rule, Simpson's 3/8" rule. **(10L/1.5Q)**

Module -III

Fourier Series & Fourier Transform: Expansion of - Algebraic, Exponential &Trigonometric functions in Fourier series, Change of interval, Even and odd function, half range sine and cosine series, Complex form of Fourier series.

Fourier Transformation and inverse Fourier Transformation, Fourier sine & cosine transforms. Convolution theorem for Fourier transforms with simple illustrations. **(8L/1Q)**

Module- IV

Z-Transform & Inverse Z-Transform- Properties - Initial and Final value theorems, Convolution theorem- Difference equations. Solution of difference equations using Z-Transformation. **(6L/1Q)**

Module -V

Probability & Statistics:

Moments, Skewness, Kurtosis. Correlation, coefficient of Correlation, Regression, linear only. Rank correlation. Sampling & Testing of Hypothesis-Null and alternate Hypothesis, level of significance, The t-distribution, The F-distribution & Chi-square tests. **(8L/1Q)**

Note-Question no.1 will be compulsory, objective type with 7 sub-parts comprising of the whole syllabus.

Text Books

1. Irwin Kreyszig, Advanced Engineering Mathematics, 9th Edition, John Wiley & Sons,

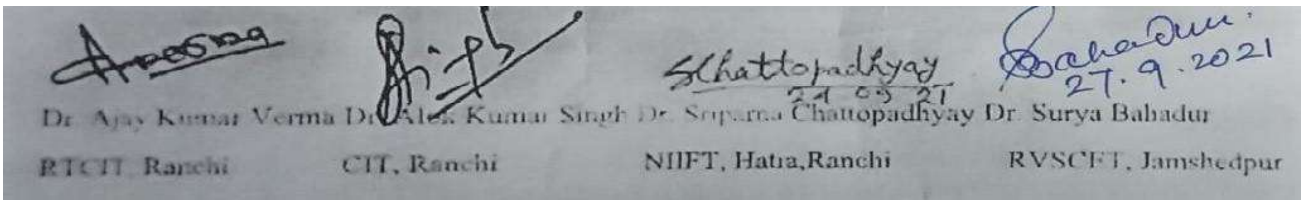
2. Ramana R. V ., Higher Engineering Mathematics, Tata McGraw Hill New Delhi,2010.

3. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 44th Edition,

Reference Books

1. R. J. Beerends .H. G. Ter Morsche, J. C. Van Den Berg. L. M. Van De Vrie, Fourier and Laplace Transforms, Cambridge University Press.

2. Sastry S.S. Introductory Methods of Numerical Analysis, PHI



BASIC ELECTRONICS

(ECE, EEE, EE, CSE, IT) Course code -EC 301

L T P CR

3 1 0 3

Module I

Basic Electronic Components

Active and Passive Components, Types of resistors and Colour coding, Capacitors, Inductors applications of Resistor, Capacitor and Inductor, Relay, LDR, Basic Integrated Circuits (IC 7805, 7809, 7812, 555 etc.). Measuring Instruments like CRO, Power supply, multi-meters etc.

Module II

Semiconductors

Difference between Insulators, Semiconductors and Conductors, Mobility and Conductivity, Intrinsic and Extrinsic Semiconductors, Fermi Level, Energy band,

Charge Densities in Semiconductors, Mass Action Law, Current Components in Semiconductors, Drift and Diffusion Current, The Continuity Equation, Injected Minority Charge Carrier, Hall Effect, P-N Junction Diode, construction, working, characteristics and diode equation Application of Diode, Rectifier: Half Wave, Full Wave and Bridge Rectifier, Zener Diode and its Applications, Varactor Diode, Schottky Diode, Regulated Power Supply using Zener Diode and Regulated ICs, LED, Photodetector.

Module III:

Transistors

Construction, Working, Modes and Configuration of BJT, Input and Output Characteristics of all Configurations, Comparison of all Configuration & Modes, BJT as a Switch and as an Amplifier. JFET Construction, working and characteristics. MOSFET Construction, working and Characteristics, Types of MOSFET.

Module IV: Power electronic devices &Communication engineering

Construction, characteristics and working of SCR, DIAC, TRIAC and UJT. Introduction, Characteristics and applications of Operational Amplifier (Ic741).

Modulation and its types.

Module V: Digital Logic and basic circuit Design

Number systems and conversion (DECIMAL, OCTAL, HEXADECIMAL, BINARY,

BCD etc.),binary addition and subtraction, Logic Gates and their truth-table ,Boolean algebra .Design of Single Stage Amplifier, LED Driver Circuit, Infrared Transmitter Receiver Circuit, LDR Driver Circuit, Relay Driver Circuit, Square Wave and Fix Frequency Generator using 555 IC.

Text Books

1. Basic Electronics and Linear Circuits by N. N. Bhargava, D. C. Kulshreshtha and S. C. Gupta, TMH Publications.
2. Op-Amps and Linear Integrated Circuits by Ramakant A. Gayakwad, PHI Publications.
3. Electronic Devices and Circuits by Godse and Bakshi Technical, Vol-1 Technical Publication Pune.

Reference Books

1. Integrated Devices & Circuits by Millman & Halkias, TMH Publications.
2. Electronics Devices and Circuit Theory by R. Boylestad & L. Nashelsky, Pearson Publication 3. Electronic Communication System by G. Kennedy, TMH Publications.
4. Basic Electronics by Sanjeev Kumar & Vandana Sachdeva, Paragaon International Publication

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DATA STRUCTURES AND ALGORITHMS

(CSE, IT) Course
code -CS 301

(3-CREDIT) (L-T-P/3-0-0)

Module I

Basic concepts and notations: Data structures and data structure operations, Complexity Analysis: Mathematical notation and functions, algorithmic complexity and time space trade off, Big O Notation, The best, average & worst cases analysis of various algorithms. Arrays: Linear & Multidimensional Arrays, Representation & traversal. Sorting algorithms: Bubble sort, Selection sort, Insertion sort, Merge sort and Quick sort, Counting Sort. Linear search and Binary search on sorted arrays.

Module II

Abstract Data Types (ADTs) Stack: Push; Pop, stack representation using array and linked list, Applications of Stack, Recursion. Queue: Representation using array and linked list, Insertion and deletion operations, circular queue, Dequeue, priority queue. Linked Lists & their types (Single, Double, Circular linked lists), Operations on Varieties of Linked Lists (Search and Update) with applications

Module III

Introduction to Trees, Binary tree - definitions and properties; binary tree traversal algorithms with and without recursion., Binary Search Tree - creation, insertion and deletion operations, Threaded tree (One way and Two way). AVL tree balancing; Btree

Module IV

Graph Algorithms: Graphs and their Representations, Graph Traversal Techniques: Breadth First Search (BFS) and Depth First Search (DFS), Applications of BFS and DFS, Minimum Spanning Trees (MST), Prim's and Kruskal's algorithms for MST, Connected Components, Dijkstra's Algorithm for Single Source Shortest Paths, Floydd's Algorithm for All-Pairs Shortest Paths Problem

Module V

Hashing techniques, Hash function, Address calculation techniques- common hashing functions Collision resolution, Linear probing, quadratic probing, double hashing, Bucket addressing. Rehashing

Course Outcomes: At the end of the course the student will be able to:

- Understand the concept of ADT
- Identify data structures suitable to solve problems
- Develop and analyse algorithms for stacks, queues
- Develop algorithms for binary trees and graphs
- Implement sorting and searching algorithms
- Implement symbol table using hashing techniques

Text Books:

1. Data Structures Using C – A.M. Tenenbaum (PHI)
2. Introduction to Data Structures with Applications by J. Tremblay and P. G. Sorenson (TMH)
3. Data Structures, Algorithms and Application in C, 2nd Edition, Sartaj Sahni
4. Data Structures and Algorithms in C, M.T. Goodrich, R. Tamassia and D. Mount, Wiley India.

REFERENCE BOOKS:

1. Data Structure and Program Design in C by C.L. Tondo.
2. Data Structures with C++, J. Hubbard, Schaum's Outlines, TMH.
3. Data Structures and Algorithms in C, M.T. Goodrich, R. Tamassia and D. Mount, Wiley India.

4. Data Structures and Algorithm Analysis in C, 3rd Edition, M.A. Weiss, Pearson.
5. Classic Data Structures, D. Samanta, 2nd Edition, PHI.
6. Data Structure Using C by Pankaj Kumar Pandey.
7. Data Structure with C, Tata McGraw Hill Education Private Limited by Seymour Lipschutz.
8. Data Structure through C in Depth, BPB Publication, by S.K. Srivastava.
9. Data Structure and algorithm Analysis in C 2nd Edition, PEARSON Publishing House, Mark Allen Weiss

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OBJECT ORIENTED PROGRAMMING

(CSE, IT) Course code -

IT 301 (3-CREDIT) (L-T-P/3-0-0)

Course Outcome:

1. To be able to apply an object-oriented approach to programming and identify potential benefits of object-oriented programming over the approaches.
2. To be able to reuse the code and write the classes which work like built in types.
3. To be able to design applications which are easier to debug, maintain and extend.
4. To be able to apply object-oriented concepts in real world applications.
5. To be able to develop applications using multi-threading.
6. To be able to handle exceptions in any applications.

Module-I 12 Hrs

Introduction to Java and Java Programming Environment, Object Oriented Programming, Fundamental Programming Structure: Data Types, Variable, Typecasting Arrays, Operators and their Precedence. Control Flow: Java's Selection Statements (if, Switch, Iteration, Statement, While, Do While, for, Nested Loop). Concept of Objects and Classes, Using Exiting Classes Building your own Classes, Constructor Overloading, Static, Final this Keyword, Inheritance: Using Super to Call Super Class Constructor, Method Overriding, Dynamic Method Dispatch, Using Abstract Classes, Using Final with Inheritance. The Object Class Packages & Interfaces: Packages, Access Protection, Importing Package, Interface, Implementing Interfaces, Variables in Interfaces, Interfaces can be Extended. Exception Handling: Fundamentals, Types

Checked, Unchecked Exceptions, Using Try & Catch, Multiple Catch, Throw, Throws, Finally Java's Built in Exceptions, User Defined Exception.

Module-II 12 Hrs

Multi-Threading: Java Thread Model, Thread Priorities, Synchronization, creating a Thread, Creating Multiple Threads, Using is Alive () and Join () Wait () & Notify (). String Handling: String Constructors, String Length, Character Extraction, String Comparison, Modifying a String. Java I/O: Classes & Interfaces, Stream Classes, Byte Streams, Character Streams, Serialization, JDBC: Fundamentals, Type I, Type II, Type III, Type IV Drivers. Networking: Basics, Socket Overview, Networking Classes, & Interfaces, TCP/IP Client Sockets, Whois, URL Format, URL Connection, TCP/IP Server Sockets.

Module-III 12 Hrs

Applets: Basics, Architecture, Skeleton, The HTML APPLET Tag, Passing Parameters to Applets, Applet Context and Show Documents (). Event Handing: Delegation Event Model, Event Classes, Event Listener Interfaces, Adapter Classes. AWT: AWT Classes Window Fundamentals, Component, Container, Panel Window, Frame, Canvas, Creating a Frame Window in an Applet, Working with Graphics, Control Fundamentals, Layout Managers, Handling Events by Extending AWT Components. Core Java API package, reflection, remote method invocation (RMI) swing applet, icons & labels, text fields, Buttons, combo boxes, tabbed panes, scroll panes, trees, tables exploring Java-language: Simple type wrappers, runtime memory management, object fusing clone () and the cloneable interface, thread, thread group, runnable.

TEXT BOOK:

1. Introduction to Java Programming: Liang, Pearson Education, 7th Edition.
2. Java the Complete Reference: Herbert Schildt, TMH, 5th Edition.

REFERENCE BOOKS:

1. Balguruswamy, Programming with Java, TMH.
2. Programming with Java: Bhave&Patekar, Person Eduction.
3. Big Java: Horstman, Willey India, 2nd Edition.
4. Java Programming Advanced Topics: Wigglesworth, Cengage Learning.

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DIGITAL ELECTRONICS AND LOGIC DESIGN

(ECE, CSE, IT)
Course code -EC 302

L	T	P	CR
3	1	0	3

Module I: Binary Codes and Boolean algebra

Analog and Digital, Binary Number System. Addition, Subtraction, Multiplication, Division of binary numbers, Subtraction using 2's complement method. Binary codes: weighted and non-weighted codes, self-complementary codes, BCD, Excess-3, Gray codes, Alphanumeric codes, ASCII Codes. *Boolean algebra*: Boolean Laws and Expression using Logic Gates, Realization of different gates using Universal gates, DeMorgan's Theorem, Duality Theorems.

Module II: Boolean function minimization Techniques

Standard forms: SOP, POS, Simplification of Switching function & representation (Maxterm & Minterm), Boolean expression & representation using logic gates, Propagation delay in logic gate. *Karnaugh map*: K-map(up to 5 variables), mapping and minimization of SOP and POS expression, Don't care condition, conversion from SOP to POS and POS to SOP form using K-map, Minimization of multiple output circuits, Quine Mc-cluskey method minimization technique, prime implicant table, Don't care condition.

Module III: Combinational Circuits Design

Adder & Subtractor (Half and Full), Parallel Binary adder, BCD Adder, Binary multipliers, Code Converters, parity bit generator, Comparators, Decoder, BCD to 7segment Decoder, Encoders, Priority Encoders, Multiplexers, De Multiplexers.

Module IV: Sequential Circuits Elements

Introduction to sequential circuit, Flip-flop & Timing Circuits: SR latch, Gated latch, Tri state logic, Edge triggered flip-plop: - D, JK, T Flip-flop, flip-flop asynchronous inputs ,characteristic table of Flip-flop, excitation table of Flip-flop, master slave JK flip flop, inter conversion of Flip-flop. Study of timing parameters of flip-flop. Shift

registers: buffer register, controlled buffer register. Data transmission in shift resistor SISO, SIPO, PISO, PIPO, Bidirectional shift register, universal shift registers. *Counter*: Classification, Ripple or asynchronous counter, Effect of propagation delay in ripple counters, up-down counter, Design of Mod-n counter, synchronous counter, Ring counter, Johnson counter. Introduction to FSM. Design of synchronous FSM, Algorithmic State Machines charts. Designing synchronous circuits like Pulse train generator.

Module V: Logic Families and VLSI Design flow

Logic Families and Semiconductor Memories: TTL NAND gate, Specifications, Noise margin, Propagation delay, fan-in, fan-out, TTL, ECL, CMOS families and their interfacing, Memory elements, Concept of Programmable logic devices like FPGA, Logic implementation using Programmable Devices VLSI Design flow: Design entry, Schematic, FSM & HDL, different modelling styles in VHDL, Data types and objects, Dataflow, Behavioural and Structural Modelling, Synthesis and Simulation VHDL constructs and codes for combinational and sequential circuits

Text Books:

1. Kharate "Digital Electronics" OXFORD Publication
2. A. Anand Kumar 'Fundamentals of Digital Circuits'. PHI Publications
3. R.P. Jain-'Modern Digital Electronics' IIIrd Edition- Tata Mc Graw Hill, Publication
4. Douglas Perry, "VHDL", Tata McGraw Hill, 4th edition, 2002.
5. Charles Roth, "Digital System Design using VHDL", Tata McGraw Hill 2nd edition
6. Bhaskar VHDL BASED DESIGN ,PEARSON EDUCATION

Reference Books:

1. Rajkamal 'Digital Systems Principals and Design' Pearson Education
2. A.P. Malvino, D.P. Leach 'Digital Principles & Applicatios' -VIth Edition-TMH publication.
3. M. Morris Mano 'Digital Design' (Third Edition). PHI Publications

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ENVIRONMENTALSCIENCE

Course code – BSC 302

L T P CR.

2 0 0 0

(COMMON FOR ALL BRANCH)

Module-1

Concept and scope of Environment science, components of environment, environmental segment and their importance. **(2 Hrs)**

Module-II

Ecology: Ecosystem and its characteristics features, structure and function of forest ecosystem, grassland ecosystem, desert ecosystem and aquatic ecosystem, ecological balance and consequences of imbalance. **(4 Hrs)**

Module-III

Atmosphere: Atmospheric composition, energy balance, climate, weather, depletion of ozone layer, greenhouse effect, acid rain, particles, ions and radicals in the atmosphere, chemical and photochemical reactions in the atmosphere.

Module-IV **(4 Hrs)**

Air pollution and control: Air pollutants, sources and effect of air pollutants, primary and secondary pollutants, photochemical smog, fly ash, inorganic and organic particulate matter. Air quality standards, sampling, monitoring and control measures for pollutants.

(4 Hrs)

Module-V

Water pollution and control: Aquatic environment, water pollution, sources and their effect, lake and ground water pollution, eutrophication, water quality standard and water pollution control measures, waste water treatment.

Module-VI **(4 Hrs)**

Land pollution; Lithosphere, composition of soil, acid base and ion exchange reactions in soil, soil erosion, landslides, desertification, pollutants (municipal, industrial, commercial, agricultural , hazardous solid wastes), origin and effects, collection and disposal of solid wastes, recovery and conversion methods. **(5 Hrs)**

Module-VII

Noise pollution; Noise classification and its sources, effects and measurement, noise pollution hazards, standards and noise pollution control. **(2 Hrs)**

Books and References:

1. Master, G.M Introduction to environment engineering and science, Pearson Education.
2. Nebel, B.J., Environment science, Prentice Hall Inc.

3. Odum, E.P. Ecology: The link between the natural and social sciences. IBH Publishing Company Delhi
4. De, A.K. Environmental Chemistry, Merrut.
5. Sharma B.K Envrionmental Chemistry, Krishna Prakashan Media Merrut.
6. Kaushik, A and Kaushik, C.P. Perspectives in Environmental studies, New Age International Publication.
7. Menon, S.E. Environmental Chemistry.

DATA STRUCTURE LAB

(CSE, IT) Course code
-CS 301P

Course Objective: The objective is to develop linear and non-linear data structure, express different operation on AVL tree, evaluate infix to postfix expression, and apply searching and sorting algorithms in real life applications.

1. C Programs on : Bubble sort
   - Selection sort
   - Insertion sort,
   - Quick sort
   - Heap sort, Merge Sort
2. C Programs on : Sequential Search
   - Binary Search
3. Write a C Program to create a stack using an array and perform
   - Push operation, Pop operation
4. Write a C Program that uses Stack Operations to perform the following:-
   - Converting an infix expression into postfix expression
   - Evaluating the postfix expression
5. Write a C Program to create a queue and perform
   - Push, Pop, Traversal
6. Write a C Program that uses functions to perform the following operations on a single linked list : i)Creation, ii) Insertion, iii) Deletion, iv) Traversal
7. Write a C Program that uses functions to perform the following operations on a double linked list: i)Creation, ii) Insertion, iii) Deletion
8. Write a C Program that uses functions to perform the following operations on a Binary Tree :i) Creation, ii) Insertion, iii) Deletion

9. Write a C Program for Single Source Shortest Paths using Dijkstra's Algorithm
10. Write a C Program for All-Pairs Shortest Paths using Floydd's Algorithm

NOTE: At least ten experiments are to be performed, minimum seven experiments should be performed from above list. Remaining three experiments may either be performed from the above list or designed & set by the concerned institution as per the scope of the syllabus.

OBJECT ORIENTED PROGRAMMINGLAB

(CSE, IT) Course code -IT 301P

Course Outcome:

1. Able to do program in object-oriented concept.
2. Able to create user defined exception.
3. Able to create GUI.
4. Able to understand JDBC and ODBC concept.

To do various Java Programs on:

1. Introduction, compiling & executing a Java program.
2. Data types & variables, decision control structures: if, nested if etc.
3. Loop control structures: do while, for etc.
4. Classes and objects.
5. Data abstraction & data biding, inheritance, polymorphism.
6. Using concept of package.
7. Threads, exception handlings and applet programs.
8. Interfaces and inner classes, wrapper classes, generics.
9. Programs on JDBC.
10. Creating GUI.

NOTE: At least ten experiments are to be performed, minimum seven experiments should be performed from above list. Remaining three experiments may either be performed from the above list or designed & set by the concerned institution as per the scope of the syllabus

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DIGITAL ELECTRONICS AND LOGIC DESIGN LAB

(ECE, EEE, EE, CSE, IT)
Course code EC 302P

List of Experiments (Minimum 10)

1. Study of TTL gates – AND, OR, NOT, NAND, NOR, EX-OR, EX-NOR.
2. Design & realize a given function using K-maps and verify its performance.
3. To verify the operation of multiplexer & Demultiplexer.
4. To verify the operation of comparator.
5. To verify the truth tables of S-R, J-K, T & D type flip flops.
6. To verify the operation of bi-directional shift register.
7. To design & verify the operation of 3-bit synchronous counter.
8. Design all gates using VHDL.
9. Design a multiplexer using VHDL
10. Design a decoder using VHDL
11. Write VHDL programs for the following circuits, check the wave forms and the hardware generated a. half adder b. full adder
12. Write VHDL programs for the following circuits, check the wave forms and the hardware generated a. multiplexer b. demultiplexer

NOTE: At least ten experiments are to be performed, minimum seven experiments should be performed from above list. Remaining three experiments may either be performed from the above list or designed & set by the concerned institution as per the scope of the syllabus. For VHDL Xilinx software may be used.

COMMUNICATIONSKILL LAB

Course code HS301

This lab paper involves interactive practice sessions in Language Lab along with some class lectures to enable the students to be confident enough in language and professional sphere of life.

Module I: Listening Comprehension

To comprehend spoken material in standard Indian English/ British English & American English

- Current situation in India regarding English

American English Vs. British English

Module II: Phonetics & Phonology

- Introduction to Phonetics & Phonology
- Organs of Speech/ Speech Mechanism
- Pronunciation, Intonation**,** Stress and Rhythm, Syllable division
- Consonants/Vowels/Diphthongs Classification

Module III: Common Everyday Situations: Conversations and Dialogues

Module IV: Communication at Workplace

Module V: Telephonic Conversation

- Introduction
- Listening/Speaking
- Telephonic Skills Required
- Problems of Telephonic Conversation
- Intensive Listening

Module VI: Interviews

- The Interview Process
- Purpose/Planning/Two-way Interaction/Informality
- Pre-interview Preparation Techniques
- Projecting a Positive Image
- Answering strategies

Module VII: Formal Presentations

- Introduction
- Nature/Importance of Presentation
- Planning
- Objective with central idea, main ideas, role of supporting materials
- Handling Stage Fright

Module VIII: Forms of Technical Communication: Technical Report: Definition & importance; Thesis/Project writing: structure & importance; synopsis writing: Methods; Technical research Paper writing: Methods & style; Seminar & Conference paper writing;

Expert Technical Lecture: Theme clarity; Analysis & Findings; C.V./Resume writing; Technical Proposal: Types, Structure & Draft.

Module IX: Technical Presentation: Strategies & Techniques Presentation: Forms; interpersonal Communication; Class room presentation; style; method; Individual

conferencing: essentials: Public Speaking: method; Techniques: Clarity of substance; emotion; Humour; Modes of Presentation; Overcoming Stage Fear; Audience Analysis & retention of audience interest; Methods of Presentation: Interpersonal; Impersonal; Audience Participation: Quizzes & Interjections.

Module X: Technical Communication Skills: Interview skills; Group Discussion: Objective & Method; Seminar/Conferences Presentation skills: Focus; Content; Style; Argumentation skills: Devices: Analysis; Cohesion & Emphasis; Critical thinking; Nuances: Exposition narration & Description; effective business communication competence: Grammatical; Discourse competence: combination of expression & conclusion; Socio-linguistic competence: Strategic competence: Solution of communication problems with verbal and non verbal means.

Jharkhand University of Technology Jharkhand, Ranchi

Proposed Syllabus for B.Tech 4th Semester

Computer Science & Engineering Information Technology

&

Computer Science & Engineering

4th semester course structure

Sl. No.	Course code	Subject	L	T	P	Credit
01	CS401	Operating System	3	1	0	3
02	CS402	Design And Analysis Of Algorithms	3	1	0	3
03	CS403	Formal Language And Automata Theory	3	1	0	3
04	BSC401	Discrete Mathematics	3	1	0	3
05	IT401	Database Management Systems	3	1	0	3
06	EN401/ IT402	Engineering Economics / Cyber Security	2	0	0	0
01	CS401P	Operating System Lab	0	0	3	1
02	CS402P	Design And Analysis Of Algorithms Lab	0	0	3	1
03	CS403P	Formal Language And Automata Theory Lab	0	0	3	1
04	EX401	Extra Activities (NSO/NSS/NCC/Yoga/ Creative Arts/Mini Project)	0	0	2	1
05	IN401	Internship/ Tour & Training/Industrial Training	0	0	0	2
Total credit						**21**

Information Technology

4th semester course structure

Sl. No.	Course code	Subject	L	T	P	Credit
01	IT401	Database Management Systems	3	1	0	3

02	CS401	Operating System	3	1	0	3
03	CS402	Design And Analysis Of Algorithms	3	1	0	3
04	CS403	Formal Language And Automata Theory	3	1	0	3
05	BSC401	Discrete Mathematics	3	1	0	3
06	EN401/ IT402	Engineering Economics / Cyber Security	2	0	0	0
01	CS401P	Operating System Lab	0	0	3	1
02	CS402P	Design And Analysis Of Algorithms Lab	0	0	3	1
03	CS403P	Formal Language And Automata Theory Lab	0	0	3	1
04	EX401	Extra Activities (NSO/NSS/NCC/Yoga/ Creative Arts/Mini Project)	0	0	2	1
05	IN401	Internship/ Tour & Training/Industrial Training	0	0	0	2
Total credit						**21**

OPERATING SYSTEM

Course Code- CS401

(3-CREDIT) (L-T-P/3-1-0)

Module - I

OPERATING SYSTEMS OVERVIEW: Introduction, Evolution of operating system, operating system operations, operating system structure, System Calls, Types of System Calls

Modul – II

PROCESS MANAGEMENT: Process concepts, process state, process control block, scheduling queues, process scheduling, Interposes Communication, Threads and implementation of threads.

CPU SCHEDULING: Objective and Criteria, CPU scheduling algorithms: FCFS, SJF, Priority Scheduling, Round robin, multilevel queue scheduling and multilevel feedback queue scheduling.

Modul- III

CONCURRENCY AND SYNCHRONIZATION: Process synchronization, critical section problem, and its solutions. Semaphores, classical problems of synchronization: readers and writers problem, dining philosophers problem, sleeping barber problem.

Modul- IV

DEADLOCKS: Introduction, deadlock characterization, Resource allocation graph, Methods for Handling Deadlocks: deadlock prevention, avoidance and deadlock detection, recovery from deadlock.

Modul V

MEMORY MANAGEMENT: Introduction, memory allocation techniques, paging, implementation of paging, segmentation and its implementation, segmentation with paging, virtual memory, demand paging, page-replacement algorithms, thrashing and its solution.

Modul VI

FILE SYSTEM: Concept of a file, access methods, directory structure, file system mounting, file sharing, protection. File system implementation: file system structure, directory implementation, allocation methods, free-space management, efficiency and performance.

Mass-Storage Structure: Overview of mass storage structure, disk structure, disk scheduling algorithms,

TEXT BOOKS:

1. **ABRAHAM SILBERSCHATZ, PETER BAER GALVIN, GREG GAGNE (2012)**, Operating System Principles, 9th edition, Wiley India Private Limited, New Delhi.

REFERENCE BOOKS:

1. **William Stallings**, Operating Systems, Internals and Design Principles, 7th edition, Pearson Education, India. 2.

2. **Andrew S. Tanenbaum (2007)**, Modern Operating Systems, 2nd edition, Prentice Hall of India, India. 3. Deitel & Deitel (2008), Operating systems, 3rd edition, Pearson Education, India.

COURSE OVERVIEW:

Operating systems course is intended as a general introduced to the techniques used to implement operating systems and related kinds of systems software. The topics covered will be functions and structure of operating systems, process management (creation, synchronization, and communication); processor scheduling; deadlock prevention, avoidance, and recovery; main-memory management; virtual memory management (swapping, paging, segmentation and page-replacement algorithms); control of disks and other input/output devices; file-system structure and implementation; and protection and security

COURSE OBJECTIVES:

- To explain main components of OS and their working.
- To familiarize the operations performed by OS as a resource Manager.
- To impart various scheduling policies of OS.
- To teach the different memory management techniques.

COURSE OUTCOMES: At the end of the course students will be able to the following

- Outline various concepts and features of Operating systems.
- Compare various operating systems with respect to characteristics and features.
- Implement algorithm of CPU Scheduling, Memory Management and disk scheduling.
- Make changes in the OS configurations as per need.

DESIGN AND ANALYSIS OF ALGORITHM

Course Code- CS402

(3-CREDIT) (L-T-P/3-1-0)

Course Outcome:

1. Ability to analyse the performance of algorithms.
2. Ability to choose appropriate algorithm design techniques for solving problems.
3. Ability to understand how the choice of data structures and the algorithm design methods impact the performance of programs.

MODULE-I

INTRODUCTION & ANALYSIS:

Analysing Algorithms, Recurrence Equations, Growth Function: Asymptotic Notation, Standard Notation & Common Functions, Recurrence Relation, Different Methods of Solution of Recurrence Equations with Examples.

MODULE-II

DIVIDE AND CONQUER & BACKTRACKING PARADIGM:

Introduction to Divide and Conquer Paradigm, Quick and Merge Sorting Techniques, Linear Time Selection Algorithm, The Basic Divide and Conquer Algorithm for Matrix Multiplication, Backtracking & Recursive Backtracking, Applications of Backtracking Paradigm, Heaps.

MODULE-III

GREEDY PARADIGM & DYNAMIC PROGRAMMING:

Greedy Paradigm: The Basic Greedy Strategy & Computing Minimum Spanning Trees, Algorithms of Kruskal and Prim, Union to Find Algorithm & Their Applications, Disjoint Set, The Relationship in Dijkstra's and Prim's Algorithms, Use of Greedy Strategy in Algorithms for the Knapsack Problem and Huffman Trees. The Basic Dynamic Programming Paradigm, Dynamic Programming Solution to the Optimal Matrix Chain Multiplication and the Longest Common Subsequence Problems.

MODULE-IV

GRAPHS ALGORITHMS & STARING MATCHING ALGORITHMS:

Representational Issues in Graphs, Depth First Search & Breath First Search on Graphs, Computation of Bi-connected Components and Strongly Connected Components Using DFS, Topological Sorting & Applications, Shortest Path Algorithms on Graphs: Bellman-Ford Algorithm, Dijkstra's Algorithm & Analysis of Dijkstra's Algorithm Using Heaps, Floyd-Warshall's all Pairs Shortest Path Algorithm and its Refinement for Computing the Transitive Closure of a Graph. The General String Problem as a Finite Automata, Kunth Morris and Pratt Algorithms.

MODULE-V

NP-COMPLETE PROBLEMS:

Solvable Problems, Types of Problems, The Notion of a Non-Deterministic Algorithm and its Basic Relationship to Backtracking, Polynomial Time Non-Deterministic Algorithms for Problems Like Satisfiability, Clique Problem, Hamiltonian Path Problems etc. The Definition of NP-Hardness and NP-Completeness, The Statement of Cook's Theorem and a Discussion of its Implication, The Notion of Polynomial Transformation, Vertex Cover, Subset Sum and Hamiltonian Cycle Problems are NP-Complete, Other Models for Computations.

Text Books:

1. Introduction to Algorithms (Second Edition); Cormen, Leserson, Rivert; PHI.
2. Fundamentals of Algorithms, Sahni& Horowitz; Galgotia.

Reference Books:

1. The Design & Analysis of Computer Algorithms, Hopcroft-Aho-Ullman, AWL.
2. Handbook of Algorithms & Data Structures, G.H. Gonnet, AWL.
3. Introduction to Design & Analysis of Algorithms, Levitin, PE-LPE.

FORMAL LANGUAGES AND AUTOMATA THEORY

Course Code- CS403 (3-

CREDIT) (L-T-P/3-1-0)

Module I: Fundamentals & Finite Automata:

Alphabet, Strings, Language, Operations, Mathematical proving techniques, Finite state machine, definitions, finite automaton model, acceptance of strings, and languages, Deterministic Finite Automaton (DFA) and Non deterministic Finite Automaton (NFA), transition diagrams and Language recognizers. Equivalence of DFA and NFA, NFA to DFA conversion, NFA with ε transitions - Significance, acceptance of languages. Equivalence between NFA with and without ε transitions,

minimization of FSM, Finite Automata with output- Moore and Mealy machines and conversion of Mealy to Moore and vice-versa.

Module II: Regular Expression and Languages:

Regular sets, regular expressions, identity rules, Constructing finite Automata for a given regular expressions, Conversion of Finite Automata to Regular expressions. Regular grammars-right linear and left linear grammars, conversion of right linear grammar to left linear and vice-versa, equivalence between regular grammar, regular expression and FA, Pumping lemma of regular sets, closure properties of regular sets.

Module III: Context Free Grammars and Push Down Automata:

Context free grammar, derivation trees, sentential forms. Right most and leftmost derivation of strings. Ambiguity in context free grammars. Reduction of Context Free Grammars. Chomsky normal form (CNF), Greiback normal form (GNF), Pumping Lemma for Context Free Languages.

Simplification of CFL.

Push down automata (PDA) definition, model, acceptance of CFL, Acceptance by final state and acceptance by empty state and its equivalence. Equivalence of CFG and PDA, interconversion.

Introduction to DCFL and DPDA. DPDA Vs NPDA.

Module IV: Turing Machine:

Turing Machine definition, representation of Turing Machines model, Variants of TM, design of TM, linear bounded automata,

Module V: Computational Complexity & Decidability, Recursively Enumerable Languages:

Complexity: Growth rate of a function, class P and NP, polynomial time reduction and NP Completeness, NP-Complete problems (SAT, CSAT, Hamiltonian circuit, travelling salesman, vertex cover). **Decidability:** decidability, decidable language, undecidable language, halting problem of Turing Machine. **Computability:** primitive recursive function and recursive function.

TEXT BOOKS:

1. Theory of Computer Science (Automata Language and Computation) K.L.P. Mishra and N. Chandrasekran, PHI.
2. Introduction to Automata Theory, Language and Computation, John E, Hopcropt and Jeffery D. Ullman, Narosa Publishing House.

REFERENCE BOOKS:

1. Theory of Automata and Formal Language, R.B. Patel & P. Nath, Umesh Publication.
2. An Introduction and Finite Automata Theory, Adesh K. Pandey, TMH.
3. Theory of Computation AM Natrajan, Tamilarasi, Bilasubramani, New Age International Publishers, Chhattisgarh Swami Vivekan.
4. An introduction to Formal Languages and Automata by Peter Linz, Narosa Publ

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DATABASE MANAGEMENT SYSTEMS

Course Code- IT401

Module I

Introduction: Overview, Database System vs File System, Database System Concept and Architecture, Data Model Schema and Instances, Data Independence and Database Language and Interfaces, Data Definitions Language, DML, Overall Database Structure. Data Modelling Using the Entity Relationship Model: ER Model Concepts, Notation for ER Diagram, Mapping Constraints, Keys, Concepts of Super Key, Candidate Key, Primary Key, Generalization, Aggregation, Reduction of an ER Diagrams to Tables, Extended ER Model, Relationship of Higher Degree.

Module II

Relational data Model and Language: Relational Data Model Concepts, Integrity Constraints, Entity Integrity, Referential Integrity, Keys Constraints, Domain Constraints, Relational Algebra, Relational Calculus, Tuple and Domain Calculus. Introduction on SQL: Characteristics of SQL, Advantage of SQL. SQl Data Type and Literals. Types of SQL Commands. SQL Operators and Their Procedure. Tables, Views and Indexes. Queries and Sub Queries. Aggregate Functions. Insert, Update and Delete Operations, Joins, Unions, Intersection, Minus, Cursors, Triggers, Procedures in SQL/PL SQL

Module III

Data Base Design & Normalization: Functional dependencies, normal forms, first, second, 8 third normal forms, BCNF, inclusion dependence, loss less join decompositions, normalization using FD, MVD, and JDs, alternative approaches to database design

Module IV

Transaction Processing Concept: Transaction System, Testing of Serializability, Serializability of Schedules, Conflict & View Serializable Schedule, Recoverability, Recovery from Transaction Failures, Log Based Recovery, Checkpoints, Deadlock Handling. Distributed Database: Distributed Data Storage, Concurrency Control, Directory System.

Module V

Concurrency Control Techniques: Concurrency Control, Locking Techniques for Concurrency Control, Time Stamping Protocols for Concurrency Control, Validation Based Protocol, Multiple Granularity, Multi Version Schemes, Recovery with Concurrent Transaction, Case Study of Oracle.

References:

1. Korth, Silbertz, Sudarshan," Database Concepts", McGraw Hill
2. Date C J, "An Introduction to Database Systems", Addision Wesley 3. Elmasri, Navathe, " Fundamentals of Database Systems", Addision Wesley
4. O'Neil, Databases, Elsevier Pub.
5. RAMAKRISHNAN"Database Management Systems",McGraw Hill
6. Leon & Leon,"Database Management Systems", Vikas Publishing House

7. Bipin C. Desai, " An Introduction to Database Systems", Gagotia Publications
8. Majumdar & Bhattacharya, "Database Management System", TMH
9. R.P. Mahapatra, Database Management System, Khanna Publishing House

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DISCRETE MATHEMATICS

Course Code- BSC401

(3-CREDIT) (L-T-P/3-1-0)

MODULE-I

Mathematical Logic:

Introduction, Statements and Notation, Connectives, Normal Forms, Theory of Inference for the Statement Calculus, The Predicate Calculus, Inference Theory of the Predicate Calculus.

MODULE-II

Set Theory:

Introduction, Basic Concepts of Set Theory, Representation of Discrete Structures, Relations and Ordering, Functions.

Algebraic Structures:

Introduction, Algebraic Systems, Semi Groups and Monoids, Groups, Lattices as Partially Ordered Sets, Boolean Algebra.

MODULE-III
Elementary Combinations:

Basic of Counting, Combinations and Permutations, Enumeration of Combinations and Permutations, Enumerating Combinations and Permutations with Repetitions, Enumerating Permutations with Constrained Repetitions, Binomial Coefficients, The Binomial and Multi-Nominal Theorems, The Principle of Inclusion-Exclusion.

MODULE-IV

Recurrence Relations:

Generating Functions of Sequences, Calculating Coefficients of Generating Functions, Recurrence Relations, Solving Recurrence Relations by Substitution and Generating Functions, The Method of Characteristic Roots, Solutions of Inhomogeneous Recurrence Relations.

MODULE-V

Graphs and Trees:

Basic Concepts, Isomorphisms and Subgraphs, Trees and Their Properties, Spanning Trees, Directed Trees, Binary Trees, Planar Graphs, Euler's Formula, Multigraphs and Euler Circuits, Hamiltonian Graphs, Chromatic Numbers, The Four-Color Problem.

TEXT BOOKS:

1. Discrete Mathematical Structures with Applications to Computer Science, J.P. Tremblay, R. Manohar, McGraw Hill Education (India) Private Limited (Units-I, II).
2. Discrete Mathematics for Computer Scientists & Mathematicians, Joe L. Mott, Abraham Kandel, Theodore P. Baker, Pearson, 2nd Edition (Units- III, IV, V).

REFERENCE BOOKS:

1. Discrete Mathematics and its Applications, Kenneth H. Rosen, 7th Edition, McGraw Hill Education (India) Private Limited.
2. Discrete Mathematics D.S. Malik & K. K. Sen, Revised Edition Cengage Learning.
3. Elements of Discrete Mathematics, C.L. Liu and D.P. Mohapatra, 4th Edition, McGraw Hill Education (India) Private Limited.
4. Discrete Mathematics with Applications, Thomas Koshy, Elsevier.
5. Discrete and Combinatorial Mathematics, R. P. Grimaldi, Pearson.
6. Discrete Mathematical Structures by Bernard Kolman, Robert C. Busby and Sharon Cutler Ross, Pearson Education.

CYBER SECURITY

Course code –IT 402

Module I: Introduction to Cybercrime: Introduction, Cybercrime, and Information Security, who are Cybercriminals, Classifications of Cybercrimes, and Cybercrime: The legal Perspectives and Indian Perspective, Cybercrime and the Indian ITA 2000, A Global Perspective on Cybercrimes.

Module II: Cyber Offenses: How Criminals Plan Them: Introduction, How Criminals plan the Attacks, Social Engineering, Cyber stalking, Cyber Cafe and Cybercrimes, Botnets: The Fuel for Cybercrime, Attack Vector, Cloud Computing.

Module III: Cybercrime : Mobile and Wireless Devices: Introduction, Proliferation of Mobile and Wireless Devices, Trends in Mobility, Credit card Frauds in Mobile and Wireless Computing Era, Security Challenges Posed by Mobile Devices, Registry Settings for Mobile Devices, Authentication service Security, Attacks on Mobile/Cell Phones, Mobile Devices:
Security Implications for Organizations, Organizational Measures for Handling Mobile, Organizational Security Policies a Measures in Mobile Computing Era, Laptops.

Module – IV: Tools and Methods Used in Cybercrime : Introduction, Proxy Servers and Anonymizers, Phishing, Password Cracking, Keyloggers and Spywares, Virus and Worms, Trojan Horse and Backdoors, Steganography, DoS and DDoS attacks, SQL Injection, Buffer Overflow.

Module V: Cyber Security: Organizational Implications Introduction, Cost of Cybercrimes and IPR issues, Web threats for Organizations, Security and Privacy Implications, Social media marketing: Security Risks and Perils for Organizations, Social Computing and the associated challenges for Organizations.

TEXT BOOK:

- Cyber Security: Understanding Cyber Crimes, Computer Forensics and Legal Perspectives, Nina Godbole and Sunil Belapure, Wiley INDIA.

REFERENCE BOOK:

- Cyber Security Essentials, James Graham, Richard Howard and Ryan Otson, CRC Press.
- Introduction to Cyber Security , Chwan-Hwa(john) Wu,J.David Irwin.CRC Press T&F Group

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ENGINEERING ECONOMICS

Course code –EN 401

COURSE OUTLINE:

The basic purpose of this course is to provide a sound understanding of concepts and principles of engineering economy and to develop proficiency with methods for making rational decisions regarding problems likely to be encountered in professional practice.

Module -1

Introduction of Engineering Economics and Demand Analysis: Meaning and nature of Economics, Relation between science, engineering, technology and economics; Nature of Economic problem, Production possibility curve, Concepts and measurement of utility, Law of Diminishing Marginal Utility, Law of equi-marginal utility – its practical application and importance.

Meaning of Demand, Individual and Market demand schedule, Law of demand, shape of demand curve, Elasticity of demand, measurement of elasticity of demand, practical importance & applications of the concept of elasticity of demand.

Module -II

Meaning of production and factors of production; Law of variable proportions, Returns to scale, Internal and External economics and diseconomies of scale.

Various concepts of cost – Fixed cost, variable cost, average cost, marginal cost, money cost, real cost, opportunity cost. Shape of average cost, marginal cost, total cost, Cost curves.

Module III

Meaning of Market, Types of Market – Perfect Competition, Monopoly, Oligopoly, Monopolistic Competition (Main features of these markets)

Pricing Policies- Entry Deterring policies, Predatory Pricing, Peak load Pricing. Product Life cycle

Firm as an organisation- Objective of the Firm, Type of the Firm, Vertical and Horizontal Integration, Diversification, Mergers and Takeovers.

Module -IV

Nature and characteristics of Indian economy (brief and elementary introduction), Privatization – meaning, merits and demerits. Globalisation of Indian economy – merits and demerits. Elementary Concepts of VAT, WTO, GATT & TRIPS agreement, Business cycle, Inflation

RECOMMENDED BOOKS: -

1. R.Paneer Seelvan: Engineering Economics, PHI
2. Managerial Economics, D.N.Dwivedi, Vikash Publication
3. Managerial Economics, H.L. Ahuja, S. Chand and Co. Ltd.
4. Managerial Economics, Suma Damodaran, Oxford.
5. R.molrishnd Ro T.V S 'Theory of firms : Economics and Managerial Aspects'. Affiliated East West Press Pvt Ltd New Delhi
6. Managerial Economics, H. Craig Petersen &W. Cris Lewis, Pearson Education.

DESIGN AND ANALYSIS OF ALGORITHM LAB

Course Code- CS402P

Course Outcome:

1. Able to analyse the Real-World Problem and Solv it.
2. Able to analyse Any Algorithm in Terms of Complexity.
3. Able to Compare Different Sorting Algorithm.
4. Able to Design Algorithm by Following Different Approach.

list of experiments:

1. Using a Stack of Characters, Covert an Infix String of Postfix String (I Class)
2. Implement Insertion, Deletion, Searching of a BST, (I Class)
3. (a) Implement Binary Search and Liner Search in a Program. (b) Implement a Heap Sort Using a Max Heap.
4. (a) Implement DFS/BFS for a Connected Graph.
   (b) Implement Dijkstra's Shortest Path Algorithm Using BFS.
5. (a) Write a Program to Implement Huffman's Algorithm.
   (b) Implement MST Using Kruskal/Prim Algorithm
6. (a) Write a Program on Quick Sort Algorithm.
   (b) Write a Program on Merge Sort Algorithm.
   Take Different Input Instance for Both the Algorithm and Show the Running Time.
7. Implement Matrix Chain Order Algorithm.
8. Write Down a Program to Find Out a Solution for 0/1 Knapsack Problem.

9. Using Dynamic Programming Implement LCS.
10. (a) Find Out the Solution on the N-Queen Problem. (b) Implement Back Tracking Using Game Trees.

NOTE: At least ten experiments are to be performed, minimum seven experiments should be performed from above list. Remaining three experiments may either be performed from the above list or designed & set by the concerned institution as per the scope of the syllabus

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OPERATING SYSTEM LAB

Course Code- CS401P

1. Study of hardware and software requirements of different operating systems (UNIX,LINUX,WINDOWS XP, WINDOWS7/8
2. Execute various UNIX system calls for i. Process management ii. File management iii. Input/output Systems calls
3. Implement CPU Scheduling Policies: i. SJF ii. Priority iii. FCFS iv. Multi-level Queue
4. Implement file storage allocation technique: i. Contiguous (using array) ii. Linked –list (using linked-list) iii. Indirect allocation (indexing)
5. Implementation of contiguous allocation techniques: i. Worst-Fit ii. Best- Fit iii. First- Fit
6. Calculation of external and internal fragmentation i. Free space list of blocks from system ii. List process file from the system
7. Implementation of compaction for the continually changing memory layout and calculate total movement of data
8. Implementation of resource allocation graph RAG)
9. Implementation of Banker's algorithm
10. Conversion of resource allocation graph (RAG) to wait for graph (WFG) for each type of method used for storing graph.
11. Implement the solutionfor Bounded Buffer (producer-consumer)problem using inter process communication techniques-Semaphores
12. Implement the solutions for Readers-Writers problem using inter process communication technique Semaphore

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FORMAL LANGUAGES AND AUTOMATA THEORY

Course Code- CS403P

1. Write a program for Pattern searching?
2. Write a program to simulate Nondeterministic Finite Automata (NFA)
3. Write a program to simulate deterministic Finite Automata (DFA)
4. Write a Program to remove Useless Production in a C.F.G
5. Write a Program to remove Unit Productionin a C.F.G
6. Create a pushdown automata for string translation

Jharkhand University of Technology
Jharkhand, Ranchi

Proposed Syllabus for B.Tech 3rd Semester

Electrical Engineering

&

Electrical and Electronics Engineering

Electrical Engineering

3rd semester course structure

Sl. No.	Course Code	Subject	L	T	P	Credit
01	EE301	Electrical Machine-I	3	1	0	3
02	EE302	Network Theory	3	1	0	3
03	EE303	Electromagnetic Field Theory	3	1	0	3
04	EC301	Basic Electronics	3	1	0	3
05	BSC301	Mathematics-III	3	1	0	4
06	BSC302	Environmental Science	2	0	0	0
01	EE301P	Electrical Machine-I Lab	0	0	3	1
02	EE302P	Network Theory Lab	0	0	3	1
03	EC301P	Basic Electronics Lab	0	0	3	1
04	EX301	Extra Activities (NSO/NSS/NCC/Yoga / Creative Arts/Mini Project)	0	0	2	1
05	HS301	Communication Skill Lab	0	0	2	1
Total credit						**21**

Electrical and Electronics Engineering

3rd semester course structure

Sl. No.	Course Code	Subject	L	T	P	Credit
01	EE301	Electrical Machine-I	3	1	0	3
02	EE302	Network Theory	3	1	0	3
03	EE303	Electromagnetic Field Theory	3	1	0	3
04	EC301	Basic Electronics	3	1	0	3
05	BSC301	Mathematics-III	3	1	0	4
06	BSC302	Environmental Science	2	0	0	0
01	EC301P	Basic Electronics Lab	0	0	3	1
02	EE301P	Electrical Machine-I Lab	0	0	3	1
03	EE302P	Network Theory Lab	0	0	3	1
04	EX301	Extra Activities (NSO/NSS/NCC/Yoga / Creative Arts/Mini Project)	0	0	2	1
05	HS301	Communication Skill Lab	0	0	2	1

Total credit	21

PROPOSED SYLLABUS FOR ALL BRANCHES EXCEPT CSE & IT

2nd year, III Semester, UG course Engg. & Tech Jharkhand University of Technology

BSC301 MATHEMATICS III

Module -1

Laplace Transformation: Laplace Transformation and its properties, Periodic function, Unit step function and impulse function .Inverse Laplace Transformation, Convolution Theorem, Applications of Laplace transforms in solving certain initial value problems & simultaneous differential equations**. (8L/1.5Q)**

Module-2

Numerical Method: Finite difference, Symbolic relations, Interpolation and Extrapolation, Newton - Gregory forward and backward formula, Lagrange's formula, Inverse Interpolation by Lagrange's formula. Numerical Differentiation and Numerical Integration, Newton Cotes Quadrature formula, Trapezoidal rule. Simpson's 1/3" rule, Simpson's 3/8" rule. **(10L/1.5Q)**

Module -3

Z-Transform & Inverse Z-Transform- Properties - Initial and Final value theorems, Convolution theorem- Difference equations. Solution of difference equations using Z-Transformation. **(6L/1.5Q)**

Module -IV

Fourier Series & Fourier Transform: Expansion of - Algebraic, Exponential &Trigonometric functions in Fourier series, Change of interval, Even and odd function, half range sine and cosine series, Complex form of Fourier series.

Fourier Transformation and inverse Fourier Transformation, Fourier sine & cosine transforms. Convolution theorem for Fourier transforms with simple illustrations. **(8L/1.5Q)**

Module V

Partial Differential Equations: Formation of partial differential equations, Linear partial differential equations of first order, Lagrange's linear equation, Non-linear equations of first order, Charpit's method Solution of one dimensional Wave equation & Heat equation by the method of separation of variables and its applications. **(8L/1Q)**

Note-Question no.1 will be compulsory, objective type with 7 sub-parts comprising of the whole syllabus.

Text Books

1. Irwin Kreyszig, Advanced Engineering Mathematics, 9th Edition, John Wiley & Sons,
2. Ramana R. V ., Higher Engineering Mathematics, Tata McGraw Hill New Delhi,2010.
3. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 44th Edition,

Reference Books

1. R. J. Beerends .H. G. Ter Morsche, J. C. Van Den Berg. L. M. Van De Vrie, Fourier and Laplace Transforms, Cambridge University Press.
2. Sastry S.S. Introductory Methods of Numerical Analysis, PHI

- R. J. Beerends ,H. G. Ter Morsche ,J. C. Van Den Berg, E. M. Van De Vrie, Fourier and Laplace Transforms, Cambridge University Press.
- Sastry S.S, Introductory Methods of Numerical Analysis, PHI.

BASIC ELECTRONICS

(ECE, EEE, EE, CSE, IT)
Course code -EC 301

L	TP	CR
3	1 0	3

Module I: Basic Electronic Components

Active and Passive Components, Types of resistors and Colour coding, Capacitors, Inductors applications of Resistor, Capacitor and Inductor, Relay, LDR, Basic Integrated Circuits (IC 7805, 7809, 7812, 555 etc.). Measuring Instruments like CRO, Power supply, multi-meters etc.

Module II: Semiconductors

Difference between Insulators, Semiconductors and Conductors, Mobility and Conductivity, Intrinsic and Extrinsic Semiconductors, Fermi Level, Energy band, Charge Densities in Semiconductors, Mass Action Law, Current Components in Semiconductors, Drift and Diffusion Current, The Continuity Equation, Injected Minority Charge Carrier, Hall Effect, P-N Junction Diode, construction, working, characteristics and diode equation Application of Diode, Rectifier: Half Wave, Full Wave and Bridge Rectifier, Zener Diode and its Applications, Varactor Diode, Schottky Diode, Regulated Power Supply using Zener Diode and Regulated ICs, LED, Photodetector.

Module III: Transistors

Construction, Working, Modes and Configuration of BJT, Input and Output Characteristics of all Configurations, Comparison of all Configuration & Modes, BJT as a Switch and as an Amplifier. JFET Construction, working and characteristics. MOSFET Construction, working and Characteristics, Types of MOSFET.

Module IV: Power electronic devices &Communication engineering

Construction, characteristics and working of SCR, DIAC, TRIAC and UJT. Introduction, Characteristics and applications of Operational Amplifier (Ic741). Modulation and its types.

Module V: Digital Logic and basic circuit Design

Number systems and conversion (DECIMAL, OCTAL, HEXADECIMAL,BINARY, BCD etc.),binary addition and subtraction, Logic Gates and their truth-table ,Boolean algebra .Design of Single Stage Amplifier, LED Driver Circuit, Infrared Transmitter Receiver Circuit, LDR Driver Circuit, Relay Driver Circuit, Square Wave and Fix Frequency Generator using 555 IC.

Text Books

1. Basic Electronics and Linear Circuits by N. N. Bhargava, D. C. Kulshreshtha and S. C. Gupta, TMH Publications.

2. Op-Amps and Linear Integrated Circuits by Ramakant A. Gayakwad, PHI Publications.

3. Electronic Devices and Circuits by Godse and Bakshi Technical, Vol-1 Technical Publication Pune.

Reference Books

1. Integrated Devices & Circuits by Millman & Halkias, TMH Publications.

2. Electronics Devices and Circuit Theory by R. Boylestad & L. Nashelsky, Pearson Publication
3. Electronic Communication System by G. Kennedy, TMH Publications.

4. Basic Electronics by Sanjeev Kumar & Vandana Sachdeva, Paragaon International Publication

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ELECTRICAL MACHINES-I

(EEE, EE,) Course
code -EE 301

L	T	P	CR.
3	1	0	3

Module I: Review of Magnetic circuits and Electro-mechanical Energy Conversion

MMF, flux, reluctance, inductance; review of Ampere Law and Biot Savart Law; Visualization of magnetic fields produced by a bar magnet and a current carrying coil. Magnetic Materials, BH characteristics, Review of magnetic system, Energy in Magnetic system, Force and torque in magnetic field system, Energy balance equation, Energy conversion via electrical field, Energy in a singly excited system, Determination of the Force and Torque from energy and co-energy.

Module II: Single Phase Transformers and Autotransformers

Principle, construction and operation of single-phase transformers, equivalent circuit, phasor diagram, voltage regulation, losses and efficiency Testing - open circuit and short circuit tests,

ELECTRICAL MACHINE-I

(EE, EEE)

Course Code – EE 301

L T P CR

3 1 0 3

Course Outcomes:

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

CO's	CO Description
CO1	**Understand** the construction and principle of operation of DC machines, Induction motor, single phase and three phase transformers.
CO2	**Analyze** the effects of armature reaction and process of commutation.
CO3	**Identify, formulate** and solve DC machine, transformer and Induction motor related problems.
CO4	**Analyze** speed-torque characteristics and speed control of three phase Induction motor.

DETAILED SYLLABUS

UNIT – I: Principles of Electro-mechanical Energy Conversion (5 Lectures)

Introduction, Flow of energy in electromechanical devices, Energy in magnetic systems (defining energy and co-energy), Singly excited systems, Determination of mechanical force, Mechanical energy, Torque equation, Doubly excited systems, Energy stored in magnetic field, Electromagnetic torque, Generated emf in machines, Torque in machines with cylindrical air gap.

UNIT – II: D.C Machines (12 Lectures)

Construction of D.C Machines, Armature winding, EMF and torque equations, Armature reaction, Commutation, Interpoles and compensating windings, Performance characteristics of D.C Generators and D.C Motors, Starting of D.C Motors, 3- point and 4- point starters, Speed control of D.C Motors, Field control, Armature control and Voltage control(Ward- Leonard method), Efficiency and testing of D.C Machines(Hopkinson's and Swinburn's Test)

UNIT- III: Single phase Transformers (8 Lectures)

Construction, Principle of operation, EMF equation, Phasor diagram , Equivalent circuit, Determination of equivalent circuit parameters, Losses, Calculation of efficiency and regulation, Polarity test, O.C and S.C test, Sumpner's test, Parallel operation of transformers and load sharing, Principle of single phase auto – Transformer, Saving of copper compared to two winding transformer and its application, Cooling methods of transformer.

UNIT – IV: Three Phase Transformers (7 Lectures)

Construction , Three phase transformer, Phasor groups and their connections, Open delta connection, Three phase to 2 phase, 6 phase and 12 phase connections and their applications, Principle of three phase auto- Transformer, Parallel operation of single phase and three phase

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transformers and load sharing, Excitation phenomenon and harmonics in transformers, Three winding transformers.

UNIT – V: Three Phase Induction Machine **(10 Lectures)**

Constructional features, Rotating magnetic field, Principle of operation, Phasor diagram, Equivalent circuit, Torque and Power equations, Torque- slip characteristics, No- Load and blocked rotor tests, Efficiency , Starting, Braking and speed control, Deep bar and double cage rotors, Cogging and Crawling, Induction Generators and its applications.

Text Books

[1]. I.J Nagrath and D.P Kothari, " Electrical Machines" , Tata Mcgraw hill
[2]. Husian Ashfaq, " Electrical Machines", Dhanpat Rai and Sons
[3]. P.S Bimbhra, " Electrical Machinery" , Khanna Publisher
[4]. E Fitggerald, C. Kingsley Jr and Umans, " Electrical Machinery" , McGraw Hill, International student addition.

Reference Books

[1]. Irving L. Kosow, "Electrical Machine and transformers" , Prentice Hall of India
[2]. M.G Say," The performance and design of A.C machine", Pit man and sons

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NETWORK THEORY

(EE, EBE, ECE)

Course Code – EE302

L T P CR

3 1 0 3

Course Outcomes:

COs	At the end of this course, students will be able to
CO1	**Evaluate** and **Analyse** the transient and resonant behavior of linear time invariant circuits.
CO2	**Analyse** circuits using graph theory.
CO3	**Evaulate** two port parameters and **obtain** transfer function.
CO4	**Design** passive filters and synthesize the R-L, R-C & L-C networks.

Module I: **(8 Lectures)**

Introduction to LTI elements. Impulse, Step, Ramp and Sinusoidal Inputs, Behaviour of R, L & C at t=0+ and t=∞, Concept of t=0- , 0 & 0+, Analysis of zero input response, zero state response and complete response of transient behavior of R-L, R-C and R-L-C Circuits using integro-differential equation and Laplace Transform.

Module II: **(5 Lectures)**

Resonance: Series resonance circuit, Effect of Q on bandwidth and selectivity. Relation between bandwidth and Q, Resonance curve with the variation of L and C, Parallel resonant circuit.

Mutual coupled circuits, Dot Convention in coupled circuits, Equivalent inductance, Analysis of Mutual coupled circuits, Ideal Transformer.

Module III: **(5 Lectures)**

Graph Theory: Introduction to graph, sub-graph, degenerate sub-graph, incidence matrix, reduced incidance matrix, Tie-set and cut set matrix, Analysis of the circuit using fundamental tie set matrix and fundamental cut set matrix.

Module IV: **(6 Lectures)**

Definition of Network Function, Driving point impedance, Driving point admittance, Transfer impedance and admittance, Voltage and current transfer ratio, Concept of poles and zeros, OCNF and SCNF, To obtain response from pole zero plot analytically and graphically. Response of the circuit transfer function with impulse, step and sinusoidal inputs.

Module V: **(6 Lectures)**

Two Port Networks: Impedance parameters, admittance parameters, transmission parameters and hybrid parameters, Interconnections of two port networks: Series, Parallel, Cascade, Series-parallel, Parallel-series, Lattice network, Ladder network, Equivalent T and π network.

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Module VI: **(6 Lectures)**

Hurwitz polynomial, its properties and Test, Positive real functions, its properties and test, Driving point immittances of L-C Network, Synthesis of L-C Network using Foster-I and Foster-II forms, Cauer-I and Cauer-II forms, Driving point impedance and admittance of R-L and R-C Network, Synthesis using Foster-I, Foster-II, Cauer-I & Cauer-II forms.

Module VII: **(6 Lectures)**

Introduction and Classifications of filters and its uses, Design of prototype Constant k and m-derived low pass filter, high pass filter, band pass filter and band stop filter.

Text Book:

[1]. Fundamentals of Electric Circuits – Alexander & Sadiku – Tata McGraw Hil,5th Editionl.

[2]. Circuits & Networks: Analysis, Design and Synthesis- Sukhija & Nagsarkar- Oxford

Reference Book(s):

[1]. Network Analysis – M E Van Valkenburg – Pearson Education, 3rd Edition.

[2]. Network Analysis and Synthesis – Franklin F. Kuo – Wiley Student Edition.

[3]. Linear Circuits Analysis and Synthesis – A Ramakalyan – Oxford University Press.

[4]. Problems & Solutions in Electric Circuit Analysis – Sivananda & Deepa – Jaico Book.

[5]. Theory and problem of electrical circuits, Schaum's Outline Series, TMH – Joseph A. Edminister, MahmoodMaqvi.

[6]. Electric Circuits – David A.Bell – Oxford, 7th Edition, 2015.

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Text Books:

1. "A.Sudhakar, Shymmohan S. Palli, _Circuit and Network – Analysis and Synthesis‘, 3 rd Edition, Tata McGraw Hill Publication.

2. Van, Valkenburg; “Network analysis”; Prentice hall of India, 2000.

3. A. Chakrabarti, _Circuit theory (Analysis and Synthesis)‘, IIIrd edition, Dhanpat Rai and Co.

Reference Books:

1. D. Roy Choudhuri, _Networks and Systems‘, New Age International Publisher.

2. M.E.Van Valkenburg Network Analysis‘, IIIrd edition, Pearsons Education/PHI.

3.Josheph Edministrar, _Theory and Problems of Electronic Circuit (Schaum‘s Series) – Tata McGraw Hill Publication.

4. Soni Gupta, _Electrical Circuit Analysis‘, Dhanpat Rai and Co.

5. Boylestad, _Introductory Circuit Analysis‘, Universal Book Stall, New

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ELECTROMAGNETIC FIELD THEORY

(ECE, EEE, EE)
Course code -EE 303

L	T	P	CR.
3	1	0	3

Module I: Coordinate Systems and Transformation:

Basics of Vectors: Addition, subtraction and multiplications; Cartesian, Cylindrical, Spherical transformation. Vector calculus: Differential length, area and volume, line surface and volume integrals, Del operator, Gradient, Divergence of a vector, Divergence theorem, Curl of a vector, Stokes’s theorem, Laplacian of a scalar.

Module II: Electrostatic fields:

Coulombs law and field intensity, Electric field due to charge distribution, Electric flux density, Gausses’ Law- Maxwell’s equation, Electric dipole and flux line, Energy density in electrostatic fields, Electric field in material space: Properties of materials, convection and conduction currents, conductors, polarization in dielectrics, Dielectric-constants, Continuity equation and relaxation time, boundary conditions, Electrostatic boundary value problems: Poisson’s and Laplace’s equations., Methods of Images.

Module III: Magneto Statics:

Magneto-static fields, Biot - Savart's Law, Ampere's circuit law, Maxwell's equation, Application of ampere's law, Magnetic flux density- Maxwell's equation, Maxwell's equation for static fields, magnetic scalar and vector potential.

Module IV: Magnetic Forces:

Materials and devices, Forces due to magnetic field, Magnetic torque and moment, a magnetic dipole. Magnetization in materials, Magnetic boundary conditions, Inductors and inductances, Magnetic energy.

Module V: Waves and Applications:

Maxwell's equation, Faraday's Law, transformer and motional electromotive forces, Displacement current, Maxwell's equation in final form Electromagnetic wave propagation: Wave propagation in loss dielectrics, Plane waves in lossless dielectrics Plane wave in free space. Plain waves in good conductors, Power and the pointing vector, Reflection of a plain wave in a normal incidence. Transmission Lines, and Smith Chart.

Text Book:

1. MNO Sadiku, "Elements of Electromagnetic', Oxford University Press.

Reference Books:

1. WH Hayt and JA Buck, "Engineering Electromagnetic", McGraw- Hill Education.
2. Antenna and wave propagation by k.d parsad satya prakashan.

ENVIRONMENTALSCIENCE

Course code – BSC 302
L T P CR.
2 0 0 0
(COMMON FOR ALL BRANCH)

Module-1

Concept and scope of Environment science, components of environment, environmental segment and their importance. **(2 Hrs)**

Module-II

Ecology: Ecosystem and its characteristics features, structure and function of forest ecosystem, grassland ecosystem, desert ecosystem and aquatic ecosystem, ecological balance and consequences of imbalance. **(4 Hrs)**

Module-III

Atmosphere: Atmospheric composition, energy balance, climate, weather, depletion of ozone layer, greenhouse effect, acid rain, particles, ions and radicals in the atmosphere, chemical and photochemical reactions in the atmosphere.

Module-IV **(4 Hrs)**

Air pollution and control: Air pollutants, sources and effect of air pollutants, primary and secondary pollutants, photochemical smog, fly ash, inorganic and organic particulate matter. Air quality standards, sampling, monitoring and control measures for pollutants.

(4 Hrs)

Module-V

Water pollution and control: Aquatic environment, water pollution, sources and their effect, lake and ground water pollution, eutrophication, water quality standard and water pollution control measures, waste water treatment.

Module-VI **(4 Hrs)**

Land pollution; Lithosphere, composition of soil, acid base and ion exchange reactions in soil, soil erosion, landslides, desertification, pollutants (municipal, industrial, commercial, agricultural , hazardous solid wastes), origin and effects, collection and disposal of solid wastes, recovery and conversion methods. **(5 Hrs)**

Module-VII

Noise pollution; Noise classification and its sources, effects and measurement, noise pollution hazards, standards and noise pollution control. **(2 Hrs)**

Books and References:

1. Master, G.M Introduction to environment engineering and science, Pearson Education.
2. Nebel, B.J., Environment science, Prentice Hall Inc.
3. Odum, E.P. Ecology: The link between the natural and social sciences. IBH Publishing Company Delhi
4. De, A.K. Environmental Chemistry, Merrut.
5. Sharma B.K Envrionmental Chemistry, Krishna Prakashan Media Merrut.
6. Kaushik, A and Kaushik, C.P. Perspectives in Environmental studies, New Age International Publication.
7. Menon, S.E. Environmental Chemistry.

BASIC ELECTRONICS LAB

(ECE, EEE, EE) Course
Code -ECE 301P

List of Experiments (Minimum 10)

1. Identification and testing of Resistors, Inductors, Capacitors, PN-Diode. Zener Diode, LED, LCD, LDR, BJT, Photo Diode, Photo Transistor,

2. Measurement of voltage and current using multimeter, Measure the frequency and Amplitude of a signal with the help of CRO and function generator.

3. Study of p-n junction diode AND Zener Diode I-V characteristics

4. Assemble the single-phase half wave and full wave bridge rectifier & the analyse effect of capacitor as a filter (only study of waveforms).

5. Study of Zener diode as voltage regulator.

6. Measurement & study of input characteristics of a BJT in CB configuration.

7. Measurement and study of characteristics of JFET and MOSFET

8. To design and simulate IR Transmitter and Receiver Circuit.
9. To design and simulate Motor Driver using Relay.
10. To design and simulate Light detector using LDR.
11. To design and simulate Constant frequency square wave generator using.
12. To design and simulate 5 volt DC power supply from 230 AC.

NOTE : At least ten experiments are to be performed, minimum seven experiments should be performed from above list. Remaining three experiments may either be performed from the above list or designed & set by the concerned institution as per the scope of the syllabus.

ELECTRICAL MACHINE LAB-I

List of Experiments (Minimum 10)

1. To obtain the speed characteristics of a D.C shunt motor as a function of armature voltage, field current, and external resistance in the armature circuit.
2. To find the critical resistance (R_c) and critical speed (N_c) and O.C.C. of a dc shunt generator.
3. To conduct a load test on a dc shunt generator and obtain its internal and external characteristics.
4. To conduct load test on a dc series generator and to obtain its internal and external characteristics.
5. To perform Hopkinson's test on two similar DC shunt machines and obtain their efficiencies at various loads.
6. To separate the mechanical and iron losses (Retardation Test) of the given dc shunt machine.
7. To pre-determine the efficiency of a D.C shunt machine considering it as a motor by performing Swinburne's test on it.
8. To study about different types of DC motor starters.
9. To study power-sharing between two single-phase transformers operated in parallel.
10. To determine transformer winding polarity and explore the impact of connecting windings in series aiding and series opposing configurations.
11. To perform the short circuit and open circuit test of single-phase transformer and draw the equivalent circuit.

12.To determine Regulation and Efficiency of a single-phase transformer using direct loading test.

NOTE : At least ten experiments are to be performed, minimum seven experiments should be performed from above list. Remaining three experiments may either be performed from the above list or designed & set by the concerned institution as per the scope of the syllabus.

NETWORK THEORY LAB

(ECE, EEE, EE)

Course code -EE 302P ListofExperiments

(Minimum10)

1. Transient response of RC circuit.
2. Transient response of RL circuit.
3. To find the resonance frequency, Band width of RLC series circuit.
4. To study and verify effect of R on frequency response of parallel resonance circuit.
5. To calculate and verify "Z" parameters of a two port network.
6. To calculate and verify "Y" parameters of a two port network.
7. To determine equivalent parameter of parallel connections of two port network.
8. To plot the frequency response of low pass filter and determine half-power frequency.
9. To plot the frequency response of high pass filters and determines the half-power frequency.
10. To plot the frequency response of band-pass filters and determines the band-width.
11. To calculate and verify "ABCD" parameters of a two port network.
12. To synthesize a network of a given network function and verify its response.
13. Introduction of P-Spice or other simulation software

COMMUNICATIONSKILL LAB

Course code HS301

This lab paper involves interactive practice sessions in Language Lab along with some class lectures to enable the students to be confident enough in language and professional sphere of life.

Module I: Listening Comprehension

To comprehend spoken material in standard Indian English/ British English & American English

- Current situation in India regarding English
- American English Vs. British English

Module II: Phonetics & Phonology

- Introduction to Phonetics & Phonology
- Organs of Speech/ Speech Mechanism
- Pronunciation, Intonation**,** Stress and Rhythm, Syllable division
- Consonants/Vowels/Diphthongs Classification

Module III: Common Everyday Situations: Conversations and Dialogues

Module IV: Communication at Workplace

Module V: Telephonic Conversation

- Introduction
- Listening/Speaking
- Telephonic Skills Required
- Problems of Telephonic Conversation
- Intensive Listening

Module VI: Interviews

- The Interview Process
- Purpose/Planning/Two-way Interaction/Informality
- Pre-interview Preparation Techniques
- Projecting a Positive Image
- Answering strategies

Module VII: Formal Presentations

- Introduction
- Nature/Importance of Presentation
- Planning
- Objective with central idea, main ideas, role of supporting materials
- Handling Stage Fright

Module VIII: Forms of Technical Communication: Technical Report: Definition & importance; Thesis/Project writing: structure & importance; synopsis writing: Methods; Technical research Paper writing: Methods & style; Seminar & Conference paper writing; Expert Technical Lecture: Theme clarity; Analysis & Findings; C.V./Resume writing; Technical Proposal: Types, Structure & Draft.

Module IX: Technical Presentation: Strategies & Techniques Presentation: Forms; interpersonal Communication; Class room presentation; style; method; Individual conferencing: essentials: Public Speaking: method; Techniques: Clarity of substance; emotion; Humour; Modes of Presentation; Overcoming Stage Fear; Audience Analysis & retention of audience interest; Methods of Presentation: Interpersonal; Impersonal; Audience Participation: Quizzes & Interjections.

Module X: Technical Communication Skills: Interview skills; Group Discussion: Objective & Method; Seminar/Conferences Presentation skills: Focus; Content; Style;

Argumentation skills: Devices: Analysis; Cohesion & Emphasis; Critical thinking; Nuances: Exposition narration & Description; effective business communication competence: Grammatical; Discourse competence: combination of expression & conclusion; Socio-linguistic competence: Strategic competence: Solution of communication problems with verbal and non-verbal means.

Jharkhand University of Technology

Jharkhand, Ranchi

Proposed Syllabus for B.Tech 4th Semester

Electrical Engineering

&

Electrical and Electronics Engineering

Electrical Engineering

4th semester course structure

Sl. No.	Course code.	Subject	L	T	P	Credit
01	EE401	Power System – I	3	1	0	3
02	EE402	Measurement & Instrumentation	3	1	0	3
03	EC401	Analog Electronics And Circuits	3	1	0	3
04	EC403	Digital Electronics And Logic Design	3	1	0	3
05	CS301	Data Structure And Algorithm	3	1	0	3
06	EN401/ IT402	Engineering Economics /Cyber Security	2	0	0	0
01	EE401P	Power System- I Lab	0	0	3	1
02	EE402P	Measurement & Instrumentation Lab	0	0	3	1
03	EC403P	Digital Electronics And Logic Design Lab	0	0	3	1
04	EX401	Extra Activities (NSO/NSS/NCC/Yoga/ Creative Arts/Mini Project)	0	0	2	1
05	IN401	Internship/ Tour & Training/Industrial Training	0	0	0	2
Total credit						**21**

Electrical & Electronics Engineering

4th semester course structure

Sl. No.	Course code	Subject	L	T	P	Credit
01	EE401	Power System – I	3	1	0	3
02	EE402	Measurement & Instrumentation	3	1	0	3
03	EC401	Analog Electronics And Circuits	3	1	0	3
04	EC403	Digital Electronics And Logic Design	3	1	0	3
05	CS301	Data Structure And Algorithm	3	1	0	3
06	EN401/ IT402	Engineering Economics /Cyber Security	2	0	0	0
01	EE401P	Power System- I Lab	0	0	3	1
02	EE402P	Measurement & Instrumentation Lab	0	0	3	1
03	EC403P	Digital Electronics And Logic Design Lab	0	0	3	1

04	EX401	Extra Activities (NSO/NSS/NCC/Yoga/ Creative Arts/Mini Project)	0	0	2	1
05	IN401	Internship/ Tour & Training/Industrial Training	0	0	0	2
Total credit						**21**

POWER SYSTEM-I

Course Code – EE 401

Course Outcomes:

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

CO's	CO Description
CO1	**Understand** the operation of conventional generating stations as well as renewable sources of electrical power.
CO2	**Determine** the electrical circuit parameters of overhead transmission lines.
CO3	**Analyze** the mechanical design of insulators and cables of power system.
CO4	**Solve** power distribution system problems.
CO5	**Illustrate** different types of tariff and **Analyze** power factor improvement methods.

DETAILED SYLLABUS

Module I: Power System Basics **(06 Lectures)**

Structure of power systems, Single line diagram. Introduction to Per Unit System.

Basic concepts of electrical power generation by conventional resources (Hydro station, Steam Power Plant, Nuclear Power Plant and Gas Turbine Plant) and renewable resources (Ocean Energy, Tidal Energy, Wave Energy, Wind Energy, Fuel Cells, and Solar Energy).

Module-II:

Electrical Design of Overhead Line **(06 Lectures)**

Constants of a Transmission Line, Resistance of a Transmission Line, Skin Effect, Proximity effect.

Calculation of inductance and capacitance of single phase, three phase, single circuit and double circuit transmission lines, Bundled conductors.

Performance of Transmission Line **(06 Lectures)**

Representation of lines: Short, Medium and Long length transmission line, Equivalent π and T circuits, Regulation and Efficiency, Evaluation of ABCD parameters. Ferranti effect, Surge impedance loading.

Module-III

Mechanical Design of Transmission Line **(08 Lectures)**

Types of insulators, methods of equalizing the potential, string efficiency. Phenomenon of corona, calculation of potential gradient, corona loss, factors affecting corona, methods of reducing corona.

Catenary curve, calculation of sag and tension, effects of wind and ice loads, sag template, vibration dampers.

Module-IV

Underground cables **(04 Lectures)**

Types of cables and their construction, charging current, dielectric stress, insulation resistance, capacitance of single phase and three phase cables, dielectric loss, heating of cables, grading of cables.

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Distribution Systems **(04 Lectures)**

Classification of Distribution Systems, D.C Distribution, Overhead Versus Underground System, Methods of solving D.C and A.C distribution problems.

Module V **(05 Lectures)**

Economics of Power system

Cost of electrical system, Economics of size of the conductor, Kelvin's law, variable load on power station, load curve, load duration curve, load characteristics, Tariff, Types of tariff.

Power Factor Improvement **(03 Lectures)**

Causes and disadvantages of Low Power Factor, Power Factor Improvement Equipments, Calculations of Power Factor Correction, most economical power factor.

Suggested Readings:

[1]. W.D. Stevenson "Elements of Power System Analysis". McGraw Hill.
[2]. C.L. Wadhwa "Electrical Power System", New age international Ltd. Third Edition.
[3]. B.R. Gupta, "Power System Analysis and Design", Third Edition, S.Chand& Co.
[4]. M.V. Deshpande,"Electrical Power System Design", TataMcGraw Hill.
[5]. S.Sivanagaraju&S.Satyanarayana,"Electric Power Transmission and Distribution", Pearson Education.
[6]. Kothari &Nagrath,"Power System Engineering", Tata McGraw Hill Education.

Reference Books:

[1]. Soni Gupta & Bhatnagar, "A Course in Electrical Power", Dhanpat Rai & Sons.
[2]. S.N. Singh, "Electric Power Generation, Transmission & Distribution", PHI Learning.

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MEASUREMENTAND INSTRUMENTATION

Course Code- EE402

Module I: Measuring System Fundamentals:

Absolute standards (International, Primary, Secondary, and Working standards),True Value, Errors(Gross, Systematic and Random); Static Characteristic of instruments(Accuracy, Precision, Sensitivity, Resolution and threshold).Classification of Instruments (based upon mode of measurement- Indicating , Recording and Integrating Instruments), Generalized Instrument (block diagram and description of various blocks), the three forces in an electromechanical indicating instrument (deflecting controlling and damping forces and the interplay between them), Comparison between gravity and spring(Qualitative Study) . Errors in Measurements. Basic statistical analysis applied to measurements: Mean, Standard Deviation, Six-sigma estimation, Cp, Cpk

Module II: Analog Ammeters, Voltmeters and Watt meters:

PMMC and MI Instruments, Construction, Torque Equation, Range Extension, Effect of temperature, Classification, Errors, Advantages and Disadvantages. Analog Wattmeters Power Factor Meters and Energy Meter Power and Power Factor, Electrodynamometer type wattmeter, power factor meter, Construction, theory, Shape of scale, torque equation, Advantages and disadvantages, active and reactive power measurement in single phase, Measurement in three phase. Single phase induction type energy meters, construction, theory, Operation, lag adjustments, Max Demand meters/indicators, Measurement of VAH and VARh.

Module III: DC and AC Bridges:

Measurement of resistance, Wheatstone Bridge, Kelvin's Bridge, Kelvin's Double Bridge,

Measurement of inductance, Capacitance, Maxwell's Bridge, Desauty Bridge, Anderson Bridge, Schering Bridge, Wien Bridge, Applications and Limitations.

Module IV: Instrument Transformers and Transducers

Current Transformer and Potential Transformer - construction, theory, phasor diagram, errors, testing and applications. Measurement of Temperature, RTD, Thermistors, LVDT, Strain Gauge, Piezoelectric Transducers, Digital Shaft Encoders, Tachometer, Hall effect sensors. Sensors and Transducers for physical parameters: temperature, pressure, torque, flow. Speed and Position Sensors.

Module V: Electronic Instruments:

Electronic Display Device, Digital Voltmeters, Digital Energy meter, CRO, measurement of voltage and frequency, Lissajous Patterns, Plotting B-H curve of a magnetic material, Wave Analyzers, Harmonic Distortion Analyzer. Digital Energy Meter. Measurements of R, L and C.Digital Multi-meter, True RMS meters, Clamp-on meters, Meggers.Digital Storage Oscilloscope.

Text Books:

1. W.D. Coopers and Helfrick, Modern Electronic instrumentation and Measurements Techniques, Prentice Hall of India Pvt. Ltd,
2. E.W. Gowlding and F.C.Widdis, Electrical Measurements and Measuring Instruments 5/e, Wheeler Publications.
3. U. A. Bakshi, A. V. Bakshi: Electrical Measurements and Instrumentation, Technical Publications.

Reference Books

1. A. K. Sawhney: A course in Electrical Measurements Electronic Measurements Instrumentation, Edition 11, Dhanpat Rai and Sons,
2. J. B. Gupta: A course in Electrical and Electronic Measurements and Instrumentation, 13/E, Kataria and Sons.

ANALOG ELECTRONICS AND CIRCUITS

Course Code- EC401

Module I: Diode & Transistor Circuits:

P-N junction diode, I-V characteristics of a diode, review of half-wave and full-wave rectifiers, Zener diodes, clamping and clipping circuits. Amplifier models, Voltage amplifier, current amplifier, transconductance amplifier and trans-resistance amplifier. Biasing schemes for BJT and FET amplifiers, bias stability, various configurations (such as CE/CS, CB/CG, CC/CD) and their features, small signal analysis, low frequency transistor models, estimation of voltage gain, input

resistance, output resistance etc., design procedure for particular specifications, low frequency analysis of multistage amplifiers, high-frequency equivalent circuits.

Module II: Oscillators, DAC & ADC:

Review of the basic concept, Barkhausen criterion, RC oscillators (phase shift, Wien bridge etc.), LC oscillators (Hartley, Colpitt, Clapp etc.), non-sinusoidal oscillators. Digital-to-analog converters (DAC) Weighted resistor, R-2R ladder, resistor string etc., Analog to-digital converters (ADC): Single slope, dual slope, successive approximation, flash etc.

Module III: MOSFET circuits:

MOSFET structure and I-V characteristics, MOSFET as a switch, MOSFET as an amplifier: small signal model and biasing circuits, common-source, common-gate and common-drain amplifiers; small signal equivalent circuits - gain, input and output impedances, transconductance, high frequency equivalent circuit.

Module IV: Differential, multi-stage and operational amplifiers:

Differential amplifier; power amplifier; direct coupled multi-stage amplifier; internal structure of an operational amplifier, ideal op-amp, non-idealities in an op-amp (Output offset voltage, input bias current, input offset current, slew rate, gain bandwidth product)

Module V: Linear & Nonlinear applications of op-amp:

Idealized analysis of op-amp circuits, Inverting and non-inverting amplifier, Differential amplifier, Instrumentation amplifier, Integrator, Active filter, P, PI and PID controllers and lead/lag compensator using an op-amp, Voltage regulator, Oscillators (Wein bridge and phase shift).Analog to Digital Conversion. Hysteretic Comparator, Zero Crossing Detector, Square wave and triangular-wave generators, Precision rectifier, peak detector, Monoshot.

Text Books:

1. A. S. Sedra and K. C. Smith, “Microelectronic Circuits”, New York, Oxford University Press, 1998.
2. J. V. Wait, L. P. Huelsman and G. A. Korn, “Introduction to Operational Amplifier theory and applications”, McGraw Hill U. S., 1992.
3. J. Millman and A. Grabel, “Microelectronics”, McGraw Hill Education, 1988.

Reference Books:

1. P. Horowitz and W. Hill, "The Art of Electronics", Cambridge University Press, 1989.
2. P. R. Gray, R. G. Meyer and S. Lewis, "Analysis and Design of Analog Integrated Circuits", John Wiley & Sons, 2001
3. Op-Amps and Linear Integrated Circuits by A. Gayakwad, Pearson Publication

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DIGITAL ELECTRONICS AND LOGIC DESIGN

Course code -EC 302

Module I: Binary Codes and Boolean algebra

Analog and Digital, Binary Number System. Addition, Subtraction, Multiplication, Division of binary numbers, Subtraction using 2's complement method. Binary codes: weighted and non-weighted codes, self-complementary codes, BCD, Excess-3, Gray codes, Alphanumeric codes, ASCII Codes. *Boolean algebra*: Boolean Laws and Expression using Logic

Gates, Realization of different gates using Universal gates, DeMorgan's Theorem, Duality Theorems.

Module II : Boolean function minimization Techniques

Standard forms: SOP, POS, Simplification of Switching function & representation (Maxterm & Minterm), Boolean expression & representation using logic gates, Propagation delay in logic gate. *Karnaugh map*: K-map(up to 5 variables), mapping and minimization of SOP and POS expression, Don't care condition, conversion from SOP to POS and POS to SOP form using Kmap, Minimization of multiple output circuits, Quine Mc-cluskey method minimization technique, prime implicant table, Don't care condition.

Module III: Combinational Circuits Design

Adder & Subtractor (Half and Full), Parallel Binary adder, BCD Adder, Binary multipliers, Code Converters, parity bit generator, Comparators, Decoder, BCD to 7-segment Decoder, Encoders, Priority Encoders, Multiplexers, De Multiplexers.

Module IV: Sequential Circuits Elements

Introduction to sequential circuit, Flip-flop & Timing Circuits: SR latch, Gated latch, Tri state logic, Edge triggered flip-plop: - D, JK, T Flip-flop, flip-flop asynchronous inputs ,characteristic table of Flip-flop, excitation table of Flip-flop, master slave JK flip flop, inter conversion of Flipflop. Study of timing parameters of flip-flop. Shift registers: buffer register, controlled buffer register. Data transmission in shift resistor SISO, SIPO, PISO, PIPO, Bidirectional shift register, universal shift registers. *Counter*: Classification, Ripple or asynchronous counter, Effect of propagation delay in ripple counters, up-down counter,

Design of Mod-n counter, synchronous counter, Ring counter, Johnson counter. Introduction to FSM. Design of synchronous FSM, Algorithmic State Machines charts. Designing synchronous circuits like Pulse train generator.

Module V: Logic Families and VLSI Design flow

Logic Families and Semiconductor Memories: TTL NAND gate, Specifications, Noise margin, Propagation delay, fan-in, fan-out, Tristate TTL, ECL, CMOS families and their interfacing, Memory elements, Concept of Programmable logic devices like FPGA, Logic implementation using Programmable Devices VLSI Design flow: Design entry, Schematic, FSM & HDL, different modelling styles in VHDL, Data types and objects, Dataflow, Behavioural and Structural Modelling, Synthesis and Simulation VHDL constructs and codes for combinational and sequential circuits

Text Books **:**

1. Kharate “Digital Electronics” OXFORD Publication
2. A. Anand Kumar ‘Fundamentals of Digital Circuits’. PHI Publications
3. R.P. Jain-‘Modern Digital Electronics’ IIIrd Edition- Tata Mc Graw Hill, Publication
4. Douglas Perry, “VHDL”, Tata McGraw Hill, 4th edition, 2002.
5. Charles Roth, “Digital System Design using VHDL”, Tata McGraw Hill 2nd edition
6. Bhaskar VHDL BASED DESIGN ,PEARSON EDUCATION

Reference Books:

1. Rajkamal ‘Digital Systems Principals and Design’ Pearson Education
2. A.P. Malvino, D.P. Leach ‘Digital Principles & Applications’ -VIth Edition-TMH publication.
3. M. Morris Mano ‘Digital Design’ (Third Edition). PHI Publications

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DATA STRUCTURES AND ALGORITHMS

Course code -CS 301

Module I

Basic concepts and notations: Data structures and data structure operations, Complexity Analysis: Mathematical notation and functions, algorithmic complexity and time space trade off, Big O Notation, The best, average & worst cases analysis of various algorithms. Arrays: Linear & Multidimensional Arrays, Representation & traversal. Sorting algorithms: Bubble sort, Selection sort, Insertion sort, Merge sort and Quick sort, Counting Sort. Linear search and Binary search on sorted arrays.

Module II

Abstract Data Types (ADTs) Stack: Push; Pop, stack representation using array and linked list, Applications of Stack, Recursion. Queue: Representation using array and linked list, Insertion and deletion operations, circular queue, Dequeue, priority queue. Linked Lists & their types.

(Single, Double, Circular linked lists), Operations on Varieties of Linked Lists (Search and Update) with applications

Module III

Introduction to Trees, Binary tree - definitions and properties; binary tree traversal algorithms with and without recursion., Binary Search Tree - creation, insertion and deletion operations, Threaded tree (One way and Two way). AVL tree balancing; B-tree

Module IV

Graph Algorithms: Graphs and their Representations, Graph Traversal Techniques: Breadth First Search (BFS) and Depth First Search (DFS), Applications of BFS and DFS, Minimum Spanning Trees (MST), Prim's and Kruskal's algorithms for MST, Connected Components, Dijkstra's Algorithm for Single Source Shortest Paths,, Floydd's Algorithm for All-Pairs Shortest Paths Problem

Module V

Hashing techniques, Hash function, Address calculation techniques- common hashing functions Collision resolution, Linear probing, quadratic probing, double hashing, Bucket addressing. Rehashing

Course Outcomes: At the end of the course the student will be able to:

- Understand the concept of ADT
- Identify data structures suitable to solve problems
- Develop and analyse algorithms for stacks, queues
- Develop algorithms for binary trees and graphs
- Implement sorting and searching algorithms
- Implement symbol table using hashing techniques

Text Books:

1. Data Structures Using C – A.M. Tenenbaum (PHI)
2. Introduction to Data Structures with Applications by J. Tremblay and P. G. Sorenson (TMH)
3. Data Structures, Algorithms and Application in C, 2nd Edition, Sartaj Sahni
4. Data Structures and Algorithms in C, M.T. Goodrich, R. Tamassia and D. Mount, Wiley India.

REFERENCE BOOKS:

1. Data Structure and Program Design in C by C.L. Tondo.
2. Data Structures with C++, J. Hubbard, Schaum's Outlines, TMH.
3. Data Structures and Algorithms in C, M.T. Goodrich, R. Tamassia and D. Mount, Wiley India.
4. Data Structures and Algorithm Analysis in C, 3rd Edition, M.A. Weiss, Pearson.
5. Classic Data Structures, D. Samanta, 2nd Edition, PHI.
6. Data Structure Using C by Pankaj Kumar Pandey.
7. Data Structure with C, Tata McGraw Hill Education Private Limited by Seymour Lipschutz.
8. Data Structure through C in Depth, BPB Publication, by S.K. Srivastava.
9. Data Structure and algorithm Analysis in C 2nd Edition, PEARSON Publishing House, Mark Allen Weiss

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CYBER SECURITY

Course code –IT 402

Module I: Introduction to Cybercrime: Introduction, Cybercrime, and Information Security, who are Cybercriminals, Classifications of Cybercrimes, and Cybercrime: The legal Perspectives and Indian Perspective, Cybercrime and the Indian ITA 2000, A Global Perspective on Cybercrimes.

Module II: Cyber Offenses: How Criminals Plan Them: Introduction, How Criminals plan the Attacks, Social Engineering, Cyber stalking, Cyber Cafe and Cybercrimes, Botnets: The Fuel for Cybercrime, Attack Vector, Cloud Computing.

Module III: Cybercrime : Mobile and Wireless Devices: Introduction, Proliferation of Mobile and Wireless Devices, Trends in Mobility, Credit card Frauds in Mobile and Wireless Computing Era, Security Challenges Posed by Mobile Devices, Registry Settings for Mobile Devices, Authentication service Security, Attacks on Mobile/Cell Phones, Mobile Devices: Security Implications for Organizations, Organizational Measures for Handling Mobile, Organizational Security Policies an Measures in Mobile Computing Era, Laptops.

Module – IV: Tools and Methods Used in Cybercrime : Introduction, Proxy Servers and Anonymizers, Phishing, Password Cracking, Keyloggers and Spywares, Virus and Worms, Trojan Horse and Backdoors, Steganography, DoS and DDoS attacks, SQL Injection, Buffer Overflow.

Module V: Cyber Security: Organizational Implications Introduction, Cost of Cybercrimes and IPR issues, Web threats for Organizations, Security and Privacy Implications, Social media marketing: Security Risks and Perils for Organizations, Social Computing and the associated challenges for Organizations.

TEXT BOOK:

- Cyber Security: Understanding Cyber Crimes, Computer Forensics and Legal Perspectives, Nina Godbole and Sunil Belapure, Wiley INDIA.

REFERENCE BOOK:

- Cyber Security Essentials, James Graham, Richard Howard and Ryan Otson, CRC Press.
- Introduction to Cyber Security , Chwan-Hwa(john) Wu,J.David Irwin.CRC Press T&F Group

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ENGINEERING ECONOMICS

Course code –EN 401

COURSE OUTLINE:

The basic purpose of this course is to provide a sound understanding of concepts and principles of engineering economy and to develop proficiency with methods for making rational decisions regarding problems likely to be encountered in professional practice.

Module -1

Introduction of Engineering Economics and Demand Analysis: Meaning and nature of Economics, Relation between science, engineering, technology and economics; Nature of Economic problem, Production possibility curve, Concepts and measurement of utility, Law of Diminishing Marginal Utility, Law of equi-marginal utility – its practical application and importance.

Meaning of Demand, Individual and Market demand schedule, Law of demand, shape of demand curve, Elasticity of demand, measurement of elasticity of demand, practical importance & applications of the concept of elasticity of demand.

Module -II

Meaning of production and factors of production; Law of variable proportions, Returns to scale, Internal and External economics and diseconomies of scale.

Various concepts of cost – Fixed cost, variable cost, average cost, marginal cost, money cost, real cost, opportunity cost. Shape of average cost, marginal cost, total cost, Cost curves.

Module III

Meaning of Market, Types of Market – Perfect Competition, Monopoly, Oligopoly, Monopolistic Competition (Main features of these markets)

Pricing Policies- Entry Deterring policies, Predatory Pricing, Peak load Pricing. Product Life cycle

Firm as an organisation- Objective of the Firm, Type of the Firm, Vertical and Horizontal Integration, Diversification, Mergers and Takeovers.

Module -IV

Nature and characteristics of Indian economy (brief and elementary introduction), Privatization – meaning, merits and demerits. Globalisation of Indian economy – merits and demerits. Elementary Concepts of VAT, WTO, GATT & TRIPS agreement, Business cycle, Inflation

RECOMMENDED BOOKS:-

1. R.Paneer Seelvan: Engineering Economics, PHI
2. Managerial Economics, D.N.Dwivedi, Vikash Publication
3. Managerial Economics, H.L. Ahuja, S. Chand and Co. Ltd.
4. Managerial Economics, Suma Damodaran, Oxford.
5. R.molrishnd Ro T.V S 'Theory of firms : Economics and Managerial Aspects'. Affiliated East West Press Pvt Ltd New Delhi
6. Managerial Economics, H. Craig Petersen &W. Cris Lewis, Pearson Education.

POWER SYSTEM-1 LAB

Course Code- EE401 List of Experiments (Minimum 10)

1. To draw operating characteristics of DMT/IDMT relay.
2. To draw operating characteristics of differential relay.
3. To study Bucholtz Relay.
4. Testing of Transformer oil.
5. To find ABCD Parameters of a model of transmission line.
6. To observe Ferranti effect in a model of transmission line.
7. To study the microcontroller based differential relay for the protection of transformer.
8. To study electromechanical type negative sequence relay.
9. To study electromechanical type over current relay.
10. To study electromechanical type directional over current relay.

11. To study electromechanical type earth fault relay.
12. To determine the string efficiency of suspension type insulators with and without guard ring.
13. To plot Annual / monthly / daily load demand of nearby area.
14. To draw single line diagram of distribution system of JUVNL of nearby area of college concerned.

NOTE: At least ten experiments are to be performed, minimum seven experiments should be performed from above list. Remaining three experiments may either be performed from the above list or designed & set by the concerned institution as per the scope of the syllabus.

MEASUREMENTAND INSTRUMENTATION LAB

Course Code- EE402

List of Experiments (Minimum 10)

1. Calibration of AC voltmeter and AC ammeter.
2. Measurement of inductance using Maxwell's Bridge.
3. Measurement of capacitance using Schering Bridge.
4. Measurement of low resistance using Kelvin's Double Bridge.
5. Measurement of Power using CT and PT.
6. Measuring displacement using LVDT.
7. Measuring temperature using thermocouple.
8. Measuring pressure using piezoelectric pick up.
9. Measurement of speed of DC motor by photoelectric pick up.

10. Speed measurement using Hall Effect sensor.
11. Measurement of a batch of resistors and estimating statistical parameters. Measurement of L using a bridge technique as well as LCR meter.
12. Measurement of C using a bridge technique as well as LCR meter. Measurement of Low Resistance using Kelvin's double bridge.

NOTE: At least ten experiments are to be performed, minimum seven experiments should be performed from above list. Remaining three experiments may either be performed from the above list or designed & set by the concerned institution as per the scope of the syllabus.

DIGITAL ELECTRONICS AND LOGIC DESIGN LAB

Course code EC 302P

List of Experiments (Minimum 10)

1. Study of TTL gates – AND, OR, NOT, NAND, NOR, EX-OR, EX-NOR.
2. Design & realize a given function using K-maps and verify its performance.
3. To verify the operation of multiplexer & Demultiplexer.
4. To verify the operation of comparator.
5. To verify the truth tables of S-R, J-K, T & D type flip flops.
6. To verify the operation of bi-directional shift register.
7. To design & verify the operation of 3-bit synchronous counter.
8. Design all gates using VHDL.
9. Design a multiplexer using VHDL
10. Design a decoder using VHDL

11. Write VHDL programs for the following circuits, check the wave forms and the hardware generated a. half adder b. full adder
12. Write VHDL programs for the following circuits, check the wave forms and the hardware generated a. multiplexer b. demultiplexer

NOTE: At least ten experiments are to be performed, minimum seven experiments should be performed from above list. Remaining three experiments may either be performed from the above list or designed & set by the concerned institution as per the scope of the syllabus. For VHDL Xilinx software may be used.

Jharkhand University of Technology Jharkhand, Ranchi

Proposed Syllabus for B.Tech 3rd Semester

Electronics and Communication Engineering

Electronics and Communication Engineering

3rd semester course structure

Sl. No.	Course Code	Subject	L	T	P	Credit
01	EC301	Basic Electronics	3	1	0	3
02	EC302	Digital Electronics And Logic Design	3	1	0	3
03	EE302	Network Theory	3	1	0	3
04	EE303	Electromagnetic Field Theory	3	1	0	3
05	BSC301	Mathematics-III	3	1	0	4
06	BSC302	Environmental Science	2	0	0	0
01	EC301P	Basic Electronics Lab	0	0	3	1
02	EC302P	Digital Electronics And Logic Design Lab	0	0	3	1
03	EE302P	Network Theory Lab	0	0	3	1
04	EX301	Extra Activities (NSO/NSS/NCC/Yoga / Creative Arts/Mini Project)	0	0	2	1
05	HS301	Communication Skill Lab	0	0	2	1
Total credit						**21**

PROPOSED SYLLABUS FOR ALL BRANCHES EXCEPT CSE & IT

2nd year, III Semester, UG course Engg. & Tech Jharkhand University of Technology

BSC301 MATHEMATICS III

Module -1

Laplace Transformation: Laplace Transformation and its properties, Periodic function, Unit step function and impulse function .Inverse Laplace Transformation, Convolution Theorem, Applications of Laplace transforms in solving certain initial value problems & simultaneous differential equations**.** **(8L/1.5Q)**

Module-2

Numerical Method: Finite difference, Symbolic relations, Interpolation and Extrapolation, Newton - Gregory forward and backward formula, Lagrange's formula, Inverse Interpolation by Lagrange's formula. Numerical Differentiation and Numerical Integration, Newton Cotes Quadrature formula, Trapezoidal rule. Simpson's 1/3" rule, Simpson's 3/8" rule. **(10L/1.5Q)**

Module -3

Z-Transform & Inverse Z-Transform- Properties - Initial and Final value theorems, Convolution theorem- Difference equations. Solution of difference equations using Z-Transformation. **(6L/1.5Q)**

Module -IV

Fourier Series & Fourier Transform: Expansion of - Algebraic, Exponential &Trigonometric functions in Fourier series, Change of interval, Even and odd function, half range sine and cosine series, Complex form of Fourier series.

Fourier Transformation and inverse Fourier Transformation, Fourier sine & cosine transforms. Convolution theorem for Fourier transforms with simple illustrations. **(8L/1.5Q)**

Module V

Partial Differential Equations: Formation of partial differential equations, Linear partial differential equations of first order, Lagrange's linear equation, Non-linear equations of first order, Charpit's method Solution of one dimensional Wave equation & Heat equation by the method of separation of variables and its applications. **(8L/1Q)**

Note-Question no.1 will be compulsory, objective type with 7 sub-parts comprising of the whole syllabus.

Text Books

1. Irwin Kreyszig, Advanced Engineering Mathematics, 9th Edition, John Wiley & Sons,
2. Ramana R. V ., Higher Engineering Mathematics, Tata McGraw Hill New Delhi,2010.
3. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 44th Edition,

Reference Books

1. R. J. Beerends .H. G. Ter Morsche, J. C. Van Den Berg. L. M. Van De Vrie, Fourier and Laplace Transforms, Cambridge University Press.
2. Sastry S.S. Introductory Methods of Numerical Analysis, PHI

BASIC ELECTRONICS

(ECE, EEE, EE,CSE, IT) Course
code -EC 301

L	T	P	CR.
3	1	0	3

Module I: Basic Electronic Components

Active and Passive Components, Types of resistors and Colour coding, Capacitors, Inductors applications of Resistor, Capacitor and Inductor, Relay, LDR, Basic Integrated Circuits (IC 7805, 7809, 7812, 555 etc.). Measuring Instruments like CRO, Power supply, multi-meters etc.

Module II: Semiconductors

Difference between Insulators, Semiconductors and Conductors, Mobility and Conductivity, Intrinsic and Extrinsic Semiconductors, Fermi Level, Energy band, Charge Densities in Semiconductors, Mass Action Law, Current Components in Semiconductors, Drift and Diffusion Current, The Continuity Equation, Injected Minority Charge Carrier, Hall Effect, P-N Junction Diode, construction, working, characteristics and diode equation Application of Diode, Rectifier: Half Wave, Full Wave and Bridge Rectifier, Zener Diode and its Applications, Varactor Diode, Schottky Diode, Regulated Power Supply using Zener Diode and Regulated ICs, LED, Photodetector.

Module III: Transistors

Construction, Working, Modes and Configuration of BJT, Input and Output Characteristics of all Configurations, Comparison of all Configuration & Modes, BJT as a Switch and as an Amplifier..h –parameter, JFET Construction, working and characteristics. MOSFET Construction, working and Characteristics, Types of MOSFET.

Module IV: Power electronic devices & Communication engineering

Construction, characteristics and working of SCR, DIAC, TRIAC and UJT.
Introduction, Characteristics and applications of Operational Amplifier (IC741). Modulation and its types.

Module V: Digital Logic and basic circuit Design

Number systems and conversion (DECIMAL, OCTAL, HEXADECIMAL, BINARY, BCD etc.), binary addition and subtraction, Logic Gates and their truth-table ,Boolean algebra .Design of Single Stage Amplifier, LED Driver Circuit, Infrared Transmitter Receiver Circuit, LDR Driver Circuit, Relay Driver Circuit, Square Wave and Fix Frequency Generator using 555 IC.

Text Books

1. Basic Electronics and Linear Circuits by N. N. Bhargava, D. C. Kulshreshtha and S. C. Gupta, TMH Publications.
2. Op-Amps and Linear Integrated Circuits by Ramakant A. Gayakwad, PHI Publications.
3. Electronic Devices and Circuits by Godse and Bakshi Technical, Vol-1 Technical Publication Pune.

Reference Books

1. Integrated Devices & Circuits by Millman & Halkias, TMH Publications.
2. Electronics Devices and Circuit Theory by R. Boylestad & L. Nashelsky, Pearson Publication
3. Electronic Communication System by G. Kennedy, TMH Publications.
4. Basic Electronics by Sanjeev Kumar & Vandana Sachdeva, Paragaon International Publication

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DIGITAL ELECTRONICS AND LOGIC DESIGN

(ECE, CSE, IT)

Course code -EC 302

L	T	P
	CR. 3	1
	0	3

Module I: Binary Codes and Boolean algebra

Analog and Digital, Binary Number System. Addition, Subtraction, Multiplication, Division of binary numbers, Subtraction using 2's complement method. Binary codes: weighted and non-weighted codes, self-complementary codes, BCD, Excess-3, Gray codes, Alphanumeric codes, ASCII Codes. *Boolean algebra*:

Boolean Laws and Expression using Logic Gates, Realization of different gates using Universal gates, DeMorgan's Theorem, Duality Theorems.

Module II: Boolean function minimization Techniques

Standard forms: SOP, POS, Simplification of Switching function & representation (Maxterm & Minterm), Boolean expression & representation using logic gates, Propagation delay in logic gate. *Karnaugh map*: K-map(up to 5 variables), mapping and minimization of SOP and

POS expression, Don't care condition, conversion from SOP to POS and POS to SOP form using K-map, Minimization of multiple output circuits, Quine Mc-cluskey method minimization technique, prime implicant table, Don't care condition.

Module III: Combinational Circuits Design

Adder & Subs tractor (Half and Full), Parallel Binary adder, BCD Adder, Binary multipliers, Code Converters, parity bit generator, Comparators, Decoder, BCD to 7-segment Decoder, Encoders, Priority Encoders, Multiplexers, De Multiplexers.

Module IV: Sequential Circuits Elements

Introduction to sequential circuit, Flip-flop & Timing Circuits: SR latch, Gated latch, Tri state logic, Edge triggered flip-plop: - D, JK, T Flip-flop, flip-flop asynchronous inputs ,characteristic table of Flip-flop, excitation table of Flip-flop, master slave JK flip flop, inter conversion of Flip-flop. Study of timing parameters of flip-flop. Shift registers: buffer register, controlled buffer register. Data transmission in shift resistor SISO, SIPO, PISO, PIPO, Bidirectional shift register, universal shift registers. *Counter*: Classification, Ripple or asynchronous counter, Effect of propagation delay in ripple counters, up-down counter, Design of Mod-n counter, synchronous counter, Ring counter, Johnson counter. Introduction to FSM. Design of synchronous FSM, Algorithmic State Machines charts. Designing synchronous circuits like Pulse train generator.

Module V: Logic Families and VLSI Design Flow

Logic Families and Semiconductor Memories: TTL NAND gate, Specifications, Noise margin, Propagation delay, fan-in, fan-out, Tristate TTL, ECL, CMOS families and their interfacing, Memory elements, Concept of Programmable logic devices like FPGA, Logic implementation using Programmable Devices VLSI Design flow: Design entry, Schematic, FSM & HDL, different modelling styles in

VHDL, Data types and objects, Dataflow, Behavioural and Structural Modelling, Synthesis and Simulation VHDL constructs and codes for combinational and sequential circuits

Text Books:

1. Kharate "Digital Electronics" OXFORD Publication
2. A. Anand Kumar 'Fundamentals of Digital Circuits'. PHI Publications
3. R.P. Jain-'Modern Digital Electronics' IIIrd Edition- Tata Mc Graw Hill, Publication
4. Douglas Perry, "VHDL", Tata McGraw Hill, 4th edition, 2002.
5. Charles Roth, "Digital System Design using VHDL", Tata McGraw Hill 2nd edition
6. Bhaskar VHDL BASED DESIGN, PEARSON EDUCATION

Reference Books:

1. Rajkamal 'Digital Systems Principals and Design' Pearson Education
2. A.P. Malvino, D.P. Leach 'Digital Principles & Applicatios' -VIth Edition-TMH publication.
3. M. Morris Mano 'Digital Design' (Third Edition). PHI Publications

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NETWORK THEORY

(ECE, EEE, EE)

Course code -EE 302

L	T	P	CR.
3	1	0	3

Module I: Circuit Fundamentals

Voltage sources, Current sources, Conversion of voltage sources to current sources and vice a versa. Network terminology :- Node, Junction, Branch, Loop, Network solution by branch current method, Loop or Mesh current method, Node voltage method, Star delta connection and conversion. Node and Mesh Analysis, matrix approach of network containing voltage and current sources, and reactance's, source transformation and duality. Network theorems: Superposition, reciprocity, Thevenin's, Norton's, Maximum power Transfer, compensation and Tallegen's theorem as applied to AC, circuits. Trigonometric and exponential Fourier series: Discrete spectra and symmetry of waveform, steady state response of a network to non-sinusoidal periodic inputs, power factor, effective values, Fourier transform and continuous spectra, three phase unbalanced circuit and power calculation.

Module II: Resonance Circuits

Series resonance circuit, Frequency response of a series resonant circuit, Q factor, Bandwidth, selectivity, Effect of Q on bandwidth and selectivity, Relation between bandwidth and Q, Impedance of a series resonant circuit, Resonance by variation of L and C, Parallel resonant circuit and effect of resistance of a capacitance, Frequency response of parallel resonant circuit.

Module III: Two- Port Network

Two- port network parameters, r, y, z, h, A B C D relation between the parameters, Inter-conversion of two port networks, cascade connection series connection, series parallel connection, T and M network representation of a two port network.

Module IV: Network Functions

Laplace transform, transform of a voltage and current, Transform of circuit elements, Network functions, Poles and zeros of the network functions, Pole zero plot, Physical significance of poles and zeroes, Stability, Two-port network parameters in the frequency domain Transient response: - step input response in RL circuit, step input response in R-C circuit, step input response in R-L-C circuit, ac transients.

Module V: Filters and Attenuators

Definitions, classification and characteristics of different filters, filter fundamentals such as attenuation constant(alpha), phase shift (beta), propagation constant (gamma), characteristic impedance (Zo), decibel, neper. Design and analysis of constant K, M derived and composite filters (low pass, high pass, band pass, and band stop filters): T and PI sections. Definitions, classification, relation between neper and decibel, analysis and design of T type, PI type, alpha lattice, bridged – T and L types attenuators.

Text Books:

1. "A.Sudhakar, Shymmohan S. Palli, _Circuit and Network – Analysis and Synthesis‘, 3 rd Edition, Tata McGraw Hill Publication.

2. Van, Valkenburg; “Network analysis”; Prentice Hall of India, 2000.

3. A. Chakrabarti, _Circuit theory (Analysis and Synthesis) ‘, IIIrd edition, Dhanpat Rai and Co.

Reference Books:

1. D. Roy Choudhuri, _Networks and Systems‘, New Age International Publisher.

2. M.E.Van Valkenburg Network Analysis‘, IIIrd edition, Pearsons Education/PHI.

3.Josheph Edministrar, _Theory and Problems of Electronic Circuit (Schaum‘s Series) – Tata McGraw Hill Publication.

4. Soni Gupta, _Electrical Circuit Analysis‘, Dhanpat Rai and Co.

5. Boylestad, _Introductory Circuit Analysis‘, Universal Book Stall, New

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ELECTROMAGNETIC FIELD THEORY

(ECE, EEE, EE)

Course code -EE 303

L	T	P	CR.
3	1	0	3

Module I: Coordinate Systems and Transformation:

Basics of Vectors: Addition, subtraction and multiplications; Cartesian, Cylindrical, Spherical transformation. Vector calculus: Differential length, area and volume, line surface and volume integrals, Del operator, Gradient, Divergence of a vector, Divergence theorem, Curl of a vector, Stokes's theorem, Laplacian of a scalar.

Module II: Electrostatic fields:

Coulombs law and field intensity, Electric field due to charge distribution, Electric flux density, Gausses' Law- Maxwell's equation, Electric dipole and flux line, Energy density in electrostatic fields, Electric field in material space: Properties of materials, convection and conduction currents, conductors, polarization in dielectrics, Dielectric-constants, Continuity equation and relaxation time, boundary conditions, Electrostatic boundary value problems: Poisson's and Laplace's equations., Methods of Images.

Module III: Magneto Statics:

Magneto-static fields, Biot - Savart's Law, Ampere's circuit law, Maxwell's equation, Application of ampere's law, Magnetic flux density- Maxwell's equation, Maxwell's equation for static fields, magnetic scalar and vector potential.

Module IV: Magnetic Forces:

Materials and devices, Forces due to magnetic field, Magnetic torque and moment, a magnetic dipole. Magnetization in materials, Magnetic boundary conditions, Inductors and inductances, Magnetic energy.

Module V: Waves and Applications:

Maxwell's equation, Faraday's Law, transformer and motional electromotive forces, Displacement current, Maxwell's equation in final form Electromagnetic wave propagation: Wave propagation in loss dielectrics, Plane waves in lossless dielectrics Plane wave in free space. Plain waves in good conductors, Power and the pointing vector, Reflection of a plain wave in a normal incidence. Transmission Lines, and Smith Chart.

Text Book:

1. MNO Sadiku, "Elements of Electromagnetic', Oxford University Press.

Reference Books:

1. WH Hayt and JA Buck, "Engineering Electromagnetic", McGraw- Hill Education.
2. Antenna and wave propagation by K.D Parsad, Satya Prakashan.

ENVIRONMENTALSCIENCE

Course code –BSC 302

L T P CR.

2 0 0 0

(COMMON FOR ALL BRANCH)

Module-1

Concept and scope of Environment science, components of environment, environmental segment and their importance. **(2 Hrs)**

Module-II

Ecology: Ecosystem and its characteristics features, structure and function of forest ecosystem, grassland ecosystem, desert ecosystem and aquatic ecosystem, ecological balance and consequences of imbalance. **(4 Hrs)**

Module-III

Atmosphere: Atmospheric composition, energy balance, climate, weather, depletion of ozone layer, greenhouse effect, acid rain, particles, ions and radicals in the atmosphere, chemical and photochemical reactions in the atmosphere.

Module-IV **(4 Hrs)**

Air pollution and control: Air pollutants, sources and effect of air pollutants, primary and secondary pollutants, photochemical smog, fly ash, inorganic and organic particulate matter. Air quality standards, sampling, monitoring and control measures for pollutants.

(4 Hrs)

Module-V

Water pollution and control: Aquatic environment, water pollution, sources and their effect, lake and ground water pollution, eutrophication, water quality standard and water pollution control measures, waste water treatment.

Module-VI **(4 Hrs)**

Land pollution; Lithosphere, composition of soil, acid base and ion exchange reactions in soil, soil erosion, landslides, desertification, pollutants (municipal, industrial, commercial, agricultural, hazardous solid wastes), origin and effects, collection and disposal of solid wastes, recovery and conversion methods. **(5 Hrs)**

Module-VII

Noise pollution; Noise classification and its sources, effects and measurement, noise pollution hazards, standards and noise pollution control. **(2 Hrs)**

Books and References:

1. Master, G.M Introduction to environment engineering and science, Pearson Education.
2. Nebel, B.J., Environment science, Prentice Hall Inc.
3. Odum, E.P. Ecology: The link between the natural and social sciences. IBH Publishing Company Delhi
4. De, A.K. Environmental Chemistry, Merrut.
5. Sharma B.K Envrionmental Chemistry, Krishna Prakashan Media Merrut.
6. Kaushik, A and Kaushik, C.P. Perspectives in Environmental studies, New Age International Publication.
7. Menon, S.E. Environmental Chemistry.

BASIC ELECTRONICS LAB

(ECE, EEE, EE)

Course code -EC 301P

List of Experiments (Minimum 10)

1. Identification and testing of Resistors, Inductors, Capacitors, PN-Diode. Zener Diode, LED, LCD, LDR, BJT, Photo Diode, Photo Transistor,
2. Measurement of voltage and current using multimeter, Measure the frequency and Amplitude of a signal with the help of CRO and function generator.
3. Study of p-n junction diode AND Zener Diode I-V characteristics
4. Assemble the single-phase half wave and full wave bridge rectifier & the analyse effect of capacitor as a filter (only study of waveforms).
5. Study of Zener diode as voltage regulator.

6. Measurement & study of input characteristics of a BJT in CB configuration. 7. Measurement and study of characteristics of JFET and MOSFET
8. To design and simulate IR Transmitter and Receiver Circuit.
9. To design and simulate Motor Driver using Relay.
10. To design and simulate Light detector using LDR.
11. To design and simulate Constant frequency square wave generator using.
12. To design and simulate 5 volt DC power supply from 230 AC.

NOTE: At least ten experiments are to be performed, minimum seven experiments should be performed from above list. Remaining three experiments may either be performed from the above list or designed & set by the concerned institution as per the scope of the syllabus.

DIGITAL ELECTRONICS AND LOGIC DESIGN LAB

(ECE, CSE, IT)

Course code EC 302P

List of Experiments (Minimum 10)

1. Study of TTL gates – AND, OR, NOT, NAND, NOR, EX-OR, EX-NOR.
2. Design & realize a given function using K-maps and verify its performance.
3. To verify the operation of multiplexer & Demultiplexer.
4. To verify the operation of comparator.
5. To verify the truth tables of S-R, J-K, T & D type flip flops.
6. To verify the operation of bi-directional shift register.
7. To design & verify the operation of 3-bit synchronous counter.
8. Design all gates using VHDL.
9. Design a multiplexer using VHDL
10. Design a decoder using VHDL
11. Write VHDL programs for the following circuits, check the wave forms and the hardware generated a. half adder b. full adder
12. Write VHDL programs for the following circuits, check the wave forms and the hardware generated a. multiplexer b. demultiplexer

NOTE: At least ten experiments are to be performed, minimum seven experiments should be performed from above list. Remaining three experiments may either be performed from the above list or designed & set by the concerned institution as per the scope of the syllabus. For VHDL Xilinx software may be used.

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NETWORK THEORY LAB

(ECE, EEE, EE)

Course code -EE 302P List of

Experiments (Minimum10)

1. Transient response of RC circuit.
2. Transient response of RL circuit.
3. To find the resonance frequency, Band width of RLC series circuit.
4. To study and verify effect of R on frequency response of parallel resonance circuit.
5. To calculate and verify "Z" parameters of a two port network.
6. To calculate and verify "Y" parameters of a two port network.
7. To determine equivalent parameter of parallel connections of two port network.
8. To plot the frequency response of low pass filter and determine half-power frequency.
9. To plot the frequency response of high pass filters and determines the half-power frequency.
10. To plot the frequency response of band-pass filters and determines the band-width.
11. To calculate and verify "ABCD" parameters of a two port network.
12. To synthesize a network of a given network function and verify its response.
13. Introduction of P-Spice or other simulation software

COMMUNICATIONSKILL LAB

Course code HS301

This lab paper involves interactive practice sessions in Language Lab along with some class lectures to enable the students to be confident enough in language and professional sphere of life.

Module I: Listening Comprehension

To comprehend spoken material in standard Indian English/ British English & American English

- Current situation in India regarding English
- American English Vs. British English

Module II: Phonetics & Phonology

- Introduction to Phonetics & Phonology
- Organs of Speech/ Speech Mechanism
- Pronunciation, Intonation, Stress and Rhythm, Syllable division
- Consonants/Vowels/Diphthongs Classification

Module III: Common Everyday Situations: Conversations and Dialogues

Module IV: Communication at Workplace

Module V: Telephonic Conversation

- Introduction
- Listening/Speaking
- Telephonic Skills Required
- Problems of Telephonic Conversation
- Intensive Listening

Module VI: Interviews

- The Interview Process
- Purpose/Planning/Two-way Interaction/Informality
- Pre-interview Preparation Techniques
- Projecting a Positive Image
- Answering strategies

Module VII: Formal Presentations

- Introduction
- Nature/Importance of Presentation
- Planning
- Objective with central idea, main ideas, role of supporting materials
- Handling Stage Fright

Module VIII: Forms of Technical Communication: Technical Report: Definition & importance; Thesis/Project writing: structure & importance; synopsis writing: Methods; Technical research Paper writing: Methods & style; Seminar & Conference paper writing; Expert Technical Lecture: Theme clarity; Analysis & Findings; C.V./Resume writing; Technical Proposal: Types, Structure & Draft.

Module IX: Technical Presentation: Strategies & Techniques Presentation: Forms; interpersonal Communication; Class room presentation; style; method; Individual conferencing: essentials: Public Speaking: method; Techniques: Clarity of substance; emotion; Humour; Modes of Presentation; Overcoming Stage Fear; Audience Analysis &

retention of audience interest; Methods of Presentation: Interpersonal; Impersonal; Audience Participation: Quizzes & Interjections.

Module X: Technical Communication Skills: Interview skills; Group Discussion: Objective & Method; Seminar/Conferences Presentation skills: Focus; Content; Style;

Argumentation skills: Devices: Analysis; Cohesion & Emphasis; Critical thinking; Nuances: Exposition narration & Description; effective business communication competence: Grammatical; Discourse competence: combination of expression & conclusion; Socio-linguistic competence: Strategic competence: Solution of communication problems with verbal and non verbal means.

Jharkhand University of Technology Jharkhand, Ranchi

Proposed Syllabus for B.Tech 4th Semester

Electronics and Communication Engineering

Electronics & Communication Engineering 4th semester course structure

Sl. No.	Course code	Subject	L	T	P	Credit
01	EC401	Analog Electronics And Circuits	3	1	0	3
02	EC402	Analog Communication	3	1	0	3
03	EE403	Signals And Systems	3	1	0	3
04	EE404	Microprocessor And Interfacing	3	1	0	3
05	CS301	Data Structure And Algorithm	3	1	0	3
06	EN401/ IT402	Engineering Economics/Cyber Security	2	0	0	0
01	EC401P	Analog Electronics And Circuits Lab	0	0	3	1
02	EC402P	Analog Communication Lab	0	0	3	1

03	EE404P	Microprocessor And Interfacing Lab	0	0	3	1
04	EX401	Extra Activities (NSO/NSS/NCC/Yoga/ Creative Arts/Mini Project)	0	0	2	1
05	IN401	Internship/ Tour & Training/Industrial Training	0	0	0	2
Total credit						**21**

ANALOG ELECTRONICS AND CIRCUITS

Course Code- EC401

Module 1: Diode & Transistor Circuits:
P-N junction diode, I-V characteristics of a diode, review of half-wave and full-wave rectifiers, Zener diodes, clamping and clipping circuits. Amplifier models, Voltage amplifier, current amplifier, transconductance amplifier and trans-resistance amplifier. Biasing schemes for BJT and FET amplifiers, bias stability, various configurations (such as CE/CS, CB/CG, CC/CD) and their features, small signal analysis, low frequency transistor models, estimation of voltage gain, input resistance, output resistance etc., design procedure for particular specifications, low frequency analysis of multistage amplifiers, high-frequency equivalent circuits.

Module II: Oscillators, DAC & ADC:
Review of the basic concept, Barkhausen criterion, RC oscillators (phase shift, Wien bridge etc.), LC oscillators (Hartley, Colpitt, Clapp etc.), non-sinusoidal oscillators. Digital-to-analog converters (DAC) Weighted resistor, R-2R ladder, resistor string etc., Analog to-digital converters (ADC): Single slope, dual slope, successive approximation, flash etc.

Module III: MOSFET Circuits:
MOSFET structure and I-V characteristics, MOSFET as a switch, MOSFET as an amplifier: small signal model and biasing circuits, common-source, common-gate and common-drain amplifiers; small signal equivalent circuits - gain, input and output impedances, transconductance, high frequency equivalent circuit.

Module IV: Differential, multi-stage and operational amplifiers:
Differential amplifier; power amplifier; direct coupled multi-stage amplifier; internal structure of an operational amplifier, ideal op-amp, non-idealities in an op-amp (Output offset voltage, input bias current, input offset current, slew rate, gain bandwidth product)

Module V: Linear & Nonlinear applications of op-amp:
Idealized analysis of op-amp circuits, Inverting and non-inverting amplifier, Differential amplifier, Instrumentation amplifier, Integrator, Active filter, P, PI and PID controllers and lead/lag

compensator using an op-amp, Voltage regulator, Oscillators (Wein bridge and phase shift).Analog to Digital Conversion. Hysteretic Comparator, Zero Crossing Detector, square wave and triangular-wave generators, Precision rectifier, peak detector, Monoshot.

Text Books:

1. A. S. Sedra and K. C. Smith, "Microelectronic Circuits", New York, Oxford University Press, 1998.
2. J. V. Wait, L. P. Huelsman and G. A. Korn, "Introduction to Operational Amplifier theory and applications", McGraw Hill U. S., 1992.
3. J. Millman and A. Grabel, "Microelectronics", McGraw Hill Education, 1988.

Reference Books:

1. P. Horowitz and W. Hill, "The Art of Electronics", Cambridge University Press, 1989.
2. P. R. Gray, R. G. Meyer and S. Lewis, "Analysis and Design of Analog Integrated Circuits", John Wiley & Sons, 2001
3. Op-Amps and Linear Integrated Circuits by A. Gayakwad, Pearson Publication

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ANALOG COMMUNICATION

Course Code- EC402

Module I: Introduction

Block schematic of communication system, Electromagnetic Spectrum, Necessity of modulation, Types of modulation – AM, FM, PM and Pulse Modulation. Noise types (Internal & External), Signal to Noise ratio, Noise factor, Noise figure, Noise Resistance, Noise Temperature, Noise factor of Amplifiers in Cascade(Numerical expected)

Module II: Amplitude Modulation

Amplitude Modulation principle, AM envelope, frequency spectrum & BW, phase representation of AM wave, Modulation index, % modulation, Power relations in AM (Numerical expected) AM modulating circuits: Low level AM modulation, medium power AM modulation, AM transmitters: Block diagram of low level DSBFC, High level DSBFC, Trapezoidal patterns, SSB Principles, Balanced modulator, SSB Generation Methods: Filter system, phase shift & third method ,Independent sideband system (ISB),Vestigial sideband(VSB)

Module III: Angle Modulation

Theory of frequency and phase modulation, mathematical analysis, FM and PM waveforms, frequency deviation and percentage modulation, deviation sensitivity, deviation ratio ,phase deviation and modulation index, frequency analysis of angle modulated wave-Bessel function,

BW requirements, Narrow band & wide band FM, FM modulators(Direct & Indirect) , Noise and angle modulation, Pre-emphasis and de-emphasis.

Module IV: Pulse Modulation

Pulse amplitude modulation, Sampling theorem , types :Natural & flat top, PAM modulation Demodulation, TDM and FDM, Crosstalk in TDM, PWM modulator & demodulator, PPM modulators & demodulator.

Module V: Digital Modulation Schemes & AM/FM Receiver

Digital modulation schemes- phase shift keying, frequency shift keying, quadrature amplitude modulation, continuous phase modulation and minimum shift keying. Simplified block diagram of AM receiver, receiver parameters: Sensitivity, Selectivity, BW, dynamic range, fidelity, Types of AM receiver: TRF and superheterodyne (block diagram), Block diagram, Double conversion FM receivers.

TEXT BOOKS:

1. George Kennedy, 'Electronics Communication System'--Tata McGraw Hill Publication.
2. Wayne Tomasi, 'Electronics Communication Systems Fundamentals through Advanced' - Pearson Education.
3. Haykin S., "Communications Systems," John Wiley and Sons, 2001.
4. Proakis J. G. and Salehi M., "Communication Systems Engineering," PearsonEducation,2002.
5. R P Singh, S D Sapre 'Communication System-Analog & Digital' 2nd Edition – TMHPublication

REFERENCE BOOKS:

1. Dennis Roddy, John Coolen, 'Electronics Communications '4th Edition-Pearson Education
2. Louis E. Frenzel, 'Principles of Electronic Communication Systems' -Tata McGraw Hill 3. Taub H. and Schilling D.L., "Principles of Communication Systems," Tata McGrawHill,2001.
4. Barry J. R., Lee E. A. and Messerschmitt D. G., "Digital Communication,"KluwerAcademic Publishers, 2004.
5. Abhay Gandhi, "Analog and Digital Communication," Cengage publication, 2015.

SIGNALS AND SYSTEMS

Course Code- EE 403

Module I: Introduction to Signals and Systems:
Signals and systems as seen in everyday life, and in various branches of engineering and science. Signal properties: periodicity, absolute integrability, determinism and stochastic character. Some special signals of importance: the unit step, the unit impulse, the sinusoid, the complex exponential, some special time-limited signals; continuous and discrete time signals, continuous and discrete amplitude signals. System properties: linearity: additivity and homogeneity, shift-invariance, causality, stability, realizability. Examples.

Module II: Behaviour of continuous and discrete-time LTI systems:
Impulse response and step response, convolution, input-output behaviour with aperiodic convergent inputs, cascade interconnections. Characterization of causality and stability of LTI systems. System representation through differential equations and difference equations. Statespace Representation of systems. State-Space Analysis, Multi-input, multi-output representation. State Transition Matrix and its Role. Periodic inputs to an LTI system, the notion of a frequency response and its relation to the impulse response.

Module III: Fourier Transforms:
Fourier series representation of periodic signals, Waveform Symmetries, Calculation of Fourier Coefficients. Fourier Transform, convolution/multiplication and their effect in the frequency domain, magnitude and phase response, Fourier domain duality. The Discrete-Time Fourier Transform (DTFT) and the Discrete Fourier Transform (DFT). Parseval's Theorem.

Module IV: Laplace and z- Transforms:
Review of the Laplace Transform for continuous time signals and systems, system functions, poles and zeros of system functions and signals, Laplace domain analysis, solution to differential equations and system behaviour. The z-Transform for discrete time signals and systems, system functions, poles and zeros of systems and sequences, z-domain analysis.

Module V: Sampling and Reconstruction:
The Sampling Theorem and its implications. Spectra of sampled signals. Reconstruction: ideal interpolator, zero-order hold, first-order hold. Aliasing and its effects. Relation between continuous and discrete time systems. Introduction to the applications of signal and system theory: modulation for communication, filtering, feedback control systems.

Text Books:

1. A. V. Oppenheim, A. S. Willsky and S. H. Nawab, "Signals and systems", Prentice Hall India, 1997.
2. J. G. Proakis and D. G. Manolakis, "Digital Signal Processing: Principles, Algorithms, and Applications", Pearson, 2006.
3. H. P. Hsu, "Signals and systems", Schaum's series, McGraw Hill Education, 2010.

Reference Books:

1. S. Haykin and B. V. Veen, "Signals and Systems", John Wiley and Sons, 2007.
2. A. V. Oppenheim and R. W. Schafer, "Discrete-Time Signal Processing", Prentice Hall, 2009.
3. M. J. Robert "Fundamentals of Signals and Systems", McGraw Hill Education, 2007.
4. B. P. Lathi, "Linear Systems and Signals", Oxford University Press, 2009

MICROPROCESSORAND INTERFACING

Course Code- EE404

Module I: Architecture & Programming of 8085:

Functional block diagram—Registers, ALU, Bus systems. Pin configuration, Timing and control signals, Machine cycle and timing diagrams. Interrupts—Types of interrupt, interrupt structure, Instruction format, Addressing modes, Instruction set. Development of assembly language programs.

Module II: Interfacing Devices:

(a). The 8255 PPI chip: Architecture, pin configuration, control words, modes and Interfacing with 8085. (b). The 8254 PIC chip: Architecture, pin configuration, control words and Interfacing with 8085. Interrupt and DMA Controller (a). The 8259 Interrupt controller chip: Architecture, pin configuration and control words only (b).The 8257 DMA controller chip:
Architecture, pin configuration and control words only.

Module III: Architecture & Programming of 8086:

Functional block diagram of 8086, details of sub-blocks such as EU, BIU, memory segmentation, physical address computations, pin configuration, program relocation, Minimum and Maximum modes of 8086— Block diagrams and machine cycles. Interrupts—Types of interrupt, interrupt structure. Instruction format, Addressing modes, Instruction set. Development of assembly language programs Assembler directives.

Module IV: 8051 Microcontroller:

8-bit Microprocessor and Microcontroller architecture, Comparison of 8-bit microcontrollers, 16bit and 32-bit microcontrollers, Definition of embedded system and its characteristics, Role of microcontrollers in embedded Systems Overview of the 8051family. 8051 - Internal Block Diagram, CPU, ALU, address, data and control bus, Working registers, SFRs, Clock and RESET circuits, Stack and Stack Pointer, Program Counter, I/O ports, Memory Structures, Data and Program Memory, Timing diagrams and Execution Cycles.

Module V: Instruction Set and Programming of 8051:

Addressing modes: Introduction, Instruction syntax, Data types, Subroutines Immediate addressing, Register addressing, Direct addressing, Indirect addressing, Relative addressing, Indexed addressing, Bit inherent addressing, bit direct addressing. 8051 Instruction set, data transfer instructions, Arithmetic instructions, Logical instructions, Branch instructions, Subroutine instructions, Bit manipulation instruction.

Text Books:

1. Microprocessor Architecture, Programming & Applications with 8085: Ramesh S Gaonkar; Wiley Eastern Ltd.
2. Microprocessor and applications – A.K.Ray.
3. M .A.Mazidi, J. G. Mazidi and R. D. McKinlay, “The8051Microcontroller and Embedded Systems: Using Assembly and C”,Pearson Education,2007.
4. K. J. Ayala, “8051 Microcontroller”, Delmar CengageLearning,2004.
5. R. Kamal, “Embedded System”, McGraw Hill Education,2009.

Reference Books:

1. Microprocessors and interfacing : Hall; TMH
2. The 8088 & 8086 Microprocessors-Programming, interfacing, Hardware & Applications : Triebel & Singh; PHI
3. Microprocessors and Interfacing, Sanjeev Kumar, Sun India’s Publication
4. Advanced Microprocessors and Interfacing : Badri Ram; TMH
6. D. V. Hall, “Microprocessors & Interfacing”, McGraw Hill Higher Education,1991.

DATA STRUCTURES AND ALGORITHMS

(Course code -CS 301)

Module I

Basic concepts and notations: Data structures and data structure operations, Complexity Analysis: Mathematical notation and functions, algorithmic complexity and time space trade off, Big O Notation, The best, average & worst cases analysis of various algorithms. Arrays: Linear & Multidimensional Arrays, Representation & traversal. Sorting algorithms: Bubble sort, Selection sort, Insertion sort, Merge sort and Quick sort, Counting Sort. Linear search and Binary search on sorted arrays.

Module II

Abstract Data Types (ADTs) Stack: Push; Pop, stack representation using array and linked list, Applications of Stack, Recursion. Queue: Representation using array and linked list, Insertion and deletion operations, circular queue, Dequeue, priority queue. Linked Lists & their types (Single, Double, Circular linked lists), Operations on Varieties of Linked Lists (Search and Update) with applications

Module III

Introduction to Trees, Binary tree - definitions and properties; binary tree traversal algorithms with and without recursion., Binary Search Tree - creation, insertion and deletion operations, Threaded tree (One way and Two way). AVL tree balancing; B-tree

Module IV

Graph Algorithms: Graphs and their Representations, Graph Traversal Techniques: Breadth First Search (BFS) and Depth First Search (DFS), Applications of BFS and DFS, Minimum Spanning Trees (MST), Prim's and Kruskal's algorithms for MST, Connected Components, Dijkstra's Algorithm for Single Source Shortest Paths, Floydd's Algorithm for All-Pairs Shortest Paths Problem

UNIT-5

Hashing techniques, Hash function, Address calculation techniques- common hashing functions Collision resolution, Linear probing, quadratic probing, double hashing, Bucket addressing. Rehashing

Course Outcomes: At the end of the course the student will be able to:

- Understand the concept of ADT
- Identify data structures suitable to solve problems
- Develop and analyze algorithms for stacks, queues
- Develop algorithms for binary trees and graphs
- Implement sorting and searching algorithms
- Implement symbol table using hashing techniques

Text Books:

1. Data Structures Using C – A.M. Tenenbaum (PHI)
2. Introduction to Data Structures with Applications by J. Tremblay and P. G. Sorenson (TMH)
3.Data Structures, Algorithms and Application in C, 2nd Edition, Sartaj Sahni
4. Data Structures and Algorithms in C, M.T. Goodrich, R. Tamassia and D. Mount, Wiley India.

REFERENCE BOOKS:

1. Data Structure and Program Design in C by C.L. Tondo.
2. Data Structures with C++, J. Hubbard, Schaum's Outlines, TMH.
3. Data Structures and Algorithms in C, M.T. Goodrich, R. Tamassia and D. Mount, Wiley India.
4. Data Structures and Algorithm Analysis in C, 3rd Edition, M.A. Weiss, Pearson.
5. Classic Data Structures, D. Samanta, 2nd Edition, PHI.
6. Data Structure Using C by Pankaj Kumar Pandey.
7. Data Structure with C, Tata McGraw Hill Education Private Limited by Seymour Lipschutz.
8. Data Structure through C in Depth, BPB Publication, by S.K. Srivastava.
9. Data Structure and algorithm Analysis in C 2nd Edition, PEARSON Publishing House, Mark Allen Weiss

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CYBER SECURITY

Course code –IT 402

Module I: Introduction to Cybercrime: Introduction, Cybercrime, and Information Security, who are Cybercriminals, Classifications of Cybercrimes, and Cybercrime: The legal Perspectives and Indian Perspective, Cybercrime and the Indian ITA 2000, A Global Perspective on Cybercrimes.

Module II: Cyber Offenses: How Criminals Plan Them: Introduction, How Criminals plan the Attacks, Social Engineering, Cyber stalking, Cyber Cafe and Cybercrimes, Botnets: The Fuel for Cybercrime, Attack Vector, Cloud Computing.

Module III: Cybercrime : Mobile and Wireless Devices: Introduction, Proliferation of Mobile and Wireless Devices, Trends in Mobility, Credit card Frauds in Mobile and Wireless Computing Era, Security Challenges Posed by Mobile Devices, Registry Settings for Mobile Devices, Authentication service Security, Attacks on Mobile/Cell Phones, Mobile Devices: Security Implications for Organizations, Organizational Measures for Handling Mobile, Organizational Security Policies an Measures in Mobile Computing Era, Laptops.

Module – IV: Tools and Methods Used in Cybercrime : Introduction, Proxy Servers and Anonymizers, Phishing, Password Cracking, Keyloggers and Spywares, Virus and Worms, Trojan Horse and Backdoors, Steganography, DoS and DDoS attacks, SQL Injection, Buffer Overflow.

Module V: Cyber Security: Organizational Implications Introduction, Cost of Cybercrimes and IPR issues, Web threats for Organizations, Security and Privacy Implications, Social media marketing: Security Risks and Perils for Organizations, Social Computing and the associated challenges for Organizations.

TEXT BOOK:

- Cyber Security: Understanding Cyber Crimes, Computer Forensics and Legal Perspectives, Nina Godbole and Sunil Belapure, Wiley INDIA.

REFERENCE BOOK:

- Cyber Security Essentials, James Graham, Richard Howard and Ryan Otson, CRC Press.
- Introduction to Cyber Security , Chwan-Hwa(john) Wu,J.David Irwin.CRC Press T&F Group

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ENGINEERING ECONOMICS

Course code –EN 401

COURSE OUTLINE:

The basic purpose of this course is to provide a sound understanding of concepts and principles of engineering economy and to develop proficiency with methods for making rational decisions regarding problems likely to be encountered in professional practice.

Module -1

Introduction of Engineering Economics and Demand Analysis: Meaning and nature of Economics, Relation between science, engineering, technology and economics; Nature of Economic problem, Production possibility curve, Concepts and measurement of utility, Law of Diminishing Marginal Utility, Law of equi-marginal utility – its practical application and importance.

Meaning of Demand, Individual and Market demand schedule, Law of demand, shape of demand curve, Elasticity of demand, measurement of elasticity of demand, practical importance & applications of the concept of elasticity of demand.

Module -II

Meaning of production and factors of production; Law of variable proportions, Returns to scale, Internal and External economics and diseconomies of scale.
Various concepts of cost – Fixed cost, variable cost, average cost, marginal cost, money cost, real cost, opportunity cost. Shape of average cost, marginal cost, total cost, Cost curves.

Module III

Meaning of Market, Types of Market – Perfect Competition, Monopoly, Oligopoly, Monopolistic Competition (Main features of these markets)

Pricing Policies- Entry Deterring policies, Predatory Pricing, Peak load Pricing. Product Life cycle

Firm as an organisation- Objective of the Firm, Type of the Firm, Vertical and Horizontal Integration, Diversification, Mergers and Takeovers.

Module -IV

Nature and characteristics of Indian economy (brief and elementary introduction), Privatization – meaning, merits and demerits. Globalisation of Indian economy – merits and demerits. Elementary Concepts of VAT, WTO, GATT & TRIPS agreement, Business cycle, Inflation

RECOMMENDED BOOKS:-

1. R.Paneer Seelvan: Engineering Economics, PHI
2. Managerial Economics, D.N.Dwivedi, Vikash Publication
3. Managerial Economics, H.L. Ahuja, S. Chand and Co. Ltd.
4. Managerial Economics, Suma Damodaran, Oxford.
5. R.molrishnd Ro T.V S 'Theory of firms : Economics and Managerial Aspects'. Affiliated East West Press Pvt Ltd New Delhi
6. Managerial Economics, H. Craig Petersen & W. Cris Lewis, Pearson Education.

ANALOG ELECTRONICS & CIRCUITS LAB

Course Code- EC 401P

List of Experiments (Minimum 10)

1. Design & study of half wave and full wave rectifier and calculation its various parameters.
2. Design and study of clipper and clamper circuit.
3. Design & Implement Transistor as a switch.
4. To study the input & output characteristics of common emitter configuration.
5. Design & measure the frequency response of an RC coupled amplifier using discrete components. (Draw Gain vs frequency response curve on semi log graph paper).
6. Design a two stage RC coupled amplifier and determine the effect of cascading on gain and bandwidth
7. Design & study of RC Oscillator.
8. Design & realize inverting amplifier, non-inverting and buffer amplifier using 741 Op Amp.
9. Verify the operation of a differentiator circuit using 741 op amp and show that it acts as a high pass filter.

10. Verify the operation of an integrator circuit using 741 op amp and show that it acts as a low pass filter.
11. Design and verify the operations of op amp adder and subtractor circuits.
12. To design and realize Schmitt trigger using op amp 741.
13. Design & realize Wein -bridge oscillator using op amp 741.
14. To design & realize square wave generator using op amp 741.

NOTE: At least ten experiments are to be performed, minimum seven experiments should be performed from above list. Remaining three experiments may either be performed from the above list or designed & set by the concerned institution as per the scope of the syllabus.

ANALOG COMMUNICATIONLAB

Course Code- EC 402P

List of Experiments (Minimum 10)

1. Study of Amplitude Modulation (A.M.)
2. Study of Frequency Modulation. (F.M.)
3. Study of AM Detection.
4. Study of SSB Modulation & Demodulation.
5. Study of DSB Modulation & Demodulation.
6. Study of FM Demodulation.
7. Sampling and Reconstruction.
8. Study of Pulse Amplitude Modulation & Demodulation.
9. Study of Pulse Width Modulation& Demodulation.
10. Study of Pulse Position Modulation & Demodulation.
11. Study of PAM-TDM.
12. Study of AM Receiver Characteristics.(Sensitivity, Selectivity & Fidelity)
13. Visit to radio station (AM/FM) or any local communication centre /mobile tower

(Visit to radio station is compulsory. Student should attach report of visit in practical file)

NOTE: At least ten experiments are to be performed, minimum seven experiments should be performed from above list. Remaining three experiments may either be performed from the above list or designed & set by the concerned institution as per the scope of the syllabus.

MICROPROCESSORAND INTERFACING LAB

Course Code- EE404P

List of Experiments (Minimum 10)

1. Study of 8085 Microprocessor kit.
2. Write a program using 8085 and verify for: a. Addition of two 8-bit numbers. b. Addition of two 8-bit numbers (with carry) and write a program using 8085 and verify for: a. 8-bit subtraction (display borrow) b. 16-bit subtraction (display borrow).
3. Write a program using 8085 for multiplication of two 8- bit numbers by repeated addition method. Check for minimum number of additions and test for typical data and write a program using 8085 for multiplication of two 8- bit numbers by bit rotation method and verify.
4. Write a program using 8085 for division of two 8- bit numbers by repeated subtraction method and test for typical data and write a program using 8085 for dividing two 8- bit numbers by bit rotation method and test for typical data.
5. Write a program using 8086 and verify for: a. Finding the largest number from an array. b. Finding the smallest number from an array.
6. Write a program using 8086 for arranging an array of numbers in descending order and verify and write a program using 8086 for arranging an array of numbers in ascending order and verify.
7. Write a program for finding square of a number using look-up table and verify. .
8. Write a program to interface a two digit number using seven-segment LEDs. Use 8085/8086 microprocessor and 8255 PPI.

9. Write a program to control the operation of stepper motor using 8085/8086 microprocessor and 8255 PPI.
10. . Study of 8051 Micro controller kit/programming software.
11. Write a program using 8051 and verify for: a. Addition of two 8-bit numbers. b. Addition of two 8-bit numbers (with carry) and write a program using 8051 and verify for: a. 8-bit subtraction (display borrow) b. 16-bit subtraction (display borrow).
12. Write a program using 8051 for multiplication of two 8- bit numbers by repeated addition method. Check for minimum number of additions and test for typical data and write a program using 8051 for multiplication of two 8- bit numbers by bit rotation method and verify.
13. Write a program using 8051 for blinking of two LED with suitable delay.

NOTE : At least ten experiments are to be performed, minimum seven experiments should be performed from above list. Remaining three experiments may either be performed from the above list or designed & set by the concerned institution as per the scope of the syllabus.

JUT – Ranchi

B.I.T. SINDRI, DHANBAD

DEPARTMENT OF METALLURGICAL ENGINEERING

3rd SEMESTER COURSE STRUCTURE

Sl. No	Course No.	Subject	L	T	P	Credit
1		Mathematics-III	3	1	0	4
2	MT 301	Materials Engineering	3	0	0	3
3	MT 302	Materials Thermodynamics and Kinetics (PCC)	3	0	0	3
4	MT 303	Fuels, Refractories and Furnaces (PCC)	3	0	0	3
5	MT 304	Metallurgical Analysis (PCC)	3	0	0	3
6		Environmental Science	2	0	0	0
1		Communication Skill Laboratory	0	0	2	1
2	MT 303 P	Fuels, Refractories and Furnaces Laboratory	0	0	3	1
3	MT 302 P	Metallurgical Thermodymics and Kinetics Laboratory	0	0	3	1
4	MT 304 P	Metallurgical Analysis Laboratory	0	0	3	1
5		Extra activity -III (NSO/NSS/NCC/YOGA/CA)	0	0	2	1
					Total Credit	**21**

JUT – Ranchi

B.I.T. SINDRI, DHANBAD

DEPARTMENT OF METALLURGICAL ENGINEERING

4th SEMESTER COURSE STRUCTURE

Sl. No	Course No.	Subject	L	T	P	Credit
1		Mathematics-IV	3	1	0	4
2		Electronics and instrumentation Engineering.	3	1	0	3
3	MT 401	Physical Metallurgy (PCC)	3	1	0	3
4	MT 402	Mineral Engineering (PCC)	3	1	0	3
5	ME 4	Introduction to transport phenomena (PCC)	3	1	0	3
6	EM-401	Engineering Economics	2	0	0	0
1	MT 401 P	Metallography (Physical Metallurgy) Laboratory	0	0	2	1
2	MT 402 P	Mineral Engineering Laboratory	0	0	3	1
3	ME 4	Transport phenomena Laboratory	0	0	3	1
4		Extra activity -IV (NSO/NSS/NCC/YOGA/CA)	0	0	2	1
5		Internship/Tour & Training/ Industrial Training	0	0	2	1
		Total Credit				**21**

Metallurgical Engineering Department

SUBJECT: – MATERIAL ENGINEERING

Course objective:

To increasing demand of the available materials, coupled with new applications and requirements has brought about many changes in the style of their uses.

To develop the basic knowledge of metals, polymers composites and ceramics other than conventional metals and alloys to apply them to advance engineering applications.

1. Introduction- Crystalline and Non crystalline solids. Classification of Engineering materials and their selections, bonding in Solids: Ionic, Covalent and Metallic bonding. (5hrs.)

2. Crystal Structure -Space lattices, Bravais lattices, Crystal system, Unit Cell, Metallic crystal structures: SC, BCC,FCC,HCP structures, Miller notations of planes and directions, Imperfections in crystals: Point defects, Line, surface defects, Dislocations: Edge and Screw dislocation, Burgers vectors. (12hrs.)

3. Metallic Materials- Metals and alloys, ferrous materials- introduction to Iron -carbon Diagram, Steel and their Heat treatment, properties and applications. Different types of heat treatment processes. Non-ferrous alloys: -Copper based alloys, Al based alloys, other important nonferrous alloys, properties and applications. (10)
4. Polymers- Basic concepts of Polymer Science, polymer classifications, Crystallinity of polymers, Copolymers, Thermoplastic and Thermosetting polymers, Elastomers, Properties and Applications. (5hrs)
5. Ceramics-Basic concepts of ceramics science, traditional and new ceramics,

Oxide and Non-Oxide ceramics, Ceramics for high temperature applications, Glass, applications of ceramics, and glass. (5 hrs.)

6. Composite materials-Definition, general characteristics, Particles reinforced and fiber reinforced composite materials, MMC, CMC, PMC, properties and applications. (5hrs.)

Text Books:

1. Elements of Material Science by Van Vlack
2. Material Science by O.P. Khanna
3. Material Science and Engineering by V. Raghavan
4. Material Science by R.S.Khurmi and R.S. Sedha

Reference Books:

1. Material Science and Engineering by William D. Callister **Course**

Outcomes:

At the end of this course, the students would be able to:

- Select different materials other than conventional metals and alloys for specific engineering applications.
- To Solve the materials problems associated with the weight reduction through the appropriate choice of metals, polymers, ceramics and composites.
- Selection criterion for polymers and composites for various engineering applications.

MATERIALS THERMODYNAMICS AND KINETICS (PCC)

OBJECTIVES OF THE COURSE:

To highlight the fundamental role of thermodynamics in describing metallurgical and materials processes.

To learn and use thermodynamics functions, rules and relations and interpret thermodynamics plots and diagrams.

1. History of Thermodynamics, Ideal Gas, Energy and Work, Extensive and Intensive properties. (2 hrs).
2. First Law of Thermodynamics, Internal Energy, Enthalpy, Heat Capacity, Reversible Processes (3 hrs.)
3. Second Law of Thermodynamics, entropy and equilibrium, Reversibility, Heat Engines (3 hrs.)
4. Statistical Interpretation of Entropy, Boltzmann Equation (3 hrs.)
5. Auxiliary functions Enthalpy, free Energy, Chemical potential, Maxwell's Equations, Gibbs-Helmholtz Equation (3hrs.).
6. Enthalpy as a function of temperature and composition, Third law of Thermodynamics (3 hrs.)
7. Phase Equilibrium in a one -component system, Equilibrium between Vapor and Condensed phase, and between condensed phases (3 hrs.)
8. Gases: Ideal, Real, Van dar waal's (3 hrs.)
9. Raoult's Law and Henry's Law ,Activity, Gibbs-Duhem Equation, Properties of Ideal and Non- ideal solutions, regular solutions (3 hrs.)
10. Effect of Temperature and Pressure on the Equilibrium constant for a gas mixtures (3 hrs.)
11. Ellingham Diagram of Metal oxides and Sulphide systems. (2 hrs.)
12. The Gibbs Phase rule (3 hrs).

13. Electrochemistry, Concentration and EMF, standard Reduction potentials, Pourbaix diagrams (3 hrs.)
14. Kinetic reactions, Activated complex theory, Homogeneous reaction and importance of rate controlling steps, Adsorption and reaction on surfaces, Reaction Rule, Thermodynamics of electrolytes and Concentration cells. (6 hrs.)

Reference Books:

1. Thermodynamics in Materials science, Robert Dehoff, CRC Press, 2006.
2. Introduction to Metallurgical Thermodynamics-Darken's and Gurry, MGH publication.
3. Introduction to the Thermodynamics of Materials-Gaskel

Course Outcomes:

1. Use the various thermodynamics functions appropriately under different experimental situations involving gases, liquids and solids.
2. Utilize Pourbaix diagrams.
3. Utilize Ellingham Diagrams.
4. Explain the Gibbs phase rule.

FUELS REFRACTORIE AND FURNACES (PCC)

1. **FUELS:** Classification of fuels, Indian Resources.

2. SOLID FUELS: Coal preparation, Proximate and Ultimate analysis of coal, Coal washing, Carbonization of Coal, Brief description of the manufacture of Coke and recovery of products, Testing of coal and Coke. Indian standard specifications of Metallurgical Coke to be used in blast furnace.

3. **LIQUID FUELS:** Advantages of liquids fuels, liquid fuels furnaces, storage and handling of liquid fuels.

4. **GASEOUS FUELS:** Advantages of gaseous fuels, Manufacture of Producer Gas, water Gas, By products of gaseous fuels-Blast furnace gas, Coke oven Gas.

5. **FURNACES**: Classificationof furnaces, Principles of working and applications in Industries., Principles of Regenerators and Recuperators.

6. **REFRACTORIES:** Definition, Classification of Refractories, Properties of a good refractory materials and factors affecting selection of Refractories. Types of Clay, Use of Grog and its advantages. Manufacture, Properties and Application of Fireclay Refractories, high Alumina Refractories, Silica, Chromite, Graphite, Magnesite, Dolomite, Silicon carbide, sillimanite and Kyanite Refractories, Carbon Refractories: Characteristics of carbon as refractories material, manufacture, properties and applications.

Reading:

1. J.D. Gilchrist -Fuels, Furnaces and refractories, Pergamon,1977.
2. O.P.Gupta -Elements of Fuels, Furnaces and Refractories, Khanna Publications,1998
3. W.Trinks, M.H. mawhinney- Industrial Furnaces, John Wiley and Sons,2003.
4. Samir Sarkar- Fuels and Combustion, Orient Longman Ltd.

COURSE OUTCOMES:

1. Select fuels, refractories and furnaces to minimize the overall cost production for a given application

2. Classification of furnaces and Refractories and their operation conditions.

3. Understand the production of solid, liquid and gaseous fuels.

4. Illustrate the production, composition, properties, testing and applications of refractories.

METALLURGICAL ANALYSIS (PCC)

1. Important of Metallurgical Analysis in Metallurgical Industries, Important Methods for the preparation of standard samples. qualitative analysis of metallurgical samples, Elementary discussion on the basic principles involved in metallurgical analysis.
2. Colorimetry and Absorptiometry: Theory of Absorptiometry and Colorimetry, Application of Beer's Law, Colorimetric methods, Absorptiometry method.
3. Emission Spectroscopy and its use in Metallurgical Analysis. Atomic Absorption Spectro electro photometric method of analysis. Conductimetric, Potentiometric titration, Polarographic and Electro- Gravitric methods of analysis.
4. Quantitative Estimation of Important Constituents of the following items:

Iron ore, Iron and steel, Lime stone and dolomite and Blast Furnace slag.

Reading:

1. B.C. Aggrawal and S.P.Jain-A text book of Metallurgical Analysis

4th SEMESTERCOURSESTRUCTURE

Physical Metallurgy (PCC)

Objectives of the course

To learn about the principles of alloy design, phase diagram and strengthening Mechanisms in different metals and alloys.

To study the fundamental aspects of heat treatment and its influence on properties and applications

To obtain knowledge about the physical metallurgy of specific and important Engineering materials such as ferrous and non-ferrous alloys.

Detailed contents:

1: Phase diagrams – binary (Cu-Ni, Cu-Sn, Pb-Sn, Al-Cu, Al-Si, Cu-Zn and other alloys) and ternary, principles of alloying, Hume-Rothery rules. Strengthening mechanisms – solid solution, work hardening, precipitation
hardening, dispersion strengthening (10 hours)

2: Iron carbon diagram, isothermal, and continuous cooling transformation Diagrams; influence of alloying elements on transformation characteristics (10 hours)

3: Heat treatment - annealing, normalizing, hardening and tempering of steels, hardenability (5 hours)

4: Introduction to important ferrous alloys (stainless and special steels, cast irons), aluminium alloys, titanium alloys, copper base alloys (10 hours)

5: Superalloys, shape memory alloys – classification, heat treatment, properties and applications (5 hours)

Suggested books:

1. Physical Metallurgy: Principles and Practice, V. Raghavan, PHI Learning, Delhi, 2008.
2. Physical Metallurgy Principles, R. Abbaschian, R. E. Reed-Hill, Cengage Learning, 2009

Suggested reference books

1. Physical Metallurgy Vols. I, II, III, R.W. Cahn and P. Haasen, North Holland, 1996.
2. Light Metals, I.J. Polmear, Elsevier, 2005

Course Outcomes:

By completing this course the student will have:

1. The ability to identify the concepts of alloy design, phase diagrams and strengthening mechanisms and apply them to materials systems
2. The knowledge of heat treatment and the resulting microstructure in materials 3. The knowledge of physical metallurgical aspects of important engineering
alloys

MINERAL ENGINEERING (PCC)

Course objective: The basic objective of mineral processing is technical and economic. Theoretical aspects of common mineral processing techniques and the associated equipment used in mining and pre-extraction practices.

1. Sampling of ores by different methods -Handling Sampling, Mechanical sampling, Theory of liberation of minerals, Principle and applications of primary, Secondary Crushers (Jaw, Gyratory, Cone, Rolls crusher). Grinding, Ball mills, Theory of ball mill operation, Rod mills and tube mills. (8 hrs.)

2. Theory of Comminution- Rittinger's Law, Kick's Law and Bond's Law theories. (2hrs)

3. Sizing: Laboratory sizing, Types of screens, Screening and factor affecting the screening Efficiency, Sedimentation and Elutriation. Industrial sizing methods. (6 hrs)

4. Movement of solids in fluids: Stoke's and Newton's laws, Terminal velocity and its relation with size, relation between time and velocity, relation between distance travelled and velocity, free and hindered settling ratios.(6 hrs)

5. Quantifying concentration operation: Ratio of concentration, Recovery and selective index. (2 hrs.)

6. Classification: Principles, Sizing and sorting classifiers. heavy media separation, processes using heavy liquids, processes using heavy suspensions, Thickening and Filtration. Jigging- Theory of jigging, types of jig, Jigging machines, Advantages and disadvantages of jigs. Tabling- Theory of flowing film concentration, shaking tables. (10 hrs)

7. Flotation: Principles of flotation, Physical Chemistry of Flotation, Factors affecting flotation, Flotation reagents, Flotation of copper, Flotation of LeadZinc ores Recent development in flotation process. Principles and applications of Magnetic and Electrostatic separation. (10 hrs.)

TEXT BOOKS:

1. A. M. Gaudin, *Principles of Mineral Dressing*, Tata McGraw & Hill, 1993
2. R. H. Richard and C. E. Locky*, A text Book on Ore Dressing*, A A Balkema, 2004

3. S.K.Jain ,Ore Processing, Oxford-IBH Publication Company-2005

REFERENCES:

1. Gilchrist J.D., „Extraction Metallurgy", 2nd Edition, Pergamon Press, 1980 2. Joseph Newton, „Extractive Metallurgy", 1st Edition, Wiley Eastern, 1967 Department of Metallurgical and Materials Engineering.
3. F. Taggart, *Mineral Dressing Handbook*, P & H, 2000
4. B. A. Wills,Tim Napier-Munn *Mineral Processing Technology*, Willy & Sons, 2005
5. G. C. Lowrison, *Crushing & Grinding*, Maxwell and MacMillan, 2002 6. L. Svalovsky, *Solid Liquid Separation*, Tata McGraw & Hill Inc., 2003

Course outcomes:

At the end of this course, the students would be able to:

(A) To understand the mineral processing basic principles and process.

(B) Discuss the physical and chemical properties of various minerals.

(C) To understand the various separation methods of mineral or gangue particles.

(D) Explain the different types of process control in mineral processing.

Introduction to Transport Phenomena (PCC)

Fluid Flow: Classification of fluids, Ideal and real, Newtonian & Nonnewtonian, Newton's law of viscosity. Types of fluid law: Streamline & Turbulent, continuity equation for incompressible and compressible fluid and its applications. Concept of velocity bounds layer.

Bernoulli's equation and its application for flow measurement by venturi meter, orifice meter, pilot tube and rotameter.

Dimensional analysis by Rayleigh's method of indices and Buckingham's π theorem. Example of analysis of pressure gradient, Mass transfer co-efficient & convective heat transfer co-efficient. Concept of similarly and dimensionless criteria. Dimensionless groups & their significance.

Pressure drop & friction factor in various configurations, flow in packed bad & Fluidized bad. Free partially restricted jets, High velocity fluid jets.

Mass Transfer: Law of diffusion and their application, concept of mass transfer co-efficient & Concentration boundary layer, Interfacial mass transfer, overall mass balance.

Heat Transfer: Internal & external modes of Heat transfer, steady state heat conduction in monolayer and composite flat walls & Cylinders. Unsteady state heat conduction, thin & Massive heating and cooling. Finite difference method in solving unsteady state heat conduction.

Natural and forced convection, concept of heat transfer co-efficient, thermal boundary layer, some example of connective co-relations.

Law of radiation – Steffan-boltzmann's law, Kirchoff's law & Lambarth's law,

Black and grey body concepts, view factor, radiation from flames & Gases. Radiation between simple surfaces with & without absorbing gas media.

Radiation shields.

Suggested books:

1. 1. Transport phenomena, 2nd Edition: R. Byron Bird, Warren E. Stewart and Edwin N
2. Lightfoot; John Wiley & Sons
3. 2. Fundamentals of Momentum, Heat and Mass Transfer, 4th Edition: James R. Welty,
4. Charles E. Wicks, Robert E. Wilson and Gregory Rorrer; John Wiley & Sons

Suggested reference books:

5. 1. Transport phenomena in materials processing : D.R. Poirier and G.H. Geiger, TMS
6. 2. Introduction to Fluid Mechanics, 5th Edition: Robert W. Fox & Alan T. McDonald: John Wiley & Sons.

Course Outcomes

At the end of this course, the student should be able to:

1. T solve a problem in transport phenomena as a balance equation
2. Make suitable assumptions to make the problem a well-defined one
3. Identify suitable geometry and boundary conditions for the problem

JHARKHAND UNIVERSITY OF TECHNOLOGY, RANCHI

MINING ENGINEERING B. Tech,
Semester III (Second year] Course Structure

3rd Semester Course Structure

Sl. No.	Course Code	Course Title	Hours per week			Credits
			L	T	P	
1	MA301N	Mathematics-III	3	1	0	4
2	ML301N	Mining Geology	3	0	0	3
3	GE301N	Materials Engineering	3	0	0	3
4	CE303N	Surveying and Geomatics - I	3	0	0	3
5	MN301N	Introduction to Mining Technology	3	0	0	3
6	CH301N	Environmental Studies	3	0	0	0
7	GE302N	Mining Geology Lab	0	0	3	1
8	CE302N	Field Surveying Lab	0	0	3	1
9	HU302N	Communication Skill Lab	0	0	2	1
10	MN302N	Introduction to Mining Technology - Lab	0	0	3	1

11	EA302N	Extra-Curricular Activity – III (NSO/NSS/NCC/YOGA/CA/ Mini Project etc.)	0	0	3	1
		Total				**21**

MN301N	**INTRODUCTION TO MINING TECHNOLOGY**	**3L:0T:0P**	**3 Credits**

Course Objective

When the students enter the college to pursue a degree in Mining Engineering and as well pursue a career in Mining Engineering after graduation, they need to understand the breadth and depth available in this field for possible engagement. When many alternative disciplines of engineering appear to offer apparently more glamorous avenues for advancement, the Mining Engineering student should realize the potentials available in this engineering discipline. The students should understand the enormous possibilities available for creative and innovative works in this all-pervasive field of engineering.

This course is designed to address the following:

- to give an understanding to the students of the vast breadth and numerous areas of engagement available in the overall field of Mining Engineering
- to motivate the student to pursue a career in one of the many areas of Mining Engineering with deep interest and keenness.
- To expose the students to the various avenues available for doing creative and innovative work in this field by showcasing the many monuments and inspiring projects of public utility.

Proposed Syllabus

Definition and scope of mining: Mining as a basic industry, definition of mining terms. Economic importance of mining, Social and environmental impact of mining.

Principle of boring and purpose of boreholes; methods of boring; rotary and percussive boring methods borehole deflection and deviation.

Explosives and Blasting: Definition, Classification, Basic ideas about coal and rock drilling, basic ideas about the use of explosives in rock breaking concerning shaft sinking, drifting and drivages of adit.

Opening of mineral deposits: Types of mine opening, selection, location, shape and size of different types of opening, drivage methods for adits and incline drifts and cycle of operation, support of incline drift and their mouth.

Shaft sinking: Conventional methods of shaft sinking, shaft lining (temporary and permanent), surface arrangements, ventilation, pumping and illumination arrangement during shaft sinking, shaft fittings. Pit top and Pit bottom layouts Opening and development of mineral deposits, method of working, ventilation, transportation, hoisting and dispatch.

Introduction to common extraction method of underground mineral deposit: Coal: Bord and Pillar method, Longwall method Metal: Various stopping methods like open stopping, cut and fill stopping, shrinkage stopping, sub level stopping, block caving etc.
Overview of Surface Mining: Types of surface mine, unit operation, basic bench geometry, applicability and limitation, advantages and disadvantages.

Modules

Module 1: **Definition and scope of mining:**
Mining as a basic industry, definition of mining terms. Economic importance of mining, Social and environmental impact of mining.

Module 2: **Boring:**
Principle of boring and purpose of boreholes; methods of boring; rotary and percussive boring methods borehole deflection and deviation.

Module 3: **Explosives and Blasting:**
Definition, Classification, Basic ideas about coal and rock drilling, basic ideas about the use of explosives in rock breaking concerning shaft sinking, drifting and drivages of adit.

Module 4: **Opening of mineral deposits:**
Types of mine opening, selection, location, shape and size of different types of opening, drivage methods for adits and incline drifts and cycle of operation, support of incline drift and their mouth.

Module 5: **Shaft sinking**: Conventional methods of shaft sinking, shaft lining (temporary and permanent), surface arrangements, ventilation, pumping and illumination arrangement during shaft sinking, shaft fittings. Pit top and Pit bottom layouts Opening and development of mineral deposits, method of working, ventilation, transportation, hoisting and dispatch.

Module 6: **Overview of Underground Mining:**
Coal: Bord and Pillar method, Longwall method
Metal: Various stopping methods like open stopping, cut and fill stopping, shrinkage stopping, sub level stopping, block caving etc.

Module 7: **Overview of Surface Mining:**
Types of surface mine, unit operation, basic bench geometry, applicability and limitation, advantages and disadvantages.

Text/Reference Books:

1. Introductory mining engineering-, Howard L. Hartman, Jan M. Mutmansky/ Wiley India (P) Ltd
2. Elements of mining technology Vol.-I - D.J. Deshmukh /Denett & Company
3. Roy Pijush Pal, Blasting in ground excavations and mines, Oxford and IBH, 1st Ed. 1993
4. C.P. Chugh, Drilling technology handbook, Oxford and IBH, 1sted, 1977.

Goals & Outcomes:

- Introduction to what constitutes Mining Engineering
- Identifying the various areas available to pursue and specialize within the overall field of Mining Engineering
- Exploration of the various possibilities of a career in this field
- Providing inspiration for doing creative and innovative work
- Highlighting possibilities for taking up entrepreneurial activities in this field
- Providing a foundation for the student to launch off upon an inspired academic pursuit into this branch of engineering

ML301N	MINE GEOLOGY	3L:0T:0P	3 Credits

Proposed Syllabus:

Module 1: **Physical Geology:**

Geology in mining engineering, scope and application, earth structure and composition, weathering processes and grade, physiographical division of India, geological work of river, wind and glacier.

Module 2:

Stratigraphy:

Principle of stratigraphy, geological time scale, mineral resource distributions and economic importance of Archean, Cuddapah, Vindhyan, Gondwana, Tertiary deposit of India.

Module 3:

Minerology:

Classification of minerals, physical properties of minerals, properties of silica, feldspar, pyroxene, amphibole, mica, olivine, group of minerals and calcite.

Module 4:

Petrology:

Classification of rocks, **igneous rock:** composition and diversification of magma, texture and structure of igneous rock, tabular classification of igneous rocks, study of importance igneous rock,

sedimentary rock: lithification and diagenesis, texture and structure of sedimentary rock, study of important sedimentary rock,

metamorphic rock: metamorphism, agents and types, study of important metamorphic rocks,

Module 5:

Structural Geology:

Introduction to geological structure, faults, folds, joints and unconformities classification, criteria for recognition in the field and significance in mineral exploration, determination of strata thickness, dip and strike calculation,

Module 6: **Economic Geology:**

Ore, Gauge, tenors of ore, grade, assay value cut – off grade, processes of formation of mineral deposit, magmatic concentration, hydrothermal processes, placer deposit and supergene sulphide enrichment deposit

GE302N	MINE GEOLOGY LAB	0L:0T:3P	1 Credits
SL. NO	NAME OF EXPERIMENT/EXERCISE		

A. Study of Mineral samples (Identification of minerals on the basis of colour, streak, luster, hardness, cleavage, fracture)		
1.	Rock Forming minerals	Quartz, Orthoclase, Biotite, Muscovite, Calcite, Plagioclase,
2.	Economic minerals	Galena, pyrolusite, Hematite, Magnetite, Bauxite, Chromite, Chalcopyrite, Pyrite
B. Megasc opic study of hand specimen (Identificaation of rock on the basis of colour, mineral composition, texture, structure)		
3.	Igneous rocks	Granite, Basalt, Rhyolite, Obsidian, Dolerite, Syenite,
4.	Sedimentary rocks	Sandstone. Shale, Limestone, Conglomerate, Breccia
5.	Metamorphic rocks	Gneiss, Schist, Quarzite, Marble, Slate,
C. Study of external morphology of crystal models (Determination of axial relationship, symmetry elements and forms present in model)		
6.	Isometric System	
7.	Tetragonal System	
8.	Orthorhombic System	
9.	Hexagonal and Trigonal System	
10.	Monoclinic System	
11.	Tetragonal System	
D. Numerical Problems related to Structural Geology		
12.	Three-point problems and its application	
13.	Borehole problems and its analysis	

MN302N	INTRODUCTION TO MINING TECHNOLOGY - LAB	0L:0T:3P	1 Credits

SL. NO	NAME OF EXPERIMENT
14.	Study and sketch of Boring and various methods of Boring.
15.	Study and sketch of Explosive and its types.
16.	Study and sketch of Blasting Accessories.
17.	Study and sketch of Priming, Charging, Stemming and Shot – firing.
18.	Solid Blasting Practices in Underground mines.
19.	Study of Blasting Pattern in underground and surface mines.
20.	Study and sketch of incline mouth support.
21.	Study and sketch of Temporary lining of shaft during sinking.
22.	Study and sketch of Concrete lining of Shaft.
23.	Study and sketch of special methods of shaft sinking by cementation process.

JHARKHAND UNIVERSITY OF TECHNOLOGY, RANCHI

MINING ENGINEERING
B. Tech, Semester IV (Second year]
Course Structure

4th Semester Course Structure

Sl No.	Course Code	Course Title	Hours per week			Credit
			L	T	P	
1.	EC407N	Electronics and Instrumentation Engg.	3	0	0	3
2.	MN401N	Underground Coal Mining Methods	3	0	0	3

3.	MN402N	Surface Mining Methods	3	0	0	3
4.	MN403N	Drilling and Blasting	3	0	0	3
5.	MN404N	Mine Surveying	3	0	0	3
6.		Engineering Economics/ Cyber Security	3	0	0	0
7.	MN405N	Mine Design - I Lab	0	0	3	1
8.	MN406N	Drilling and Blasting - Lab	0	0	3	1
9.	MN407N	Mine Surveying Lab	0	0	3	1
10.	IS401N	Internship/ Tour and Training/ Industrial Training	0	0	0	2
11.	EA402N	Extra-Curricular Activity – IV (NSO/NSS/NCC/YOGA/CA/ Mini Project etc.)	0	0	3	1
		Total				**21**

MN401N	**UNDERGROUND COAL MINING METHODS**	**3L:0T:0 P**	**3 CREDITS**

Course Objectives:

This course is designed to address the following:

- to give an understanding to the students for opening the underground coal deposit, different mode of opening and their suitability including advantages and disadvantages.
- to give an understanding to the student of various methods of working in underground coal mining and their application.

Proposed Syllabus

Opening of Deposits: Developments of mine for in-seam mining and horizon mining (including shaft pillar), their comparison, advantages and disadvantages, division into levels and districts. General principle of Bord & Pillar Development, their choice, suitability, advantages and disadvantages.

Open and Panel Systems, Layout of Bord & Pillar panel, size of panel and statutory provisions, Concurrent development activities like support, track laying, lighting, transportation of materials and minerals in and out of the mine etc.

Preparatory arrangement for depillaring operation, statutory provision for depillaring, principle and designing of pillar extraction, size of a district, factors affecting choice of pillar extraction, depillaring with caving, stowing, mechanized depillaring operation, organization and safety. Longwall methods of working, their choice, suitability, advantages and disadvantages. Shape & size of development roadways and gate roads and their maintenance, support systems of longwall face and gate roads.

Layout of the workings for the required output, length and orientation of longwall faces. Advancing and retreating longwall faces, longwall face and gate road machineries, mechanized longwall faces with shearers, AFC, power support and gate road machineries.

Modules:

Module 1: **Opening of Deposits:** Developments of mine for in-seam mining and horizon mining (including shaft pillar), their comparison, advantages and disadvantages, division into levels and districts.

Module 2: **Bord and Pillar Development:**
General principle of Bord & Pillar Development, their choice, suitability, advantages and disadvantages,

Module 3: **Bord and Pillar Panels:**
Open and Panel Systems, Layout of Bord & Pillar panel, size of panel and statutory provisions, Concurrent development activities like support, track laying, lighting, transportation of materials and minerals in and out of the mine etc.

Modu

le 4: Pillar Extraction:
Preparatory arrangement for depillaring operation, statutory provision for depillaring, principle and designing of pillar extraction, size of a district, factors affecting choice of pillar extraction, depillaring with caving, stowing, mechanized depillaring operation, organization and safety.

Module 5: Longwall Panel Development:
Longwall methods of working, their choice, suitability, advantages and disadvantages. Shape & size of development roadways and gate roads and their maintenance, support systems of longwall face and gate roads.

Module 6: Longwall Panel Extraction:
Layout of the workings for the required output, length and orientation of longwall faces. Advancing and retreating longwall faces, longwall face and gate road machineries, mechanized longwall faces with shearers, AFC, power support and gate road machineries.

Text/Reference Books:

1. Wining and working – R. T. Deshmukh & D. J. Deshmukh
2. Elements of Mining Technology Vol. I, III – D. J. Deshmukh
3. Principle and Practices of Modern Coal Mining – R. D. Singh
4. Modern Coal Mining – S. K. Das
5. Introductory mining engineering-, Howard L. Hartman, Jan M. Mutmansky/ Wiley India (P) Ltd
6. SME Mining Engineers Handbook 3rd Edition - Peter Darling

Goals and Outcomes:

This course qualifies participants to apply basic concepts of Mining in

1. Explain different mining methods and their selection.
2. Describe details working of bord and pillar method and its development & depillaring.
3. Explain longwall working.

Knowledge:

1. Analyse and evaluate the development of surface mines, with stripping ratio.
2. Analyse the operation and application of the equipment used in surface mining and advanced appreciation of the systems engineering involved with interacting machines.

Skills:

1. Review, analyse, consolidate and synthesizes knowledge to identify and provide to selection of Mining method.
2. Assess and evaluate complex ideas in surface mining and selection of the number required and the size of appropriate equipment

Course Objectives:

This course is designed to address the following:

- to give an understanding to the students for basic concept of surface mining including selection between surface mining verses underground mining for a particular project.
- to give an understanding to the student of various cycle of operation of extraction of deposit including opening of deposit, production of different benches, drilling and blasting, excavation and transportation etc.

Proposed Syllabus:

Status of surface mining in India. Selection between surface mining and underground mining. Preliminary evaluation of surface mining prospects; different stripping ratios -- concepts and significance.
Box Cut: Selection of site and machineries, Calculation of rock movement in box cutting for given geometry.

MN402N	SURFACE MINING METHODS	3L:0T:0P	3 CREDITS

Geometrical parameters of the benches, bench height, bench slope, bench width etc. with regard to the geometry of the deposits and overlying rocks. Formation parameters and factors affecting their selection.

Working principles of Excavation machineries, deployment of drills, dozer, shovel - dumper, dragline, hydraulic shovels, Ripper and Scraper, surface miners etc. their cycle of operation, application and limitation.

Drilling principles, types of blast hole drills, estimation of number of drill for a given mine production, blast design, determination of charge weight, factors affecting blast design, calculation of charge required per hole, problems associated with drilling and blasting, secondary blasting.
Cyclic methods-- shovel-dumper, pay-loader, dragline and their annual capacity calculation.

Modules:

Module 1: **Basic Concept of Surface Mining:**
Status of surface mining in India. Selection between surface mining and underground mining. Preliminary evaluation of surface mining prospects; different stripping ratios -- concepts and significance.

le 2: **Opening up of Deposits:**

Box Cut: Selection of site and machineries, Calculation of rock movement in box cutting for given geometry.

Modu

Module 3: **Production benches**

Geometrical parameters of the benches, bench height, bench slope, bench width etc. with regard to the geometry of the deposits and overlying rocks. Formation parameters and factors affecting their selection.

Module 4: **Preparation for Excavation:**

Working principles of Excavation machineries, deployment of drills, dozer, shovel - dumper, dragline, hydraulic shovels, Ripper and Scraper, surface miners etc. their cycle of operation, application and limitation.

Module 5: **Drilling and blasting:**

Drilling principles, types of blast hole drills, estimation of number of drill for a given mine production, blast design, determination of charge weight, factors affecting blast design, calculation of charge required per hole, problems associated with drilling and blasting, secondary blasting.

Module 6: **Excavation and Transportation:**

Cyclic methods-- shovel-dumper, pay-loader, dragline and their annual capacity calculation.

Text/Reference Books:

1. Surface Mining- Misra, G.B.,
2. Surface Mining -B.A. Kennedy
3. Surface Mining Operations -S.K. Das,
4. SME Mining Engineers Handbook 3rd Edition - Peter Darling

Surface Mining Technology - T.N. Singh

Surface Mine Blast Evaluation, AMIE Publication

5.
6.

Course Learning Outcomes:

1. Provide a detailed description of the proposed surface mining method and related equipment and support infrastructure (including illustrations, sketches, plans, etc.);
2. Design and evaluate materials handling and transport options;
3. Conduct productivity analysis for the selected mining system;
4. Identify and evaluate core risks in each mining method;

5. Appraise mining systems with respect to safe, efficient, economic and environmentally and socially responsible operations; and
6. Demonstrate awareness of major technological trends.

Course Objectives:

This course is designed to address the following:

- to give an understanding to the students for basic concept of drilling and blasting in both surface mining and underground mining.
- to give an understanding to the student of various cycle of operation of drilling and blasting including exploratory drilling, production drilling in both metal as well as coal mines.

Proposed Syllabus:

MN403N	DRILLING AND BLASTING	3L:0T:0P	3 CREDITS

Exploration Drilling Boring for exploration; Various types of exploratory drills and their applicability – Auger, Cable-tool, Odex, Core Drills; Core recovery: single and double tube core barrels, wire line core barrel; Storage of cores; Interpretation of borehole data. Explosives and Initiating Systems Types of explosives, their composition and properties, classification; Selection of explosives; Manufacture, transport, storage and handling of explosives; Testing of explosives; Types of initiating systems – Electrical Detonators, Detonating Fuse, Detonating Relays, NONEL, Electronic Detonators, Blasting accessories, exploders. Drilling & Blasting in Surface Mines Drilling: Blasthole drills – types, classification, applicability and limitations; Mechanics of drilling, performance parameters, drilling cost, compressed air requirement for hole cleaning; Selection of drilling systems, drilling errors, organization of drilling. Blasting: Mechanics of rock fragmentation; Livingstone theory of crater formation; Factors affecting blasting, Blast design - estimation of burden and spacing, estimation of charge requirement; Initiation patterns; Secondary blasting – pop and plaster shooting; Problems associated with blasting, Ground vibration and air over pressure, Blast instrumentation Drilling & Blasting in Underground Mines Coal mines: Drilling systems and their applicability, blasting-off-solid, different blasting cuts, ring hole blasting, calculation of specific charge, specific drilling and detonator factor, initiation patterns. Metal mines: Drilling systems and their applicability, blast design for horizontal drivages, different blasting cuts, longhole blasting, vertical crater retreat blasting.

Modules:

Module 1: Exploration Drilling:

Boring for exploration; Various types of exploratory drills and their applicability – Auger, Cable-tool, Odex, Core Drills; Core recovery: single and double tube core barrels, wire line core barrel; Storage of cores; Interpretation of borehole data

Modu

Module 2: **Explosives and Initiating Systems:**

Types of explosives, their composition and properties, classification; Selection of explosives; Manufacture, transport, storage and handling of explosives; Testing of explosives; Types of initiating systems – Electrical Detonators, Detonating Fuse, Detonating Relays, NONEL, Electronic Detonators, Blasting accessories, exploders.

Module 3: **Drilling in Surface Mines**

Drilling: Blasthole drills – types, classification, applicability and limitations; Mechanics of drilling, performance parameters, drilling cost, compressed air requirement for hole cleaning; Selection of drilling systems, drilling errors, organization of drilling.

Module 4: **Blasting in Surface Mines**

Mechanics of rock fragmentation; Livingstone theory of crater formation; Factors affecting blasting, Blast design - estimation of burden and spacing, estimation of charge requirement; Initiation patterns; Secondary blasting – pop and plaster shooting; Problems associated with blasting, Ground vibration and air over pressure, Blast instrumentation

Module 5: **Drilling & Blasting in Underground Coal Mines:**

Drilling systems and their applicability, blasting-off-solid, different blasting cuts, ring hole blasting, calculation of specific charge, specific drilling and detonator factor, initiation patterns.

Module 6: **Drilling & Blasting in Underground Metal Mines:**

Drilling systems and their applicability, blast design for horizontal drivages, different blasting cuts, longhole blasting, vertical crater retreat blasting.

Text/Reference Books:

1. Rock blasting effects and operations, Lovely Prakashan: P. Pal Roy.
2. Blasting Practices in Surface Mines: S K Das.
3. Explosives and Blasting Technology: G.K.Pradhan.
4. Rock Blasting: Sushil Bhandari.
5. Drilling and Blasting: chapters in SME Mining Engineers Handbook: P Darling.
6. Drilling and blasting of rock, CRC publications: Jimino.
7. Surface and Underground Excavations: R R Tatiya.
8. Blasting principles for open pit mining, SME vol. I & II: W Hustrulid.
9. Surface Blast Design: C.J.Konya.
10. Indian Explosive Act 1884.
11. Legislation in Indian Mines – A Critical Appraisal: Rakesh and Prasad.

Course Learning Outcomes:

After completion of the subject the students will be able to:

1. Identifying and relating various drilling procedures to various rock characteristics.

2. Outline and define various blasting practices, accessories, explosives & their suitability in Indian mines both underground and opencast.
3. Analyse and optimize blast performance and productivity improvements.
4. Formulate and list the documentation for safe blasting practices.
5. To understand and appreciate environmental and social implications of rock/coal blasting.

Course Objectives:

The course is designed where, students can apply knowledge of mathematics in surveying to calculate and analyse different parameters of survey. Students can get the ability to identify, formulate and solve problems in the field of advanced surveying using advanced surveying instruments. Ability to analyse survey data and design mining engineering projects.

This course is designed to address the following:

- To give an understanding to the students of the vast breadth and numerous areas of engagement available in the overall field of Mine Surveying.
- To motivate the student to pursue a career in one of the many areas of Mine Surveying with deep interest and keenness.
- To expose the students to the various avenues and Instruments available for doing creative and innovative work in this field by showcasing the applications in many monuments and inspiring projects of public utility.
- To introduce the students to advanced and astronomical surveying.

Proposed Syllabus:

MN404N	MINE SURVEYING	3L:0T:P	3 Credits

Surveying Instruments: Mining theodolite, miner's dial, loose and fast needle traversing with miner's dial, EDM & Total Station -- their applications. Introduction to Gyro-theodolite & GPS. Triangulation Survey: Classification; Reconnaissance; Procedures for angles and base-line measurement; Comparison with precise EDM traversing

Correlation Survey: Correlation of underground and surface surveys and different methods of correlation- connection through adit, incline and shafts, method of connection through single or double vertical shafts. Corrections by means of magnetic needle.

In-pit Survey: Setting out a point of known rectangular co-ordinate. Control of directions and gradients for inclined shafts, slopes, levels and tunnels. Maintaining alignments, simple curve laying underground, laying out and fixing of mine boundaries claims, subsidence surveys on surface and underground. Volume calculations.

Stope Surveying: Stope surveying with Hanging Compass and Alignometer, tape triangulation, radiation and other methods.

Mine Plans and Sections: Legal requirements as to mine plans and sections in India, preparation and preservation of plans and sections, representation of geological and other surface and underground features on mine plans and sections.

Modu

Astronomy: Astronomical terms and definitions, Introduction to field astronomy, determination of true meridian, latitude, longitude and time including hour angle.

Modules

Module 1: Surveying Instruments:

Mining theodolite, miner's dial, loose and fast needle traversing with miner's dial, EDM & Total Station - their applications. Introduction to Gyro-theodolite & GPS.

Module 2: Triangulation Survey:

Classification; Reconnaissance; Procedures for angles and base-line measurement; Comparison with precise EDM traversing.

Module 3: Correlation Survey:

Correlation of underground and surface surveys and different methods of correlation-connection through adit, incline and shafts. Method of connection through single or double vertical shafts. Corrections by means of magnetic needle

Module 4: In-pit Survey:

Setting out a point of known rectangular co-ordinate. Control of directions and gradients for inclined shafts, slopes, levels and tunnels. Use of Top telescope and side telescope. Maintaining alignments, simple curve laying underground, laying out and fixing of mine boundaries claims, subsidence surveys on surface and underground. Volume calculations.

Module 5: Stope Surveying:

Stope surveying with Hanging Compass and Alignometer, tape triangulation, radiation and other methods.

Module 6: Mine Plans and Sections:

Legal requirements as to mine plans and sections in India, preparation and preservation of plans and sections, representation of geological and other surface and underground features on mine plans and sections.

Module 7: Photogrammetry:

Introduction to photogrammetry, Scale of a vertical photograph, photographs verses maps, application of photogrammetry in mining

Module 8: Astronomy:

Astronomical terms and definitions, Introduction to field astronomy, determination of true meridian, latitude, longitude and time including hour angle.

Application of Computer in surveying and computation.

Text/Reference Books:

1. Surveying (Vol – 1,2 & 3), by B.C. Punmia, Ashok Kumar Jain and Arun Kumar Jain – Laxmi Publications (P) Ltd., New Delhi.
2. Surveying (Vol 1, 2& 3), Duggal S.K. Tata Mc.Graw Hill Publishing Co. Ltd. New Delhi, 2004

3. Text book of surveying by C. Venkataramaiah, Universities Press.
4. Engineering surveying by Schofield, Wilfred, and Mark Breach.. CRC Press, 2007
5. Surveying (Vol 1, 2 & 3), Arora K R, standard Book House, Delhi, 2004.
6. Plane Surveying, Chandra A M. New age International Pvt. Ltd. Publisher, New Delhi, 2002
7. Higher Surveying, Chandra A M., New Age International Pvt. Ltd. Publisher, New Delhi, 2002
8. Surveying and levelling by R. Subramanian, Oxford University Press, New Delhi.

Goals & Outcomes:

Upon successful completion of this course, the student will be able to:
(Knowledge based)

- Know the various surveying instruments and their purpose;
- Have complete understanding of the significant role of surveying play in mining.
- Understanding the setting out concepts and different kind of techniques.
- Understanding the Legal requirements of mine plans and sections in India
- Understand and remember different Astronomical terms, definition and their significance.
- Can remember different kind of representations of geological, surface and underground features on mine plans and sections *(Skills)*

Use operations of Mine Surveying to:

- Identify and analyse the applications of Surveying Instruments in different kind of Mining scenario.
- Apply and evaluate the techniques used in correlation for correlation survey depending on the type of mine.
- Apply and analyse different setting out procedure in direction and gradient control in Mining Scenario.
- Apply the different techniques of stope surveying in different kind of mining methods.
- Apply different techniques to analyse the volume of mined-out area, heap and etc.
- Identify and evaluate different kind of representations of geological, surface and underground features on mine plans and sections.

MN405N	MINE DESIGN - I	0L:0T:3P	1 CREDITS
SL. NO	**NAME OF EXPERIMENT**		

1.	Determination of annual production capacity of a rope shovel with given bucket capacity, dumper capacity and numbers and distance of dumping yard.
2.	Determination of annual excavation capacity of a dragline of given specification including bucket capacity.
3.	Determination of total drilling requirement for an opencast overburden/ coal bench with given geometry and excavation volume/ production requirement per round of blasting.
4.	Determination of matching number of dumpers per shovel for a target output when the shovel and dumper capacities are given.
5.	Determination of volume of rock excavation in box cutting for a given geometry of the entry and depth of first bench.
6.	Determination of haul road dimensions for a given condition.
7.	Study and sketch of an inclined drivage showing support requirements, transport mode, safety features, illumination etc.
8.	Study and sketch of a conventional/ mechanized Bord and Pillar panel being developed.
9.	Study and sketch of a Bord and Pillar panel being depillared with hydraulic sand stowing showing systematic support.
10.	Study and sketch of a Bord and Pillar panel being depillared with caving showing systematic support.
11.	Study and sketch of longwall main gate and tail gate roads with respective gate machineries.
12.	Study and sketch of a mechanized longwall face in a coal seam with given specifications.

MN406N	**DRILLING & BLASTING LAB**	**0L:0T:3P**	**1 CREDITS**

SL. NO	NAME OF EXPERIMENT/ EXERCISE
1.	Study & sketch of Hand held Coal drill, drill rods and drag bits.
2.	Study & sketch of air leg mounted compressed air drill, drill rod with bit.
3.	Study and sketch of rotary drill with Diamond coring bit.
4.	Study and sketch of Churn/percussive drilling component including water flushing system.
5.	Study and sketch of Down the Hole (DTH) drill for O/C Mines.
6.	Study and sketchof P_3 and P_5 explosives with priming and initiation (direct and reverse) methods.
7.	Study and sketch of copper and aluminium tube delay Detonators with section al views.
8.	Study and sketch of non – electric delays, detonation chord with sectional views.
9.	Study and sketch of multi shot exploders with internal views.
10.	Exercise for deciding drilling pattern, number of holes, amount and type explosive,of stemming material in respect of a given coal face with desired yield.
11.	Exercise for deciding drilling pattern, number of holes, amount and explosive,type of stemming material in respect of a given stone drift.
12.	Exercise for deciding drilling pattern, number of holes, amount and explosive,type of stemming material in respect of a given coal/ overburden bench.

MN407N	MINE SURVEYING LAB	0L:0T:3P	1 CREDITS

SL. NO	NAME OF EXPERIMENT/ EXERCISE
1.	Study of EDM and total station.

2.	Study of gyro theodolite.
3.	GPS and its applications.
4.	GNSS and its characteristics.
5.	Correlation survey by alignment/ co-planning method.
6.	Correlation survey by weisbach triangle method.
7.	Correlation survey by weiss-quadrilateral method.
8.	Setting out of simple curves.
9.	To determine the most probable value of the included angles of given triangle by method of least squares.
10.	Subsidence monitoring using precise instruments.
11.	Study of photo theodolite.
12.	Measurement of muck pile volume.