Jabalpur Engineering College, Jabalpur

(Declared Autonomous by MP Govt., Affiliated to RGPV, Bhopal)
(AICTE Model Curriculum Based Scheme)
Bachelor of Technology (B.Tech.) III Semester (Civil Engg.)

For batches admitted in July 2017 & July 2018 (w.e.f. July 2018)

S.No.	Subject Code	Category Code	Subject Name	Maximum Marks Allotted					Total Marks	Contact Hours Per Week			Total Credits
				Theory			Practical						
				End. Sem.	Mid Sem. Exam.	Quiz/ Assignment	End Sem.	Lab Work		L	T	P	
1	MA311	BSC	Mathematics-III	70	20	10	-	-	100	3	1	-	4
2	CH302	HSMC	Energy & Environmental Engineering	70	20	10	-	-	100	3	1	-	4
3	CE303	PCC	Strength of Materials	70	20	10	30	20	150	3	-	2	4
4	CE304	PCC	Engineering Geology	70	20	10	30	20	150	3	-	2	4
5	CE305	PCC	Building Design and Drawing	70	20	10	30	20	150	3	-	2	4
6	CE306	ESC	Software Lab-I	-	-	-	30	20	50	-	-	2	1
7	BT307	DLC/PI	Industrial Training Evaluation	-	-	-	30	20	50	-	-	2	1
			Total	350	100	50	150	100	750	15	2	10	22
8	CE308	DLC	Self-Learning Presentation (SWAYAM/NPTEL/MOOC)	-	-	-	-	-	-	-	-	-	4
NSS/NCC/Swachhata Abhiyan/Rural Outreach				Qualifier									
Additional Course for Honours or Minor Specialization				Permitted to opt for maximum two additional courses in subject code CE308 for the award of Honours (Minor Specialization).									

Note: Departmental BOS will decide list of three optional subjects those are available in MOOC. *Students should contact department for opting DLC optional subject/subjects

1 hour lecture (L) = 1 credit	1 hour Tutorial (T) = 1 credit	2 hour Practical (P) = 1 credit

Registrar (Academic)
for Principal
Jabalpur Engineering College
Jabalpur - 482 011 (M.P.)

Controller (Exam)
Jabalpur Engineering College
Jabalpur - 482 011 (M.P.)

DEAN
Academic
JEC, Jabalpur (M.P.)

Principal
Jabalpur Engineering College
Jabalpur - 482 011 (M.P.)

Jabalpur Engineering College, Jabalpur (M.P.)

Branch (CE/ME/IP) w.e.f. July 2018

(Based on AICTE Model Syllabus)

SUBJECT –MATHEMATICS-III (MA 311) [L+T+P =TC][3+1+0=4]

Module 1: Numerical Method-I (08 hours)
Roots of algebraic and transcendental equations: Bisection method, Regula-Falsi method, Newton-Raphson method, iteration method, Graffes root squaring method, Solution of system of linear equations: Gauss elimination method, Gauss Jordan method, LU decomposition method, relaxation method, Jacobi and Gauss-Seidel methods.

Module 2: Numerical Method-II (08 hours)
Interpolation: Finite difference operator and their relationships, difference tables, Newton, Gauss, Bessel and Stirling's interpolation formulae, Divided differences,Lagrange interpolation and Newton's divided difference interpolation. Numerical differentiation and Integration: First and second order derivatives by various interpolation formulae, Trapezoidal, Simpsons $1/3^{rd}$ and $3/8^{th}$ rules.

Module 3: Numerical Method-III (10 hours)
Numerical solution of ordinary differential equations: Solution of ODE by Taylor series, Picard's method , Modified Euller method, Runge-Kutta method, Predictor corrector method. Partial differential equations: Finite difference solution two-dimensional Laplace equation and Poission equation, Implicit and explicit methods for one dimensional heat equation (Bendre Schmidt and Crank-Nicholson methods), Finite difference explicit method for wave equation.

Module 4: Applied Statistics (08 hours)
Curve fitting by the method of least squares- fitting of straight lines, second degree parabolas and more general curves. Test of significance: Large sample test for single proportion, difference of proportions, single mean, difference of means and difference of standard deviations.

Module 5: Concept of Probability (06 hours)
Probability Mass function, Probability Density Function, Discrete Distribution : Binomial, Poisson's Distribution , Continuous Distribution: Normal Distribution, Exponential Distribution.

Books References:

1. P. Kandasamy, K.Thilagavathy, K. Gunavathi, Numerical Methods, S. Chand & Company, 2^{nd} Edition, Reprint 2012.
2. S.S. Sastry, Introductory methods of numerical analysis, PHI, 4^{th} Edition, 2005.
3. B.S. Grewal, Higher Engineering Mathematics, Khanna Publisher, 35^{th} Edition, 2010.
4. N.P. Bali and Manish Goyal, A text book of Engineering Mathematics, Laxmi Publications, Reprint, 2010.
5. S. Ross, A First Course in Probability, 6^{th} Edition, Pearson Education India 2002.
6. W. Feller, An Introduction to Probability Theory and its Applications, Vol. 1, 3^{rd} Edition, Wiley 1968. Statistics.

Course Outcomes :

At the end of the course the students will able to :

1. Understand Mathematical tools for Numerical Solution of algebraic and transcendental equations.
2. Estimate the value of function by various interpolation methods.
3. Determine derivative and integrals by numerical methods.
4. Solve the ODE and PDE by finite difference/numerical methods.
5. Apply probability distribution and statistics in various techniques dealing with engineering problems.

20.7.18

2017/18

Jabalpur Engineering College, Jabalpur

(AICTE Model Curriculum based scheme)

B.Tech. (AICTE) III Sem. (Civil Engineering)

Course	Subject Title	Subject Code	Hours/week	Total Credits
B.Tech.	Strength of Materials	CE303	3-0-2	4

STRENGTH OF MATERIALS

MODULE I:-

Simple Stress and Strains.'Concept of Elastic body, stress and Strain, Hooke'slaw, Concept of stress and strains & their relationships, Fatigue and thermal stresses, Creep. Equilibrium equations, Elastic constants, Stresses in compound bars, composite and tapering bars, Complex Stress and Strains: Two dimensional and three dimensional stress system. Normal and tangential stresses, Principal Planes, Principal Stresses and strains, Mohr's circle of stresses and strain, Combined Bending and Torsion, Theories of failure.

MODULE II:-

Bending & Deflection 'Theoryof simple bending: Concept of pure bending and bending stress, Equation

V of bending. Neutral axis, Section-Modulus, Determination of bending stresses in simply supported, Cantilever and Overhanging beams subjected to point load and uniformly distributed loading. Bending & shear stress distribution across a section in Beams.

MODULE III:-

Deflection of beams: Double Integation Method. Conjugate Beam Method, Macaulay'sMethod Area

Moment Method. unit load method : Strain Energy in direct stress, bending and shear. Theory of Plates and Shells, Introduction to theory of elasticity and photo-elasticity.

MODULE IV:-

Torsion of Shafts:Concept of pure torsion, Torsion equation, Determination of shear stress and angle o twist of shafts of circular section, Hollow shafts, Open and closed coil springs, Leaf Spring, Helical Spring, Pressure Vessels: Thin and Thick walled cylinders and spheres. Stress due to internal pressure, Change in diameter and volume, Compound cylinders and shrink fittings' Stresses in thin, thick cylinders and rotating discs.

MODULE V:-

Unsymmetrical Bending: Principal moment of Inertia, Product of Inertia, Bending of a beam in a plane

which is not a plane of, symmetry. Concept of shear flow and shear centre. Curved beams: Pure bending of curved beams ofrectangular, circular and trapezoidal sections, Stress distribution and position ofneutral axis. Columns and Struts: Euler'sbucklingload for uniform section, various end conditions, slendemess Ratio, Stress V in columns, Rankine formulae, Eccentric loading on columns. Combined Stresses and Bending.

References

1. E,P. Popov, Engineering Mechanics of Solids, 2nd Ed., Prentice Hill, New Delhi, 1999.
2.F.P. Beer, E.R. Johnston and J.T. DeWolf, Mechanics of Materials, 3rd Ed., Tata McGraw Hill, New Delhi, 2004.
3.I.H. Shames and J.M. Pitanesi, Introduction to the Solid Mechanics, 3rd Ed., Prentice Hill, New Delhi, 1989.
4.J.M. Gere, Mechanics of Materials, 5th Ed., Brooks/Cole, Chennai, 2001. S.H. Crandall, N.C. Dhal and T.J. Lardner,
5.Mechanics of Solids: An Introduction, McGraw Hill, Tokyo, 1994. S.M.A. Kazimi, Solid Mechanics,McGraw-Hill, New Delhi, 1981.
6.Nash; Strength of Materials (Schaum), TMH.
7.Ramamrutham; Strength of Materials, ,
8.Subramaniam; Strength of Materials: R; Oxford

COURSE OUTCOMES

After completion of this course the students will be able to

1. Explain mechanical properties of steel, different laws of engg mechanics
2. Determine various stresses in symmetrical & unsymmetrical beams, rods, shafts, cylinders & springs.
3. Calculate buckling load in columns & deflection in beams by using various methods.

List of Experiments

1. To determine Tensile strength of steel rod.
2. To determine flexural strength of steel rod.
3. To determine Young's Modulus of Elasticity of different materials ofbeam simply supported at ends.
4. To determine the Stiffness of the open and closed coil Spring.
5. To determine the deflection of simply supported beam of different materials.
6. To determine Hardness of Mild Steel.
7. Torsion test on steel rod.
8. To determine Impact strength of steel.

COURSE OUTCOMES

After completion of this course the students will be able to

1. Perform experiments to determine mechanical properties of steel, timber etc.

Jabalpur Engineering College, Jabalpur

(AICTE Model Curriculum based scheme)

B.Tech. (AICTE) III Sem. (Civil Engineering)

Course	Subject Title	Subject Code	Hours/week	Total Credits
B.Tech.	Engineering Geology	CE304	3-0-2	4

ENGINEERING GEOLOGY

MODULEI :- PHYSICAL GEOLOGY

The Earth as a Planet, important parts of the Earth, Action of Atmosphere, Weathering of Rocks, Principles and processes, Engineering significance of weathering, Geologic Action of wind erosion transportation and deposition, Action of River, Ground water and glaciers' Processes and features with all Engineering consideration.

MODULEII :-MINERALOGY&PETROLOGY

Study of Rocks : their origin, composition, classification. Detailed study of important Igneous, Sedimentary, Metamorphic Rocks with Rock cycle. Bowens reaction series, distribution of rocks on Indian sub continent. Civil Engineering importance of Rock forming minerals , Study of Minerals with their importance, hand specimen properties. distribution of some economic minerals on Indian sub continent.

MODULE III:-STRUCTURAL GEOLOGY

Structural features of rocks, Folds, Faults, Joints; Lineaments, Mountains, valleys. terminology, classification, their Engineering properties for Civil Engineering considerations. Earth quakes : Their causes,

MODULE IV:- REMOTE SENSING, GIS & ITS APPLICATION

Remote Sensing technology, E.M.S., Spectral signatures , its Applications in Civil Engineering, Geographical information system, data base management, use of Remote sensing in G.LS. for soil, rock, site selection purposes.

MODULE V:- APPLIED GEOLOGY

Study of major and minor structures of Civil Engineering like Dam ,Tunnel , Bridges, Culvert, Roads. Their terminolory, classification, different causes for failure, Geological considerations different methods for sub- surface, surface, aerial, satellite investigations for site selection of such structures.

References :

1. Engineering Geology by Kranine& Jade
2. Engineering Geology by Pravin Singh
3. Physical and Engineering Geology by S.K.Garg

COURSE OUTCOMES

After completion of this course the students will be able to

1. Illustrate action of natural agencies on various geological formation.
2. Categorize various types of rocks and structural formation on earth crust.
3. Apply remote sensing technology for site selection of structures such as dams, tunnels, bridges etc. by sub-surface, surface & aerial investigations.

List of Experiments

1. Identify the given minerals sample for the following :
"HAND SPECIMEN" Mega-scopic Identification on the basis of physical properties

i. Rock forming minerals
ii. Ore forming minerals
iii. Gangue minerals

2. Identify the given rock sample for the following : "HAND SPECIMEN" Mega-scopic Identification on the basis of physical properties

i. Igneous rocks
ii. Sedimentary rocks
iii. Metamorphic rocks

3. Study the given geological maps for the following:

i. Topography - Configuration of the ground surface with the help of (dotted lines) contours drawn at a regular interval.
ii. Geologic rock boundaries (dark continuous lines.) superimposed on geographic map.
iii. Inter relationship of different rock tlryes with each other i.e. unconformities, sequence etc.
iv. Structural feature of the rock formations in the form of folds, faults igneous intrusions etc.

4. Use the given geological map for the site selection of a Dam, Bridge, Canal& Tunnel.

COURSE OUTCOMES

After completion of this course the students will be able to

1. Identify the given sample of minerals and rocks.
2. Study geological and geographical maps.

Jabalpur Engineering College, Jabalpur

(AICTE Model Curriculum based scheme)

B.Tech. (AICTE) III Sem. (Civil Engineering)

Course	Subject Title	Subject Code	Hours/week	Total Credits
B.Tech.	Building Design and Drawing	CE305	3-0-2	4

BUILDING DESIGN AND DRAWING

MODULE I:-

Components of a building and their functions. Drawing & dimensions of various types of foundations, doors, windows, ventilators, lintels, chhajjas, stairs, trusses.

MODULE II:-

Basics of building planning : Orientation, sun diagram. Principles of building planning viz aspect, prospect, roominess, Grouping, elegance etc, building lay-out. Energy Efficient buildings, principle of architectural composition (i.e. unit, scale, contest etc.)

MODULE III:-

Percentage built up area concept, FAR, open afea, set backs, height of buildings, municipal bye laws National building code and its important provisions. Preparation of submission drawing. Basics of colony planning. Fire safety measures.

MODULE IV:-

Planning of residential buildings on different sizes of plots including plan, elevation sectional elevation. drawing to show all dimensions of various components of buildings health buildings.

MODULE V:-

Planning of school & Hostel buildings including drawings selection of site and salient features related to dimensions of each components of these buildings.

References :

1. Building planning, Designing & scheduling by Gurcharan Singh &Jagdish Singh
2.Building Design & Drawing by Shah, Kale &Patki
3.Building Design & Drawing by Malik &Meo.
4. Building Construction by B.C. Punamra
5. Estimating & Costing by B.N. Datta

COURSE OUTCOMES

After completion of this course the students will be able to

1. Illustrate various components of building with drawings.
2. Elaborate basics of building planning along with provisions of national building code
3. Plan different types of buildings like residential, school and hostel buildings.

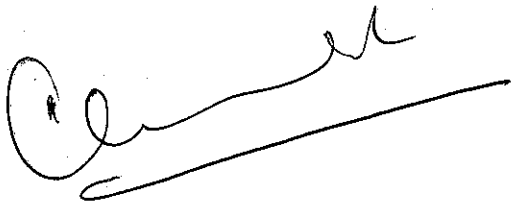
List of Experiments

1. Drawing of various types of foundations.
2. Drawing of various types of foundations door, window, ventilators, stair case
3. Drawing of plan section & elevation of simple four Roomed building
4. Planning & Drawing of residential building
5. Plaruring& Drawing of simple health building
6. Planning& Drawing of school
7. Planning& Drawing of Hostel
8. Planning& Drawing of Shopping complex.

COURSE OUTCOMES

After completion of this course the students will be able to

1. Draw various components of buildings
2. Plan different types of buildings.



JABALPUR ENGINEERING COLLEGE, JABALPUR (M.P.)

Branch- Common to All Discipline

CH302	Energy & Environmental Engineering	3L-1T-0P	4 Credits

Module 1:

A. **Introduction to Energy Science:**
World & Indian Energy Scenario, Overview to Energy Systems, Energy sustainability and Environment. Fossil Fuels. Alternatives for fossil fuels: biomass, wind, solar, nuclear, wave, tidal & hydrogen.

B. **Water Pollution:**
Definition, causes, effects and control measures (Primary & Secondary waste water treatment), Acid Rain and marine pollution. Pollution case studies: Minamata Tragedy, Ganga Action Plan, Major oil spills of the 20th & 21st century. Water conservation, Rain water harvesting and water shed management.

Module2: Ecosystems:

Concept of an ecosystem; Structure and function of an ecosystem; Producers, consumers and decomposers; Energy flow in the ecosystem; Ecological succession; Food chains, food webs and ecological pyramids; Introduction, types, characteristic features, structure and function of the following ecosystem (a.)Forest ecosystem (b) Grassland ecosystem (c) Desert ecosystem (d) Aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries)

Causes, effects & Control Measures of Air Pollution: Primary and secondary air pollutants and photo-chemical smog. Climate changes, Global warming, Ozone layer depletion. Pollution case studies: Bhopal gas Disaster and London smog Disaster.

Module 3: Biodiversity and its conservation:

Introduction ,Definition: genetic, species and ecosystem diversity; Bio-geographical classification of India; Value of biodiversity: consumptive use, productive use, social, ethical, aesthetic and option values; Biodiversity at global & National levels; India as a mega-diversity nation; Hot-spots of biodiversity; Threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts; Endangered and endemic species of India; Conservation of biodiversity: In-situ and Ex-situ conservation of biodiversity. Environment Protection Act, Prevention and Control of Pollution Act: Air, water, wild life, forest conservation. Issues involved in enforcement of environmental legislation; Public awareness.

Module 4: Environmental Pollution and Social Issues:

Causes, effects and control measures of Soil pollution, Noise pollution, Thermal pollution, Nuclear hazards, Solid waste Management (urban and industrial wastes), Pollution case studies. Disaster management: floods, earthquake, cyclone and landslides. Environmental ethics, Wasteland reclamation; Consumerism and waste products, issues and possible solutions. Nuclear accidents and holocaust. Case Studies: Chernobyl disaster & the 2004 Asian Earthquake & Tsunami.

Module 5:

A. Corrosion & its prevention:

Theories of Corrosion and Mechanism – Dry (Direct Chemical attack), Wet (Electro Chemical Theory) Atmospheric corrosion, Galvanic Series, Galvanic and Concentration Cell Corrosion, Corrosion by sea water. Factors Influencing and Control of Corrosion – Proper Design, Use of pure metal and metal alloys, passivity, cathodic protection – Sacrificial anode and Impressed Current. Modifying the environment, Use of inhibitors.

Definition, Causes, effects & control measures of water pollution: Acid Rain & Pollution case studies.

B. Batteries:

Classification of Batteries, Important Applications, Lead-Acid battery, Ni-Cd battery & Li battery. Fuel Cell: Hydrogen-Oxygen Fuel cell.

TEXT BOOKS

1. A text book of Engineering Chemistry by Jain & Jain, Dhanpat Rai Publishing Company, New Delhi
2. Chemistry of Engineering Materials by C.P. Murthy, C.V. Agarwal and A. Naidu BS Publication Hyd.
3. A text book of Environmental Chemistry and Pollution control by S.S. Dara & Dr. D. D. Mishra, S. Chand & Co, New Delhi
4. Energy,Environment Ecology and Society by Dr.Pushpendra,Vayu Education of India New Delhi
5. Energy, Environment Ethics and Society, by Dr.S.Deswal & Dr.A.Deswal Dhanpat Rai Publishing Company, New Delhi

REFERENCE BOOKS

1. J.C. Kuriakose and J. Rajaram, "Chemistry in Engineering and Technology", Vol.1 & 2, Tata Mcgraw Hill Publishing Company (P) Ltd., New Delhi
2. Mars G. Fontana, "Corrosion Engineering", Tata Mcgraw Hill Publishing Company (P) Ltd., New Delhi.
3. F.Chau, Y. Liang, J. Gao and X. Shao, "Chemometrics", Wiley Inter Science.
4. De A.K., Environmental Chemistry, Wiley Eastern Ltd.
5. Trivedi R.K., Handbook of Environmental Laws, Rules Guidelines, Compliances and Standards', Vol I and II, Enviro Media (R)
6. Brunner R.C., 1989, Hazardous Waste Incineration, McGraw Hill Inc.
7. Clark R.S., Marine Pollution, Clanderson Press Oxford (TB).
8. Cunningham, W.P. Cooper, T.H. Gorhani, E & Hepworth, M.T. 2001, Environmental Encyclopedia, Jaico Publ. House, Mumabai,
9. Boyle, Godfrey, Bob Everett, and Janet Ramage (Eds.) (2004), Energy Systems and Sustainability: Power for a Sustainable Future. Oxford University Press.
10. Schaeffer, John (2007), Real Goods Solar Living Sourcebook: The Complete Guide to Renewable Energy Technologies and Sustainable Living, Gaiam
11. J.P.Gupta, A Text book of Energy, Environment Ethics & Society" Dhanpat Rai Publishing Company.

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Jabalpur Engineering College ,Jabalpur (M.P)

B.Tech III Sem (Common to all branches)

Course content

EVALUATION						
Sub code	Sub Name	L	T	P	Max. Marks	Credits
CH302	Energy & Environmental Engineering	3	1	-	70	4

COURSE OUTCOME: At the end of the course the student will be able to

CO1	Apply the concept of sustainability of renewable energy to overcome the shortcoming of energy from non-renewable sources. Causes & Control of water Pollution
CO2	Understand the interrelationship of different species in variety of ecosystems and hazards of air pollution.
CO3	Conservation of Biodiversity & awareness of Environmental protection Act
CO4	Identify social issues related to environmental pollution and its preventive measure.
CO5	Recognize the origin as well as types of corrosion and apply appropriate protection mechanism to control corrosion. Devices for energy storage.

Mapping of course outcome with program outcome

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1												
CO2												
CO3												
CO4												
CO5												

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Jabalpur Engineering College, Jabalpur

(Declared Autonomous by MP Govt., Affiliated to RGPV, Bhopal)
(AICTE Model Curriculum Based Scheme)
Bachelor of Technology (B.Tech.) III Semester (Computer Science & Engg.)

For batches admitted in July 2017 & July 2018 (w.e.f. July 2018)

S.No.	Subject Code	Category Code	Subject Name	Maximum Marks Allotted					Total Marks	Contact Hours Per Week			Total Credits
				Theory			Practical						
				End. Sem.	Mid Sem. Exam.	Quiz/ Assignment	End Sem.	Lab Work		L	T	P	
1	MA331	BSC	Mathematics-III	70	20	10	-	-	100	3	1	-	4
2	CH302	HSMC	Energy & Environmental Engineering	70	20	10	-	-	100	3	1	-	4
3	CS303	PCC	Data Structures & Algorithms	70	20	10	30	20	150	3	-	2	4
4	CS304	PCC	Object Oriented Programming with C++	70	20	10	30	20	150	3	-	2	4
5	CS305	PCC	Digital Electronics	70	20	10	30	20	150	3	-	2	4
6	CS306	ESC	Software Lab-I	-	-	-	30	20	50	-	-	2	1
7	BT307	DLC/PI	Industrial Training Evaluation	-	-	-	30	20	50	-	-	2	1
			Total	350	100	50	150	100	750	15	2	10	22
8	CS308	DLC	Self-Learning Presentation (SWAYAM/NPTEL/MOOC)	-	-	-	-	-	-	-	-	-	4
NSS/NCC/Swachhata Abhiyan/Rural Outreach				Qualifier									
Additional Course for Honours or Minor Specialization				Permitted to opt for maximum two additional courses in subject code CS308 for the award of Honours (Minor Specialization).									

Note: Departmental BOS will decide list of three optional subjects those are available in MOOC. *Students should contact department for opting DLC optional subject/subjects

1 hour lecture (L) = 1 credit	1 hour Tutorial (T) = 1 credit	2 hour Practical (P) = 1 credit

Registrar (Academic)
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Controller (Exam)
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DEAN
Academic
JEC, Jabalpur (M.P.)

Jabalpur Engineering College, Jabalpur (M.P.)

Branch (CS/IT) w.e.f. July 2018

(Based on AICTE Model Syllabus)

SUBJECT –MATHEMATICS-III (MA331) [L+T+P =TC][3+1+0=4]

Module 1: Numerical Methods-I (08 hours)

Solution of polynomial and transcendental equations – Bisection method, Newton – Raphson method and Regula – Falsi method. Finite differences, Relation between operators, interpolation using Newton's forward and backward difference formulae. Interpolation with unequal intervals: Newton's divided difference and Lagrange's formulae.

Module 2: Numerical Methods-II (10 hours)

Numerical differentiation, Numerical integration: Trapezoidal rule and Simpson's 1/3rd and 3/8 rules. Solution of simultaneous Linear Algebraic equations by Gauss's Elimination, Gauss's Jordan, Crout's methods, Jacobi's Method, Gauss-Seidal, and Relaxation method. Solution of Ordinary differential equations: Taylor's series, Euler and modified Euler's method, Runge Kutta method of fourth order Milne's and Adam's predicator – corrector methods.

Module 3: Basic Probability (08 hours)

Probability spaces, Counting techniques, Probability measure, Conditional probability and Baye's theorem, Random variable and distribution function, Moment, Expected value and Variance of Random variables, Chebychev Inequality, Moment generating function. Bivariate discrete and continuous random variables, Independence of random variables.

Module 4: Probability Distribution (08 hours)

Measures of Central tendency: Moments, Skewness and Kurtosis. Discrete Distributions: Binomial, Poisson's Continuous Distributions: Normal Distribution, Exponential Distribution.

Module 5: Applied Statistics (06 hours)

Curve fitting by the method of least squares- fitting of straight lines, second degree parabolas and more general curves. Test of significance: Large sample test for single proportion, difference of proportions, single mean, difference of means and difference of standard deviations.

Books References:

1. P. Kandasamy, K.Thilagavathy, K. Gunavathi, Numerical Methods, S. Chand & Company, 2nd Edition, Reprint 2012.
2. S.S. Sastry, Introductory methods of numerical analysis, PHI, 4th Edition, 2005.
3. B.S. Grewal, Higher Engineering Mathematics, Khanna Publisher, 35th Edition, 2010.
4. N.P. Bali and Manish Goyal, A text book of Engineering Mathematics, Laxmi Publications, Reprint, 2010.
5. Veerarajan T., Engineering Mathematics, Tata McGraw-Hill, New Delhi, 2008.
6. S. Ross, A First Course in Probability, 6th Edition, Pearson Education India 2002.
7. W. Feller, An Introduction to Probability Theory and its Applications, Vol. 1, 3rd Edition, Wiley 1968. Statistics.
8. Prasanna Sahoo, Probability and Mathematical Statistics, Louisville KY 40292 USA.

Course Outcomes :

At the end of the course the students will able to :

1. Understand Mathematical tools for Numerical Solution of algebraic and transcendental equations.
2. Estimate the value of function by various interpolation methods.
3. Solve the ordinary differential equations by Numerical methods
4. Determine derivative and integrals by numerical methods.
5. Determine the concept of Basic probability.
6. Apply probability distribution and statistics in various techniques dealing with engineering problems.

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Jabalpur Engineering College, Jabalpur

(AICTE Model Curriculum based scheme)

B.Tech. (AICTE) III Sem. (Computer Science & Engg.)

(w.e.f. July 2018)

Subject Code	Subject Name & Title	Maximum Marks Allotted						Hours/Week			Total Credits
		Theory			Practical		Total Marks	L	T	P	
		End Sem	Mid Sem MST	Quiz, Assignment	End Sem	Lab Work					
CS305	Digital Electronics	70	20	10	30	20	150	3	-	2	4

Module 1 :Fundamentals of Digital Systems and logic families: Digital signals, digital circuits, AND, OR, NOT, NAND, NOR and Exclusive-OR operations, Boolean algebra, examples ofICgates, number systems-binary, signed binary, octal hexadecimal number, binary arithmetic, one's and two's complements arithmetic, error detecting and correcting codes, characteristics of digital ICs, digital logic families, TTL, Schottky TTL and CMOS logic, Interfacing CMOS and TTL, Tri-state logic.

Module 2 I: Combinational Digital Circuits: Standard representation for logic functions, K-map representation, simplification of logic functions using K-map, minimization of logical functions. Don't care conditions, Multiplexer, De-Multiplexer/Decoders, Adders, Subtractors, BCD arithmetic, carry look ahead adder, serial adder, ALU, elementary ALU design, popular MSI chips, digital comparator, parity checker/generator, code converters, priority encoders, decoders/drivers for display devices, Q-M method of function realization.

Module 3 I: Sequential circuits and systems: A 1-bit memory, the circuit properties of Bistable latch, the clocked SR flip flop, J- K-T and Dtypes flipflops, applications of flipflops, shift registers, applications of shift registers, serial to parallel converter, parallel to serial converter, ring counter, sequence generator, ripple (Asynchronous) counters, synchronous counters, counters design using flipflops, special counter IC's, asynchronous sequential counters, applications of counters.

Module 4 I: A/D and D/A Converters: Digital to analog converters: weighted resistor/converter, R-2R Ladder D/A converter, specifications for D/A converters, examples of D/A converter ICs, sample and hold circuit, analog to digital converters: quantization and encoding, parallel comparator A/D converter, successive approximation A/D converter, counting A/D converter, dual slope A/D converter, A/D converter using voltage to frequency and voltage to time conversion, specifications of A/D converters, example of A/D converter ICs

Module 5 : Semiconductor memories and Programmable logic devices: Memory organization and operation, expanding memory size, classification and characteristics of memories, sequential memory, read only memory (ROM), read and write memory (RAM), content addressable memory (CAM), charge de coupled device memory (CCD), commonly used memory chips, ROM as a PLD, Programmable logic array, Programmable array logic, complex Programmable logic devices (CPLDS), Field Programmable Gate Array (FPGA).

Text/References:

1. R. P. Jain, "Modern Digital Electronics", McGraw Hill Education, 2009.
2. M. M. Mano, "Digital logic and Computer design", Pearson Education India, 2016.
3. A. Kumar, "Fundamentals of Digital Circuits", Prentice Hall India, 2016.

CSE– III Semester

Digital Electronics

Course Outcomes:

At the end of this course, students will demonstrate the ability to

1. Understand working of logic families and logic gates.
2. Design and implement Combinational and Sequential logic circuits.
3. Understand the process of Analog to Digital conversion and Digital to Analog conversion.
4. Be able to use PLDs to implement the given logical problem.

Jabalpur Engineering College, Jabalpur

(AICTE Model Curriculum based scheme)

B.Tech. (AICTE) III Sem. (Computer Science & Engg.)

(w.e.f. July 2018)

Subject Code	Subject Name & Title	Maximum Marks Allotted						Hours/Week			Total Credits
		Theory			Practical		Total Marks	L	T	P	
		End Sem	Mid Sem MST	Quiz, Assignment	End Sem	Lab Work					
CS303	Data Structures & Algorithms	70	20	10	30	20	150	3	-	2	4

Module 1 :

Introduction: Basic Terminologies: Elementary Data Organizations, Data Structure Operations: insertion, deletion, traversal etc.; Analysis of an Algorithm, Asymptotic Notations, Time-Space trade off. **Searching:** Linear Search and Binary Search Techniques and their complexity analysis.

Module 2 :

Stacks and Queues: ADT Stack and its operations: Algorithms and their complexity analysis, Applications of Stacks: Expression Conversion and evaluation-corresponding algorithms, ADT queue, Types of Queue: Simple Queue, Circular Queue, Priority Queue; Operations on each Type of Queues: Algorithms and their analysis.

Module 3 :

Linked Lists: Singly linked lists: Representation in memory, Algorithms of several operations: Traversing, Searching, Insertion into, Deletion from linkedlist; Linked representation of Stack and Queue, Header nodes, doubly linked list: operations on it. Circular Linked Lists: all operations their algorithms.

Module 4

Trees: Basic Tree Terminologies, Different types of Trees: Binary Tree, Threaded Binary Tree, Binary Search Tree, AVL Tree; Tree operations on each of the trees and their algorithms with complexity analysis. Applications of Binary Trees. B Tree, B+ Tree: definitions and operations.

Module 5

Sorting and Hashing: Objective and properties of different sorting algorithms: Selection Sort, Bubble Sort, Insertion Sort, Quick Sort, Merge Sort, Heap Sort; Performance and Comparison among all the methods, Hashing, Collision handling techniques.

Graph: Basic Terminologies and Representations, Graph search and traversal algorithms and complexity analysis.

Suggested books:

1. "Fundamentals of data structures in C " 2nd edition, by S Sahni, Universities Press.
2. "How to Solve it by Computer", 2nd Impression by R. G. Dromey, Pearson Education.Data
3. "Data Structures using C and C++" 2nd edition, Tenenbaum, PHI publication.
4. "Introduction to algorithms" 3rd edition by Cormen, MIT press.

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Suject: Data Structures and Algorithms (CS303)

Course Outcomes: after completion of course student will be able to:

CO1. Describe various data structures such as arrays, linked lists, stacks, queues, trees and graphs and the operations performed on them.

CO2. Apply the concepts of various data structures such as linked lists, stacks, queues, trees and graphs to write algorithms and programs to implement them.

CO3. Analyse various searching and sorting algorithms such as Linear search, Binary search, Selection Sort, Bubble Sort, Insertion Sort, Quick Sort, Merge Sort and Heap sort to estimate their time and space complexity

CO4. Develop solutions of the given problem using appropriate data structures.

Jabalpur Engineering College, Jabalpur
(AICTE Model Curriculum based scheme)
B.Tech. (AICTE) III Sem. (Computer Science & Engg.)
(w.e.f. July 2018)

Subject Code	Subject Name & Title	Maximum Marks Allotted						Hours/Week			Total Credits
		Theory			Practical		Total Marks	L	T	P	
		End Sem	Mid Sem MST	Quiz, Assignment	End Sem	Lab Work					
CS304	Object Oriented Programming with C++	70	20	10	30	20	150	3	-	2	4

Module 1 : Introduction to Object Oriented Thinking & Object Oriented Programming: Comparison with Procedural Programming, features of Object oriented paradigm– Merits and demerits of OO methodology; Object model; Elements of OOPS, IO processing.

Module 2 : Encapsulation and Data Abstraction- Concept of Objects: State, Behavior & Identity of an object; Classes: identifying classes and candidates for Classes Attributes and operations, Access modifiers, Static members of a Class, Instances, Message passing, and Construction and destruction of Objects.

Module 3 : Relationships – Inheritance: purpose and its types, 'is a' relationship; Association, Aggregation. Concept of Abstract classes.

Module 4 : Polymorphism: Introduction, Method Overriding & Overloading, static and run time Polymorphism.

Module 5 : Case studies: Implementation of Stack, Queue and Linked Lists in C++.

Suggested Books :

1. Object Oriented Programming with C++ by E Balagurusamy, TMH.
2. Timothy Budd, "An Introduction to Object-Oriented Programming", AddisonWesley Publication, 3rd Edition.
3. Object Oriented Programming in C++ by Robert Lafore, Sams publishing.
4. Object Oriented Programming with C++, A. K. Sharma Pearson.
5. Booch, "Object Oriented Analysis& Design", Addison Wesley.
6. James Martin, "Principles of Object Oriented Analysis and Design", Prentice Hall/PTR.

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Suject: Object Oriented Programming using C++ (CS304)

Course Outcomes: after completion of course student will be able to:

CO1: Understand the difference between the top down and bottom up approach.
CO2: Explain the concepts of Object Oriented Programming.
CO3: Apply the concepts of OOP such as polymorphism, inheritance, dynamic binding etc to solve the given problem.
CO4: Apply OOP concepts to implement data structures such as Stack, Queue and Linked lists.

JABALPUR ENGINEERING COLLEGE, JABALPUR (M.P.)

Branch- Common to All Discipline

CH302	Energy & Environmental Engineering	3L-1T-0P	4 Credits

Module 1:

A. **Introduction to Energy Science:**
World & Indian Energy Scenario, Overview to Energy Systems, Energy sustainability and Environment. Fossil Fuels. Alternatives for fossil fuels: biomass, wind, solar, nuclear, wave, tidal & hydrogen.

B. **Water Pollution:**
Definition, causes, effects and control measures (Primary & Secondary waste water treatment), Acid Rain and marine pollution. Pollution case studies: Minamata Tragedy, Ganga Action Plan, Major oil spills of the 20th & 21st century. Water conservation, Rain water harvesting and water shed management.

Module2: Ecosystems:

Concept of an ecosystem; Structure and function of an ecosystem; Producers, consumers and decomposers; Energy flow in the ecosystem; Ecological succession; Food chains, food webs and ecological pyramids; Introduction, types, characteristic features, structure and function of the following ecosystem (a.)Forest ecosystem (b) Grassland ecosystem (c) Desert ecosystem (d) Aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries)

Causes, effects & Control Measures of Air Pollution: Primary and secondary air pollutants and photo-chemical smog. Climate changes, Global warming, Ozone layer depletion. Pollution case studies: Bhopal gas Disaster and London smog Disaster.

Module 3: Biodiversity and its conservation:

Introduction ,Definition: genetic, species and ecosystem diversity; Bio-geographical classification of India; Value of biodiversity: consumptive use, productive use, social, ethical, aesthetic and option values; Biodiversity at global & National levels; India as a mega-diversity nation; Hot-spots of biodiversity; Threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts; Endangered and endemic species of India; Conservation of biodiversity: In-situ and Ex-situ conservation of biodiversity. Environment Protection Act, Prevention and Control of Pollution Act: Air, water, wild life, forest conservation. Issues involved in enforcement of environmental legislation; Public awareness.

Module 4: Environmental Pollution and Social Issues:

Causes, effects and control measures of Soil pollution, Noise pollution, Thermal pollution, Nuclear hazards, Solid waste Management (urban and industrial wastes), Pollution case studies. Disaster management: floods, earthquake, cyclone and landslides. Environmental ethics, Wasteland reclamation; Consumerism and waste products, issues and possible solutions. Nuclear accidents and holocaust. Case Studies: Chernobyl disaster & the 2004 Asian Earthquake & Tsunami.

Module 5:

A. Corrosion & its prevention:

Theories of Corrosion and Mechanism – Dry (Direct Chemical attack), Wet (Electro Chemical Theory) Atmospheric corrosion, Galvanic Series, Galvanic and Concentration Cell Corrosion, Corrosion by sea water. Factors Influencing and Control of Corrosion – Proper Design, Use of pure metal and metal alloys, passivity, cathodic protection – Sacrificial anode and Impressed Current. Modifying the environment, Use of inhibitors.

Definition, Causes, effects & control measures of water pollution: Acid Rain & Pollution case studies.

B. Batteries:

Classification of Batteries, Important Applications, Lead-Acid battery, Ni-Cd battery & Li battery. Fuel Cell: Hydrogen-Oxygen Fuel cell.

TEXT BOOKS

1. A text book of Engineering Chemistry by Jain & Jain, Dhanpat Rai Publishing Company, New Delhi
2. Chemistry of Engineering Materials by C.P. Murthy, C.V. Agarwal and A. Naidu BS Publication Hyd.
3. A text book of Environmental Chemistry and Pollution control by S.S. Dara & Dr. D. D. Mishra, S. Chand & Co, New Delhi
4. Energy,Environment Ecology and Society by Dr.Pushpendra,Vayu Education of India New Delhi
5. Energy, Environment Ethics and Society, by Dr.S.Deswal & Dr.A.Deswal Dhanpat Rai Publishing Company, New Delhi

REFERENCE BOOKS

1. J.C. Kuriakose and J. Rajaram, "Chemistry in Engineering and Technology", Vol.1 & 2, Tata Mcgraw Hill Publishing Company (P) Ltd., New Delhi
2. Mars G. Fontana, "Corrosion Engineering", Tata Mcgraw Hill Publishing Company (P) Ltd., New Delhi.
3. F.Chau, Y. Liang, J. Gao and X. Shao, "Chemometrics", Wiley Inter Science.
4. De A.K., Environmental Chemistry, Wiley Eastern Ltd.
5. Trivedi R.K., Handbook of Environmental Laws, Rules Guidelines, Compliances and Standards', Vol I and II, Enviro Media (R)
6. Brunner R.C., 1989, Hazardous Waste Incineration, McGraw Hill Inc.
7. Clark R.S., Marine Pollution, Clanderson Press Oxford (TB).
8. Cunningham, W.P. Cooper, T.H. Gorhani, E & Hepworth, M.T. 2001, Environmental Encyclopedia, Jaico Publ. House, Mumabai,
9. Boyle, Godfrey, Bob Everett, and Janet Ramage (Eds.) (2004), Energy Systems and Sustainability: Power for a Sustainable Future. Oxford University Press.
10. Schaeffer, John (2007), Real Goods Solar Living Sourcebook: The Complete Guide to Renewable Energy Technologies and Sustainable Living, Gaiam
11. J.P.Gupta, A Text book of Energy, Environment Ethics & Society" Dhanpat Rai Publishing Company.

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Jabalpur Engineering College ,Jabalpur (M.P)

B.Tech III Sem (Common to all branches)

Course content

EVALUATION						
Sub code	Sub Name	L	T	P	Max. Marks	Credits
CH302	Energy & Environmental Engineering	3	1	-	70	4

COURSE OUTCOME: At the end of the course the student will be able to

CO1	Apply the concept of sustainability of renewable energy to overcome the shortcoming of energy from non-renewable sources. Causes & Control of water Pollution
CO2	Understand the interrelationship of different species in variety of ecosystems and hazards of air pollution.
CO3	Conservation of Biodiversity & awareness of Environmental protection Act
CO4	Identify social issues related to environmental pollution and its preventive measure.
CO5	Recognize the origin as well as types of corrosion and apply appropriate protection mechanism to control corrosion. Devices for energy storage.

Mapping of course outcome with program outcome

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1												
CO2												
CO3												
CO4												
CO5												

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Jabalpur Engineering College, Jabalpur

(Declared Autonomous by MP Govt., Affiliated to RGPV, Bhopal)

(AICTE Model Curriculum Based Scheme)

Bachelor of Technology (B.Tech.) III Semester (Electronics & Tele Communication Engg.)

For batches admitted in July 2017 & July 2018 (w.e.f. July 2018)

S.No.	Subject Code	Category Code	Subject Name	Maximum Marks Allotted					Total Marks	Contact Hours Per Week			Total Credits
				Theory			Practical						
				End. Sem.	Mid Sem. Exam.	Quiz/ Assignment	End Sem.	Lab Work		L	T	P	
1	MA321	BSC	Mathematics-III	70	20	10	-	-	100	3	1	-	4
2	CH302	HSMC	Energy & Environmental Engineering	70	20	10	-	-	100	3	1	-	4
3	EC303	PCC	Signals & Systems	70	20	10	30	20	150	3	-	2	4
4	EC304	PCC	Electronic Devices	70	20	10	30	20	150	3	-	2	4
5	EC305	PCC	Network Analysis	70	20	10	30	20	150	3	-	2	4
6	EC306	ESC	Software Lab-I	-	-	-	30	20	50	-	-	2	1
7	BT307	DLC/PI	Industrial Training Evaluation	-	-	-	30	20	50	-	-	2	1
			Total	350	100	50	150	100	750	15	2	10	22
8	EC308	DLC	Self-Learning Presentation (SWAYAM/NPTEL/MOOC)	-	-	-	-	-	-	-	-	-	4
NSS/NCC/Swachhata Abhiyan/Rural Outreach				Qualifier									
Additional Course for Honours or Minor Specialization				Permitted to opt for maximum two additional courses in subject code EC308 for the award of Honours (Minor Specialization).									

Note: Departmental BOS will decide list of three optional subjects those are available in MOOC. *Students should contact department for opting DLC optional subject/subjects

1 hour lecture (L) = 1 credit	1 hour Tutorial (T) = 1 credit	2 hour Practical (P) = 1 credit

Registrar (Academic)
for Principal
Jabalpur Engineering College
Jabalpur - 482 011 (M.P.)

Controller (Exam)
Jabalpur Engineering College
Jabalpur - 482 011 (M.P.)

DEAN
Academic
JEC, Jabalpur (M.P.)

Principal
Jabalpur Engineering College
Jabalpur - 482 011 (M.P.)

Jabalpur Engineering College, Jabalpur (M.P.)
Branch (EE/EC) w.e.f. July 2018
(Based on AICTE Model Syllabus)

SUBJECT –MATHEMATICS-III (MA321) [L+T+P =TC][3+1+0=4]

Module 1: Transform Calculus-I (06 hours)

Fourier integrals, Fourier sine and cosine integrals, Fourier transform, Fourier sine and cosine transforms and their elementary properties, Convolution theorem, Application of Fourier transformations to solve the boundary value problems.

Module 2: Transform Calculus-II (10 hours)

Hankel and Mellin transformations. Their elementary properties . Wavelet transforms, CWT, properties of CWT, Z- transform and inverse Z-transform of elementary functions, Shifting theorems, convolution theorem, Initial and final value theorem, Application of Hankel and Mellin transformations to solve the boundary value problems.

Module 3: Basic Probability (08 hours)

Probability spaces, Counting techniques, Probability measure, Conditional probability and Baye's theorem, Random variable and distribution function, Moment, Expected value and Variance of Random variables, Chebychev Inequality, Moment generating function. Bivariate discrete and continuous random variables, Independence of random variables.

Module 4: Probability Distributions (08 hours)

Measures of Central tendency: Moments, Skewness and Kurtosis. Discrete Distributions: Binomial, Poisson's, Continuous Distributions: Normal Distribution, Exponential Distribution.

Module 5: Applied Statistics (08 hours)

Curve fitting by the method of least squares- fitting of straight lines, second degree parabolas and more general curves. Test of significance: Large sample test for single proportion, difference of proportions, single mean, difference of means and difference of standard deviations.

Books References:

1. B.S. Grewal, Higher Engineering Mathematics, Khanna Publisher, 35th Edition, 2010.
2. S. Ross, A First Course in Probability, 6th Edition, Pearson Education India 2002.
3. W. Feller, An Introduction to Probability Theory and its Applications, Vol. 1, 3rd Edition, Wiley 1968. Statistics
4. Advanced Engineering Mathematics by B.S. Grewal, Khanna Publishers.
5. Higher Engineering Mathematics by B.V. Ramana TMH.
6. Prasanna Sahoo, Probability and Mathematical Statistics, Louisville KY 40292 USA.

Course Outcomes :

At the end of the course the students will able to :

1. Understand the knowledge of transform calculus.
2. Solve the Boundary value problems by the using transform methods.
3. Determine the concept of Basic probability.
4. Apply probability distribution and statistics in various techniques dealing with engineering problems

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Jabalpur Engineering College, Jabalpur
(AICTE Model Curriculum based scheme)
B.Tech. (AICTE) III Sem. (E&TC Engg.)

(w.e.f. July 2018)

Subject Code	Subject Name & Title	Maximum Marks Allotted						Hours/Week			Total Credits
		Theory			Practical		Total Marks	L	T	P	
		End Sem	Mid Sem MST	Quiz/ Assignment	End Sem	Lab Work					
EC303	Signals and Systems	70	20	10	30	20	150	3	-	2	4

Module I Signals and Systems.
Signals: Classification of signals, Continuous-Time and Discrete-Time Signals, Periodic and Aperiodic, Even and Odd,Causal and Non-Causal, Deterministic and Random, Energy and power signals, Energy Theorem, Power Theorem, Cross-correlation,auto-correlation, ESD, PSD, Singularity Functions.
Systems: Classification of System and Basic System Properties, System with & without memory, inevitability& inversesystem, Causality, Stability, Time-Invariance, Linearity.LTI system: Response, Convolution Integral, Properties & Eigen Function of LTI system, System described by differenceand differential equation.

Module II Fourier analysis of Signals
Fourier series: Fourier series representation of Continuous-Time periodic signals, convergence & properties ofContinuous-Time Fourier series, Fourier series representation of Discrete-Time periodic signals, properties of Discrete-Time Fourier series, Fourier series and LTI systems
Fourier transforms: Representation of Aperiodic signals, Continuous-Time Fourier transform, Discrete-Time Fouriertransform, Spectrum plot, Fourier transform of periodic signal, Properties and Applications of Fourier transform(Hilberttransform), Frequency Response of LTI Systems.

Module III Laplace Transform
Laplace transform, Region of Convergence, Inverse Laplace Transform, Properties of Laplace Transform, Applications of Laplace Transform, Laplace Transform of Some Common Signals, Unilateral Laplace transform, Relation between different transforms.

Module IV Sampling
Sampling theorem, Reconstruction of original signals from its samples, Alising, Anti-alising, Interpolation, Sample & HoldCircuit, Multirate Sampling, Sampling of band-pass signals, Discrete-time processing of Continuous-time Signals,Sampling of discrete time signals.

Module V Z-Transform
Z-Transform, Region of Convergence, Inverse Z-Transform, Properties of Z-Transform, Applications of Z-Transform,Analysis and Characteristic of LTI Systems using Z-Transform, System Function Algebra and Block DiagramRepresentation, Unilateral Z-Transform.

Reference books:

1. Oppenheim, Willsky and Nawab: Signals and Systems, PHI
2. Simon Haykins, B.V.Vean: signals and systems, John Wiley & Sons, Inc.
3. H. P. Hsu: Schaum's Outline of Signals & Systems, MGH
4. David McMahon: Signals and Systems demystified, MGH
5. B.P.Lathi: Linear Systems & Signals, Oxford Series

Course Outcomes:

Upon successful completion of course students will be able to:

CO1	Classify various types of Signals and Systems
CO2	Transform signal from time domain to frequency domain
CO3	Analyze various transforming technique
CO4	Convert signal from continous to discrete form
CO5	Apply various transforming techniques

SIGNAL & SYSTEMS LAB

(Suggested Exercise)

1. To plot the basic step, ramp and parabolic signal.
2. To plot the signal after applying shifting, compressing and expanding.
3. To plot the signal after time manipulation and frequency manipulation
4. To check for linearity, causality and stability for a given system
5. To perform sampling rate conversion for any given arbitrary sequence or signal by interpolation, up sampling, down sampling and resampling

Evaluation:

Evaluation will be continuous an integral part of the class followed by the final practical examination as well as through external assessment.

Course Outcomes:

Upon successful completion of course students will be able to:

CO1	Understand various types of signals and system
CO2	Apply various transforming techniques on signals
CO3	Analyze the signals after applying various operations on them

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Jabalpur Engineering College, Jabalpur
(AICTE Model Curriculum based scheme)
B.Tech. (AICTE) III Sem. (E&TC Engg.)

(w.e.f. July 2018)

Subject Code	Subject Name & Title	Maximum Marks Allotted						Hours/Week			Total Credits
		Theory			Practical		Total Marks	L	T	P	
		End Sem	Mid Sem MST	Quiz/ Assignment	End Sem	Lab Work					
EC304	Electronic Devices	70	20	10	30	20	150	3	-	2	4

Module I Semiconductor Physics
Energy Bands in Semiconductors, Charge Carriers in Semiconductor, Intrinsic and Extrinsic Semiconductor, Carrier Concentration, Generations and Recombination of Carriers, Fermi Energy Level, Energy Density, Mass Action Law, Drift and Diffusion current, Mechanism of Current flow in Semiconductor, Mobility and Resistivity, The Einstein Relationship, Hall Effect

Module II PN Junction
Open circuited P-N Junction, Electric field intensity and Potential energy barriers at the Junction, Energy band diagram of an open circuit P-N junction, Leakage/Saturation current, Voltage current characteristic of P-N junction diode, Diode resistance, The current components in an P-N junction diode, diode characteristic and its temperature dependence, Junction capacitances, Diode switching times.

Module III Junction Transistors– BJT
Transistor fabrication techniques, Basic transistor operation, Current components in a BJT, Emitter Junction efficiency, Base transport factor, large signal current gain, Current amplification factors, Relationship between α and β, Base spreading resistance, Ebers–moll model,Early effect and Base width Modulation, Transistor circuit configuration, Common Base Configuration, Common Emitter Configuration, Common Collector Configurations, Comparison of Characteristics of transistors in different Configurations, Transistor as an amplifier , Transistor Maximum Ratings.

Module IV Junction Field - EffectTransistor - FET
Junction Field - Effect transistor (JFET), Static Characteristics curves of FET, The pinch-off voltage(Vp),Voltampere characteristics of JFET, FET as a Voltage dependent resistor, Metal-Oxide Semiconductor FET (MOSFET), Enhancement MOSFET(n-Channel, p-Channel), Depletion type MOSFET (n-Channel, p- Channel),Gate Protection in MOSFET, Small Signal Models of JFET & MOSFET, Comparison of JFETs & MOSFETs.

Module V SPECIAL SEMICONDUCTOR DEVICES
Special types of Diodes: Zener Diode, PIN Diode, Schottky Diode, Varacter Diode, Tunnel Diode,Photo-conductive Devices- Photoconductive cells & Photodiodes, Photovoltaic effect and Solar cells, Light emitting diode(LED)
Thermistors, Sensistors, Barretters, Thyristors- SCR,TRIAC,DIAC,

Text Books:

1. Electronic Devices and Circuits: Jacob Millman, Christos C. Halkias
2. Solid State Electronic Devices: Ben G. Streetman, S K Banerjee
3. Microelectronics Circuits: SedraA.S .and Smith K.C.
4. Electronic Devices &circuit Theory: Boylestad R. and Nashelsky L.
5. Electronic Circuits – Analysis and Design: Neamen

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Course Outcomes:

Upon successful completion of course students will be able to:

CO1	Understand the mechanism of semiconductor physics
CO2	Analyze the behavior of PN junction Diode
CO3	Analyze the behavior of Transistor
CO4	Classify Various types of FET
CO5	Elaborate various types of Special semiconductor device

ELECTRONIC DEVICES & CIRCUITS LAB

(Suggested Exercise)

1. Study of V-I Characteristics of P.N. Junction diode (Zener Diodes.)
2. To plot&study the drain current vs drain voltage : Characteristics of F.E.T.
3. Toplot & study the Characteristics of MOSFET
4. To plot & study the finding characteristics of a Silicon Controlled rectifier.
5. To plot & study V-I characteristics of U.I.T.
6. Design various clipper & clamper circuit.
7. To plot & study the input output characteristics of Transistor CBmode.
8. To plot & study the input output characteristics of Transistor CC mode.
9. To plot & study the input output characteristics of Transistor CE mode.

Evaluation:

Evaluation will be continuous an integral part of the class followed by the final practical examination as well as through external assessment.

Course Outcomes:

Upon successful completion of course students will be able to:

CO1	Identify various electronic devices
CO2	Operate various electronic devices
CO3	Analyze the characteristic curves of various electronic devices

Jabalpur Engineering College, Jabalpur
(AICTE Model Curriculum based scheme)
B.Tech. (AICTE) III Sem. (E&TC Engg.)

(w.e.f. July 2018)

Subject Code	Subject Name & Title	Maximum Marks Allotted						Hours/Week			Total Credits
		Theory			Practical		Total Marks	L	T	P	
		End Sem	Mid Sem MST	Quiz/ Assignment	End Sem	Lab Work					
EC305	Network Analysis	70	20	10	30	20	150	3	-	2	4

Module I Transient and steady state analysis of first order system, response of RL, RC system for different input signal.

Module II Transient and steady state analysis of second order system, Response of LC, RLC system for different input signal.

Module III Laplace Transformation and its Application in Circuit Analysis
Fourier series: Introduction, exponential form, trigonometry form, symmetry in Fourier series, frequency spectrum amplitude spectrum.

Module IV Two Port Network Analysis
Introduction, network element, classification of network, network configuration, recurrent network, z parameter, y parameter, h parameter, ABCD parameter. Condition of reciprocity and symmetry, inter- relationships, interconnections, image impedances.

Module V Synthesis: Concept of stability of system (polynomial ratio) from pole zero concept, Hurwitz polynomials, properties of Hurwitz polynomials. Concept of network synthesis, procedure of synthesis, LC network synthesis, foster's canonic form, cauer canonic form of reactive network, application of foster and cauer forms.

Reference Books:
1. M.E.Vanvalkenburg "Network Analysis" Prentice Hall .
2. M.E.Vanvalkenburg "Network Synthesis " John Wiley & sons

Course Outcomes:
Upon successful completion of course students will be able to:

CO1	Determine the natural response of both RL & RC circuits
CO2	Determine the natural response of both LC & RLC circuits
CO3	Calculate Laplace and Inverse Laplace Transform
CO4	Analyze the Two port Networks
CO5	Implement a RLC circuit from the given equation

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NETWORK ANALYSIS LAB

1. To verify the operation of parallel resonance RLC circuit and measurement of resonance frequency and bandwidth.
2. To verify the operation of series resonance RLC circuit and measurement of resonance frequency and bandwidth.
3. To verify the frequency characteristics of high pass RC circuit.
4. To verify the frequency characteristics of low pass RC circuit.
5. To study of Y parameters & Z parameters of two port T network.
6. To study of network theorems in AC circuit

a. Thevenin's b. Norton's c. Superposition

7. To study of network functions.

Evaluation:

Evaluation will be continuous an integral part of the class followed by the final practical examination as well as through external assessment.

Course Outcomes:

Upon successful completion of course students will be able to:

CO1	Apply various network theorems on circuits
CO2	Analyze the characteristics of circuits
CO3	Calculate various network parameters of circuits

JABALPUR ENGINEERING COLLEGE, JABALPUR (M.P.)

Branch- Common to All Discipline

CH302	Energy & Environmental Engineering	3L-1T-0P	4 Credits

Module 1:

A. **Introduction to Energy Science:**
World & Indian Energy Scenario, Overview to Energy Systems, Energy sustainability and Environment. Fossil Fuels. Alternatives for fossil fuels: biomass, wind, solar, nuclear, wave, tidal & hydrogen.

B. **Water Pollution:**
Definition, causes, effects and control measures (Primary & Secondary waste water treatment), Acid Rain and marine pollution. Pollution case studies: Minamata Tragedy, Ganga Action Plan, Major oil spills of the 20th & 21st century. Water conservation, Rain water harvesting and water shed management.

Module2: Ecosystems:

Concept of an ecosystem; Structure and function of an ecosystem; Producers, consumers and decomposers; Energy flow in the ecosystem; Ecological succession; Food chains, food webs and ecological pyramids; Introduction, types, characteristic features, structure and function of the following ecosystem (a.)Forest ecosystem (b) Grassland ecosystem (c) Desert ecosystem (d) Aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries)

Causes, effects & Control Measures of Air Pollution: Primary and secondary air pollutants and photo-chemical smog. Climate changes, Global warming, Ozone layer depletion. Pollution case studies: Bhopal gas Disaster and London smog Disaster.

Module 3: Biodiversity and its conservation:

Introduction ,Definition: genetic, species and ecosystem diversity; Bio-geographical classification of India; Value of biodiversity: consumptive use, productive use, social, ethical, aesthetic and option values; Biodiversity at global & National levels; India as a mega-diversity nation; Hot-spots of biodiversity; Threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts; Endangered and endemic species of India; Conservation of biodiversity: In-situ and Ex-situ conservation of biodiversity. Environment Protection Act, Prevention and Control of Pollution Act: Air, water, wild life, forest conservation. Issues involved in enforcement of environmental legislation; Public awareness.

Module 4: Environmental Pollution and Social Issues:

Causes, effects and control measures of Soil pollution, Noise pollution, Thermal pollution, Nuclear hazards, Solid waste Management (urban and industrial wastes), Pollution case studies. Disaster management: floods, earthquake, cyclone and landslides. Environmental ethics, Wasteland reclamation; Consumerism and waste products, issues and possible solutions. Nuclear accidents and holocaust. Case Studies: Chernobyl disaster & the 2004 Asian Earthquake & Tsunami.

Module 5:

A. Corrosion & its prevention:

Theories of Corrosion and Mechanism – Dry (Direct Chemical attack), Wet (Electro Chemical Theory) Atmospheric corrosion, Galvanic Series, Galvanic and Concentration Cell Corrosion, Corrosion by sea water. Factors Influencing and Control of Corrosion – Proper Design, Use of pure metal and metal alloys, passivity, cathodic protection – Sacrificial anode and Impressed Current. Modifying the environment, Use of inhibitors.

Definition, Causes, effects & control measures of water pollution: Acid Rain & Pollution case studies.

B. Batteries:

Classification of Batteries, Important Applications, Lead-Acid battery, Ni-Cd battery & Li battery. Fuel Cell: Hydrogen-Oxygen Fuel cell.

TEXT BOOKS

1. A text book of Engineering Chemistry by Jain & Jain, Dhanpat Rai Publishing Company, New Delhi
2. Chemistry of Engineering Materials by C.P. Murthy, C.V. Agarwal and A. Naidu BS Publication Hyd.
3. A text book of Environmental Chemistry and Pollution control by S.S. Dara & Dr. D. D. Mishra, S. Chand & Co, New Delhi
4. Energy,Environment Ecology and Society by Dr.Pushpendra,Vayu Education of India New Delhi
5. Energy, Environment Ethics and Society, by Dr.S.Deswal & Dr.A.Deswal Dhanpat Rai Publishing Company, New Delhi

REFERENCE BOOKS

1. J.C. Kuriakose and J. Rajaram, "Chemistry in Engineering and Technology", Vol.1 & 2, Tata Mcgraw Hill Publishing Company (P) Ltd., New Delhi
2. Mars G. Fontana, "Corrosion Engineering", Tata Mcgraw Hill Publishing Company (P) Ltd., New Delhi.
3. F.Chau, Y. Liang, J. Gao and X. Shao, "Chemometrics", Wiley Inter Science.
4. De A.K., Environmental Chemistry, Wiley Eastern Ltd.
5. Trivedi R.K., Handbook of Environmental Laws, Rules Guidelines, Compliances and Standards', Vol I and II, Enviro Media (R)
6. Brunner R.C., 1989, Hazardous Waste Incineration, McGraw Hill Inc.
7. Clark R.S., Marine Pollution, Clanderson Press Oxford (TB).
8. Cunningham, W.P. Cooper, T.H. Gorhani, E & Hepworth, M.T. 2001, Environmental Encyclopedia, Jaico Publ. House, Mumabai,
9. Boyle, Godfrey, Bob Everett, and Janet Ramage (Eds.) (2004), Energy Systems and Sustainability: Power for a Sustainable Future. Oxford University Press.
10. Schaeffer, John (2007), Real Goods Solar Living Sourcebook: The Complete Guide to Renewable Energy Technologies and Sustainable Living, Gaiam
11. J.P.Gupta, A Text book of Energy, Environment Ethics & Society" Dhanpat Rai Publishing Company.

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Jabalpur Engineering College ,Jabalpur (M.P)

B.Tech III Sem (Common to all branches)

Course content

EVALUATION						
Sub code	Sub Name	L	T	P	Max. Marks	Credits
CH302	Energy & Environmental Engineering	3	1	-	70	4

COURSE OUTCOME: At the end of the course the student will be able to

CO1	Apply the concept of sustainability of renewable energy to overcome the shortcoming of energy from non-renewable sources. Causes & Control of water Pollution
CO2	Understand the interrelationship of different species in variety of ecosystems and hazards of air pollution.
CO3	Conservation of Biodiversity & awareness of Environmental protection Act
CO4	Identify social issues related to environmental pollution and its preventive measure.
CO5	Recognize the origin as well as types of corrosion and apply appropriate protection mechanism to control corrosion. Devices for energy storage.

Mapping of course outcome with program outcome

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1												
CO2												
CO3												
CO4												
CO5												

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Jabalpur Engineering College, Jabalpur

(Declared Autonomous by MP Govt., Affiliated to RGPV, Bhopal)
(AICTE Model Curriculum Based Scheme)
Bachelor of Technology (B.Tech.) III Semester (Electrical Engg.)

For batches admitted in July 2017 & July 2018 (w.e.f. July 2018)

S.No.	Subject Code	Category Code	Subject Name	Maximum Marks Allotted					Total Marks	Contact Hours Per Week			Total Credits
				Theory			Practical						
				End. Sem.	Mid Sem. Exam.	Quiz/ Assignment	End Sem.	Lab Work		L	T	P	
1	MA321	BSC	Mathematics-III	70	20	10	-	-	100	3	1	-	4
2	CH302	HSMC	Energy & Environmental Engineering	70	20	10	-	-	100	3	1	-	4
3	EE303	PCC	Circuit Theory and Network Analysis	70	20	10	30	20	150	3	-	2	4
4	EE304	PCC	Analog and Digital Electronics	70	20	10	30	20	150	3	-	2	4
5	EE305	PCC	Electrical Measurement & Measuring Instruments	70	20	10	30	20	150	3	-	2	4
6	EE306	ESC	Software Lab-I	-	-	-	30	20	50	-	-	2	1
7	BT307	DLC/PI	Industrial Training Evaluation	-	-	-	30	20	50	-	-	2	1
			Total	350	100	50	150	100	750	15	2	10	22
8	EE308	DLC	Self-Learning Presentation (SWAYAM/NPTEL/MOOC)	-	-	-	-	-	-	-	-	-	4
NSS/NCC/Swachhata Abhiyan/Rural Outreach				Qualifier									
Additional Course for Honours or Minor Specialization				Permitted to opt for maximum two additional courses in subject code EE308 for the award of Honours (Minor Specialization).									

Note: Departmental BOS will decide list of three optional subjects those are available in MOOC. *Students should contact department for opting DLC optional subject/subjects

1 hour lecture (L) = 1 credit	1 hour Tutorial (T) = 1 credit	2 hour Practical (P) = 1 credit

Registrar (Academic)
for Principal
Jabalpur Engineering College
Jabalpur - 482 011 (M.P.)

Controller (Exam)
Jabalpur Engineering College
Jabalpur - 482 011 (M.P.)

DEAN
Academic
JEC, Jabalpur (M.P.)

Principal
Jabalpur Engineering College
Jabalpur - 482 011 (M.P.)

Jabalpur Engineering College, Jabalpur (M.P.)
Branch (EE/EC) w.e.f. July 2018
(Based on AICTE Model Syllabus)

SUBJECT –MATHEMATICS-III (MA321) [L+T+P =TC][3+1+0=4]

Module 1: Transform Calculus-I (06 hours)

Fourier integrals, Fourier sine and cosine integrals, Fourier transform, Fourier sine and cosine transforms and their elementary properties, Convolution theorem, Application of Fourier transformations to solve the boundary value problems.

Module 2: Transform Calculus-II (10 hours)

Hankel and Mellin transformations. Their elementary properties . Wavelet transforms, CWT, properties of CWT, Z- transform and inverse Z-transform of elementary functions, Shifting theorems, convolution theorem, Initial and final value theorem, Application of Hankel and Mellin transformations to solve the boundary value problems.

Module 3: Basic Probability (08 hours)

Probability spaces, Counting techniques, Probability measure, Conditional probability and Baye's theorem, Random variable and distribution function, Moment, Expected value and Variance of Random variables, Chebychev Inequality, Moment generating function. Bivariate discrete and continuous random variables, Independence of random variables.

Module 4: Probability Distributions (08 hours)

Measures of Central tendency: Moments, Skewness and Kurtosis. Discrete Distributions: Binomial, Poisson's, Continuous Distributions: Normal Distribution, Exponential Distribution.

Module 5: Applied Statistics (08 hours)

Curve fitting by the method of least squares- fitting of straight lines, second degree parabolas and more general curves. Test of significance: Large sample test for single proportion, difference of proportions, single mean, difference of means and difference of standard deviations.

Books References:

1. B.S. Grewal, Higher Engineering Mathematics, Khanna Publisher, 35th Edition, 2010.
2. S. Ross, A First Course in Probability, 6th Edition, Pearson Education India 2002.
3. W. Feller, An Introduction to Probability Theory and its Applications, Vol. 1, 3rd Edition, Wiley 1968. Statistics
4. Advanced Engineering Mathematics by B.S. Grewal, Khanna Publishers.
5. Higher Engineering Mathematics by B.V. Ramana TMH.
6. Prasanna Sahoo, Probability and Mathematical Statistics, Louisville KY 40292 USA.

Course Outcomes :

At the end of the course the students will able to :

1. Understand the knowledge of transform calculus.
2. Solve the Boundary value problems by the using transform methods.
3. Determine the concept of Basic probability.
4. Apply probability distribution and statistics in various techniques dealing with engineering problems

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Jabalpur Engineering College, Jabalpur
(AICTE Model Curriculum based scheme)
B.Tech. (AICTE) III Sem. (Electrical Engineering)

(w.e.f. July 2018)

Subject Code	Subject Name & Title	Maximum Marks Allotted						Hours/Week			Total Credits
		Theory			Practical		Total Marks	L	T	P	
		End Sem	Mid Sem MST	Quiz, Assignment	End Sem	Lab Work					
EE303	Circuit Theory & Network Analysis	70	20	10	30	20	150	3	-	2	4

Course Objectives

- To prepare the students to have a basic knowledge in the analysis of Electric Networks.
- To verify various theorems and methods for a given network.
- To acquire the basic knowledge of Graph theory and application of knowledge to solve the electrical network.
- Understand the concept of resonance in series and parallel circuits.
- Have a broad coverage in the field that of network functions and Synthesis of R-L, R-C and L-C networks.

Circuit Theory & Network Analysis

Module 1 : Review of Circuit Elements and Energy Sources

Energy sources, Source transformation, Sinusoidal steady state analysis, AC in inductance and capacitance, star-delta connection, Kirchhoff's laws, current & voltage division rules, nodal & Mesh Analysis of electrical circuits(with Power and Energy calculation).

Module 2 : Network Theorems in AC & DC Circuits

Thevenin's, Norton's, Superposition, maximum power transfer, Milliman's, reciprocity, Substitution, Compensation and Tellegen's theorem.

Module 3 : Transient and Steady State Response for Arbitrary Inputs

Introduction to Transient and Steady State response of first order circuit (RL & RC) with dc and ac excitation, Transient and Steady State response of second order circuit (RLC) with dc and ac excitation, resonance (series and parallel).

Module 4 : Network Topology

Concept and terminology of network graphs (twigs, links, tree formation) formation of incidence, Tie-set matrix, Cut set matrix and their calculation.

Tow port Network: Z, Y, Hybrid and G (inverse of H) parameter.

Module 5 : Network functions and Network Synthesis

Network functions Introduction to Laplace transformation and its application in electrical circuit analysis, driving point impedance and admittance, transfer impedance and admittance, introduction of passive filters (low pass, high pass, band pass, band stop).

Network synthesis: Reliability concept, Hurwitz polynomials and its properties, positive real functions, Synthesis of R-L, R-C and L-C networks, Foster and Cauer forms (1st and 2nd form).

Books References:

1. Electrical Engineering fundamentals by Vincent Del Toro, Tata McGraw Hill Pub.
2. Circuit theory Analysis and Synthesis by Abhijeet Chakrabarti, Dhanpat Rai & Co.P.Ltd.
3. Network and Systems by D.Roy Choudhury Wiley Eastern Limited.
4. Network Analysis by ME Van-Valkeburg.

List of Experiments:

1. Verification of Kirchhoff's current Law in AC circuit.
2. Verification of Kirchhoff's voltage Law in AC circuit.
3. Verification of Superposition theorem in AC circuit.
4. Verification of The venin theorem in AC circuit.
5. Verification of Norton theorem in AC circuit.
6. Find out the resonance frequency in RLC series circuit.
7. Find out the resonance frequency in RLC parallel circuit.
8. Verification of Reciprocity theorem in AC circuit.
9. Measurement of phase angle, peak value of signal of AC circuit.

Course Outcomes

At the end of the course, a student will be able to:

- Apply different network theorem to solve given network problems.
- Analyze transient and steady state response of R-L-C circuit..
- Analyze two port networks.
- Apply appropriate method to test for realizability and Synthesize network from given network driving point functions
- Calculate the complex power and power factor using different methods.

Jabalpur Engineering College, Jabalpur
(AICTE Model Curriculum based scheme)
B.Tech. (AICTE) III Sem. (Electrical Engineering)

(w.e.f. July 2018)

Subject Code	Subject Name & Title	Maximum Marks Allotted						Hours/Week			Total Credits
		Theory			Practical		Total Marks	L	T	P	
		End Sem	Mid Sem MST	Quiz, Assignment	End Sem	Lab Work					
EE304	Analog & Digital Electronics	70	20	10	30	20	150	3	-	2	4

Course Objectives

- To provide a strong foundation on analog electronics.
- To acquire the basic knowledge of Diode, transistors and their various applications
- Have a broad coverage in the field that is relevant for engineers to design linear circuits using Op-amps.
- To acquire the basic knowledge of Digital logic levels and application of knowledge to understand the digital electronics circuits.

ANALOG & DIGITAL ELECTRONICS

Module 1 : Basic Analog Devices

Basic concept of the working of P-N junction diodes, Schottky Diodes, Zener Diodes, Application of Diodes- Clipper circuits and clamper circuits, the peak to peak detector, Zener based voltage regulator, Basic BJTs, Basic FETs, Difference between JFETs and MOSFETs.

Module 2 : Biasing and Frequency response of Transistor

Biasing of BJTs: CB, CE & CC configurations, biasing of FETs, Amplifier circuits using h-parameters, emitter-follower, Miller's theorem, frequency response of RC coupled amplifiers, Transistors at high frequencies, frequency response, gain bandwidth, emitter follower at high frequencies.

Module 3 : Feedback Amplifiers

Feedback amplifier: General feedback structure, properties of negative feedback, Sinusoidal Oscillator; RC phase shift, Wein's bridge oscillator, Hartley & Collpitt's oscillators.

Module 4 : Operational Amplifiers

Operational amplifiers: Input and output resistance, open loop gain, bias currents, Offset currents and voltages, differential mode gain, common mode gain, CMRR, Negative feedback, Inverting and non-inverting amplifiers, frequency response, Linear and nonlinear applications of OP-Amp.

Module 5 : Digital Electronics

Logic gates, logic families, Minimization techniques. Combinational Circuits: Encoders, decoders, multiplexers, parity detectors comparators. Sequential Circuits: Flip flops, JK, RS, D, T, master slave, shift registers, counters and latches.

Text books:

1. Millman & Halkias, "Integrated Electronics" TMH.

2. Anand Kumar, "Switching Theory & Logic Design" PHI.

Reference books:

1. R.A.Gayakwad, "Op amps and Linear Integrated Circuits" PH India.
2. Boylestad & Nashelsky, "Elex. Devices & Circuits" Pearson.
3. Morris Mano, "Logic & Computer Design Fundamentals" PHI.

List of Experiments:

1. To obtain the characteristics of common base (CB) configuration of BJT.
2. To obtain the characteristics of common emitter (CE) configuration of BJT.
3. To perform and verify the application of op-amp as a non-inverting amplifiers.
4. To perform and verify the application of op-amp as an integrator.
5. To perform and verify the application of Op-Amp as a differentiator.
6. To perform an experiment about universal Gates.
7. Verification of the law of boolean algebra and De-Morgan's theorem.
8. Construction and verification of various types of flip-flops using Gate ICs.
9. Construction and verification of half adder, full adder, half subtractor and full subtractor.
10. Construction of 3-bit down counter.
11. Construction and verification of 4-bit left shift register.

Course Outcomes

At the end of the course, a student will be able to:

- Analyze BJT & FET amplifier circuit in different Configurations.
- Analyze high Frequency transistor amplifier Circuits.
- Analyze various types of OPAMP circuits.
- Develop various combinational Circuits using Gates.
- Develop sequential logic using various flip-flops.

Jabalpur Engineering College, Jabalpur

(AICTE Model Curriculum based scheme)

B.Tech. (AICTE) III Sem. (Electrical Engineering)

(w.e.f. July 2018)

Subject Code	Subject Name & Title	Maximum Marks Allotted						Hours/Week			Total Credits
		Theory			Practical		Total Marks	L	T	P	
		End Sem	Mid Sem MST	Quiz, Assignment	End Sem	Lab Work					
EE305	Electrical Measurement and Measuring Instruments	70	20	10	30	20	150	3	-	2	4

Course Objective: After completion of this course students will be able to-

1. Perform experiments to determine various types of errors in measurements.
2. Use various measuring instruments used to detect electrical quantities.

ELECTRICAL MEASURMENT AND MEASURING INSTRUMENTS

Module 1 : Errors in Measurement and Their statistical analysis: Limiting Errors, Types of Errors, statistical treatment of each data-Histogram, arithmetic mean, measure of dispersion from mean,, range, deviation, average deviation, standard deviation, variance, normal and Gaussian curve of errors, precision index, probable error, average and standard deviation for normal curve, standard deviation of mean, standard deviation of standard deviation. *Galvanometers* – construction and torque equation. Introduction to unit system, dimension and standard.

Characteristic of instruments and measurement system-Static characteristic, errors in measurement, true value, static error, static correction, scale range and span, error calibration curve, Reproducibility and drift, repeatability, accuracy and precision, linearity, threshold, dead time, dead zone, resolution or discrimination.

Module 2 : Analog instruments: Classification of analog instruments, Operating force (deflecting, Damping and controlling force), and types of instruments (Permanent Magnet Moving Coil, Moving Iron, Electrodynamometer, Hotwire, thermocouple, Electrostatic, Induction, Rectifier type- construction, torque equation, advantage and disadvantage of each). Errors in ammeter and voltmeter, Extension of range of instruments using shunt & multiplier.

Module 3 : Measurement of Power and wattmeter: Measurement of Power – Power in AC and DC Circuit, Electrodynamometerwattmeter, low power factor wattmeter, Measurement of Power using instrument transformers, Measurement of power in three phase circuit by one, two & three wattmeter, three phase wattmeter, Measurement of reactive power by single wattmeter, measurement of phase and frequency-power factor meter (single & three phase, electrodynamometer, moving iron).

Introduction to instrument transformer, Construction and working of instrument transformer, ration and phase angle errors in Current and Potential transformer, Methods to reduce both ration and phase angle errors, Difference between CT and PT, Testing of CT and PT, Measurement of power using CTs &PTs.

Module 4 : Measurement of Energy: Single phase induction type energy meter, Polyphase meters, Single phase and three phase VARh meters, Measurement of Volt ampere-hours, and Phantom loads.

Principle of Potentiometer, Slide Wire DC potentiometer, Crompton's potentiometer,potentiometer Calibration, Volt-ratio box, Practicalapplication of DC potential meter. Introduction to AC Potentiometer.

Module 5 :Miscellaneous Instruments & Measurements: Measurement of frequency- Vibrating Reed, Weston Frequency meter Ratio Meter type. Power factor meter- Dynamometer type Single phase and three phase, Moving iron. Synchroscopes, Measurement of Low Resistance- Ammeter Voltmeter Method, Potentiometer method, Kelvin's double bridge, Ohm meter. Measurement of Medium Resistance- Ammeter Voltmeter Method, Substitution method, Wheatstone Bridge, Carey Foster Bridge Method. Measurement of High Resistance- Direct Deflection Method, Megger& loss of charge methods, Ohm meters (Series & Shunt Type) Multimeter, Earth resistance measurement.Q meters.

List of Experiments:-

1. Measurement of resistance by Wheatstone bridge.
2. Measurement of low resistance by Kelvin's double bridge.
3. To calibrate AC watt-hour meter by a standard wattmeter.
4. Measurement of iron losses using Llyod's Fischer square method.
5. To plot the following characteristics of a given CT. Burden V/S Secondary current Burden V/S Secondary voltage
6. Measurement of three phase power by two wattmeter method.
7. Measurement of high resistance by using megger.
8. Measurement of earth resistance using earth tester.
9. Testing of energy meter using phantom loading.

References:

1. E W Golding & F C Widdis, Vedition, ," Electrical Measurement & Measuring Instruments ",Wheeler Publishing
2. A.K. Sawhney," Electrical & Electronic Measurements & Instrumentation", DhanpatRai& Sons Publications
3. Buckingham &Price ,"Electrical Measurements", Prentice Hall

Course Outcomes:

After completion of this course students will be able to-

1. Calculate the error and perform error analysis for different measurements.
2. Select PMMC/MI/Induction/Dynamometer instruments based on application.
3. Apply one, two and three wattmeter method to measure power.
4. Calculate unknown (low, medium and high) resistance by various methods.
5. Calibrate AC watt-hour meter by a standard wattmeter.

JABALPUR ENGINEERING COLLEGE, JABALPUR (M.P.)

Branch- Common to All Discipline

CH302	Energy & Environmental Engineering	3L-1T-0P	4 Credits

Module 1:

A. **Introduction to Energy Science:**
World & Indian Energy Scenario, Overview to Energy Systems, Energy sustainability and Environment. Fossil Fuels. Alternatives for fossil fuels: biomass, wind, solar, nuclear, wave, tidal & hydrogen.

B. **Water Pollution:**
Definition, causes, effects and control measures (Primary & Secondary waste water treatment), Acid Rain and marine pollution. Pollution case studies: Minamata Tragedy, Ganga Action Plan, Major oil spills of the 20th & 21st century. Water conservation, Rain water harvesting and water shed management.

Module2: Ecosystems:

Concept of an ecosystem; Structure and function of an ecosystem; Producers, consumers and decomposers; Energy flow in the ecosystem; Ecological succession; Food chains, food webs and ecological pyramids; Introduction, types, characteristic features, structure and function of the following ecosystem (a.)Forest ecosystem (b) Grassland ecosystem (c) Desert ecosystem (d) Aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries)

Causes, effects & Control Measures of Air Pollution: Primary and secondary air pollutants and photo-chemical smog. Climate changes, Global warming, Ozone layer depletion. Pollution case studies: Bhopal gas Disaster and London smog Disaster.

Module 3: Biodiversity and its conservation:

Introduction ,Definition: genetic, species and ecosystem diversity; Bio-geographical classification of India; Value of biodiversity: consumptive use, productive use, social, ethical, aesthetic and option values; Biodiversity at global & National levels; India as a mega-diversity nation; Hot-spots of biodiversity; Threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts; Endangered and endemic species of India; Conservation of biodiversity: In-situ and Ex-situ conservation of biodiversity. Environment Protection Act, Prevention and Control of Pollution Act: Air, water, wild life, forest conservation. Issues involved in enforcement of environmental legislation; Public awareness.

Module 4: Environmental Pollution and Social Issues:

Causes, effects and control measures of Soil pollution, Noise pollution, Thermal pollution, Nuclear hazards, Solid waste Management (urban and industrial wastes), Pollution case studies. Disaster management: floods, earthquake, cyclone and landslides. Environmental ethics, Wasteland reclamation; Consumerism and waste products, issues and possible solutions. Nuclear accidents and holocaust. Case Studies: Chernobyl disaster & the 2004 Asian Earthquake & Tsunami.

Module 5:

A. Corrosion & its prevention:

Theories of Corrosion and Mechanism – Dry (Direct Chemical attack), Wet (Electro Chemical Theory) Atmospheric corrosion, Galvanic Series, Galvanic and Concentration Cell Corrosion, Corrosion by sea water. Factors Influencing and Control of Corrosion – Proper Design, Use of pure metal and metal alloys, passivity, cathodic protection – Sacrificial anode and Impressed Current. Modifying the environment, Use of inhibitors.

Definition, Causes, effects & control measures of water pollution: Acid Rain & Pollution case studies.

B. Batteries:

Classification of Batteries, Important Applications, Lead-Acid battery, Ni-Cd battery & Li battery. Fuel Cell: Hydrogen-Oxygen Fuel cell.

TEXT BOOKS

1. A text book of Engineering Chemistry by Jain & Jain, Dhanpat Rai Publishing Company, New Delhi
2. Chemistry of Engineering Materials by C.P. Murthy, C.V. Agarwal and A. Naidu BS Publication Hyd.
3. A text book of Environmental Chemistry and Pollution control by S.S. Dara & Dr. D. D. Mishra, S. Chand & Co, New Delhi
4. Energy,Environment Ecology and Society by Dr.Pushpendra,Vayu Education of India New Delhi
5. Energy, Environment Ethics and Society, by Dr.S.Deswal & Dr.A.Deswal Dhanpat Rai Publishing Company, New Delhi

REFERENCE BOOKS

1. J.C. Kuriakose and J. Rajaram, "Chemistry in Engineering and Technology", Vol.1 & 2, Tata Mcgraw Hill Publishing Company (P) Ltd., New Delhi
2. Mars G. Fontana, "Corrosion Engineering", Tata Mcgraw Hill Publishing Company (P) Ltd., New Delhi.
3. F.Chau, Y. Liang, J. Gao and X. Shao, "Chemometrics", Wiley Inter Science.
4. De A.K., Environmental Chemistry, Wiley Eastern Ltd.
5. Trivedi R.K., Handbook of Environmental Laws, Rules Guidelines, Compliances and Standards', Vol I and II, Enviro Media (R)
6. Brunner R.C., 1989, Hazardous Waste Incineration, McGraw Hill Inc.
7. Clark R.S., Marine Pollution, Clanderson Press Oxford (TB).
8. Cunningham, W.P. Cooper, T.H. Gorhani, E & Hepworth, M.T. 2001, Environmental Encyclopedia, Jaico Publ. House, Mumabai,
9. Boyle, Godfrey, Bob Everett, and Janet Ramage (Eds.) (2004), Energy Systems and Sustainability: Power for a Sustainable Future. Oxford University Press.
10. Schaeffer, John (2007), Real Goods Solar Living Sourcebook: The Complete Guide to Renewable Energy Technologies and Sustainable Living, Gaiam
11. J.P.Gupta, A Text book of Energy, Environment Ethics & Society" Dhanpat Rai Publishing Company.

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Jabalpur Engineering College ,Jabalpur (M.P)

B.Tech III Sem (Common to all branches)

Course content

EVALUATION						
Sub code	Sub Name	L	T	P	Max. Marks	Credits
CH302	Energy & Environmental Engineering	3	1	-	70	4

COURSE OUTCOME: At the end of the course the student will be able to

CO1	Apply the concept of sustainability of renewable energy to overcome the shortcoming of energy from non-renewable sources. Causes & Control of water Pollution
CO2	Understand the interrelationship of different species in variety of ecosystems and hazards of air pollution.
CO3	Conservation of Biodiversity & awareness of Environmental protection Act
CO4	Identify social issues related to environmental pollution and its preventive measure.
CO5	Recognize the origin as well as types of corrosion and apply appropriate protection mechanism to control corrosion. Devices for energy storage.

Mapping of course outcome with program outcome

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1												
CO2												
CO3												
CO4												
CO5												

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Jabalpur Engineering College, Jabalpur.

(Declared Autonomous by MP Govt., Affiliated to RGPV, Bhopal)
(AICTE Model Curriculum Based Scheme)
Bachelor of Technology (B.Tech.) III Semester (Industrial & Production Engg.)

For batches admitted in July 2017 & July 2018 (w.e.f. July 2018)

S.No.	Subject Code	Category Code	Subject Name	Maximum Marks Allotted					Total Marks	Contact Hours Per Week			Total Credits
				Theory			Practical						
				End. Sem.	Mid Sem. Exam.	Quiz/ Assignment	End Sem.	Lab Work		L	T	P	
1	MA311	BSC	Mathematics-III	70	20	10	-	-	100	3	1	-	4
2	CH302	HSMC	Energy & Environmental Engineering	70	20	10	-	-	100	3	1	-	4
3	IP303	PCC	Mechanics of Materials	70	20	10	30	20	150	3	-	2	4
4	IP304	PCC	Machine Drawing & CAD	70	20	10	30	20	150	3	-	2	4
5	IP305	PCC	Thermodynamics	70	20	10	30	20	150	3	-	2	4
6	IP306	ESC	Software Lab-I	-	-	-	30	20	50	-	-	2	1
7	BT307	DLC/PI	Industrial Training Evaluation	-	-	-	30	20	50	-	-	2	1
			Total	350	100	50	150	100	750	15	2	10	22
8	IP308	DLC	Self-Learning Presentation (SWAYAM/NPTEL/MOOC)	-	-	-	-	-	-	-	-	-	4
NSS/NCC/Swachhata Abhiyan/Rural Outreach				Qualifier									
Additional Course for Honours or Minor Specialization				Permitted to opt for maximum two additional courses in subject code IP308 for the award of Honours (Minor Specialization).									

Note: Departmental BOS will decide list of three optional subjects those are available in MOOC. *Students should contact department for opting DLC optional subject/subjects

1 hour lecture (L) = 1 credit | 1 hour Tutorial (T) = 1 credit | 2 hour Practical (P) = 1 credit

Registrar (Academic)
for Principal
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Jabalpur - 482 011 (M.P.)

Controller (Exam)
Jabalpur Engineering College
Jabalpur - 482 011 (M.P.)

DEAN
Academic
JEC, Jabalpur (M.P.)

Principal
Jabalpur Engineering College
Jabalpur - 482 011 (M.P.)

Jabalpur Engineering College, Jabalpur (M.P.)

Branch (CE/ME/IP) w.e.f. July 2018

(Based on AICTE Model Syllabus)

SUBJECT –MATHEMATICS-III (MA 311) [L+T+P =TC][3+1+0=4]

Module 1: Numerical Method-I (08 hours)

Roots of algebraic and transcendental equations: Bisection method, Regula-Falsi method, Newton-Raphson method, iteration method, Graffes root squaring method, Solution of system of linear equations: Gauss elimination method, Gauss Jordan method, LU decomposition method, relaxation method, Jacobi and Gauss-Seidel methods.

Module 2: Numerical Method-II (08 hours)

Interpolation: Finite difference operator and their relationships, difference tables, Newton, Gauss, Bessel and Stirling's interpolation formulae, Divided differences,Lagrange interpolation and Newton's divided difference interpolation. Numerical differentiation and Integration: First and second order derivatives by various interpolation formulae, Trapezoidal, Simpsons $1/3^{rd}$ and $3/8^{th}$ rules.

Module 3: Numerical Method-III (10 hours)

Numerical solution of ordinary differential equations: Solution of ODE by Taylor series, Picard's method , Modified Euller method, Runge-Kutta method, Predictor corrector method. Partial differential equations: Finite difference solution two-dimensional Laplace equation and Poission equation, Implicit and explicit methods for one dimensional heat equation (Bendre Schmidt and Crank-Nicholson methods), Finite difference explicit method for wave equation.

Module 4: Applied Statistics (08 hours)

Curve fitting by the method of least squares- fitting of straight lines, second degree parabolas and more general curves. Test of significance: Large sample test for single proportion, difference of proportions, single mean, difference of means and difference of standard deviations.

Module 5: Concept of Probability (06 hours)

Probability Mass function, Probability Density Function, Discrete Distribution : Binomial, Poisson's Distribution , Continuous Distribution: Normal Distribution, Exponential Distribution.

Books References:

1. P. Kandasamy, K.Thilagavathy, K. Gunavathi, Numerical Methods, S. Chand & Company, 2^{nd} Edition, Reprint 2012.
2. S.S. Sastry, Introductory methods of numerical analysis, PHI, 4^{th} Edition, 2005.
3. B.S. Grewal, Higher Engineering Mathematics, Khanna Publisher, 35^{th} Edition, 2010.
4. N.P. Bali and Manish Goyal, A text book of Engineering Mathematics, Laxmi Publications, Reprint, 2010.
5. S. Ross, A First Course in Probability, 6^{th} Edition, Pearson Education India 2002.
6. W. Feller, An Introduction to Probability Theory and its Applications, Vol. 1, 3^{rd} Edition, Wiley 1968. Statistics.

Course Outcomes :

At the end of the course the students will able to :

1. Understand Mathematical tools for Numerical Solution of algebraic and transcendental equations.
2. Estimate the value of function by various interpolation methods.
3. Determine derivative and integrals by numerical methods.
4. Solve the ODE and PDE by finite difference/numerical methods.
5. Apply probability distribution and statistics in various techniques dealing with engineering problems.

20.7.16

2017/18

Jabalpur Engineering College, Jabalpur (M.P.)
Programme: B.Tech. III-Semester: Industrial & Production Engineering

Credits: 4	IP303	Mechanics of Materials	L: 3, T: 0, P: 2

Course Objective:

- To calculate the stresses and strain of different members of machines.
- To draw shear force and bending moment diagram for various types of beams with different loadings.
- To apply theories of failures to different materials and loading conditions.
- To study torsion and stresses of shafts.

Course Contents:

MECHANICS OF MATERIALS

(IP303)

Module-I:Mechanical Properties of Materials: Ductility, malleability, hardness, toughness, fatigue, creep, behavior of materials under tension, compression, bending, shear, ductile and brittle materials failure of MS and CI in tension and torsion, ductile and brittle failures.Stress and strain: stresses in members of a structure, axial loading, normal stress, shear stress, bearing stress, analysis of simple structures, stress on oblique plane under axial loading, stepped rods, members in series and parallel, stress strain diagram, Hooke's law, modulus of elasticity, elastic and plastic behavior of materials, deformation under axial loading, statically indeterminate problems, stress due to temperature, Poisson's ratio, Bulk modulus, shear strain, relation among elastic constants, residual stress, fiber reinforced composite materials.

Module -II :Transformation of stress and strain, principal stresses, normal and shear stress, Mohr's circle and its application two dimensional analysis, Shear force and BM diagram for various types of loading, stresses in thin walled pressure vessel.

Module-III: Bending: pure bending, symmetric member, deformation and stress, bending of composite sections, eccentric axial loading, beams of unsymmetrical sections, shear stresses in beams, distribution of shear stresses. Deflection of beams, moment area method,

Module-IV :Torsion in shafts: stresses in a shaft, deformation in circulars haft, angle of twist, stepped hollow, thin walled-hollow transmission shafts, transmission shaft under combined bending and torsion; Leaf springs; helical springs, open and closed coil, stress in spring wire, deflection of helical spring, springs in series and parallel..

Module-V :Theories of failures: maximum normal stress & shear stress theory; maximum normal and shear Strain energy theory; maximum distortion energy theory; application of theories to different materials and loading conditions Columns: stability of structures, Euler's formula for columns with different end conditions, Rankin's formula.

EVALUATION

Evaluation will be continuous an integral part of the class as well through external assessment.

References:

1. Beer FP ,Johnson ER, Dewolf JT: Mechanics of Materials; TMH
2. Rattan; Strength of materials ;TMH
3. Nash William ;Schaum's Outline of Strength of Materials; TMH.
4. Negi; strength of materials; TMH
5. Singh Arbind K;Mechanics of Solids ;PHI
6. Strength of Materials, Sadhu Singh,
7. Kamal Kand Ghai RC;Advanced Mechanics of Materials; Khanna Pub.

List of experiments (Pl. expand it):

1. Standard tensile test on MS ~~and CI~~ tests pecimen.
2. Direct/cross Shear test on MS ~~and CI~~ specimen
3. Transverse bending test on wooden beams to obtain modulus of rupture
4. Fatiguet est
5. Brinell Hardness tests
6. Vicker hardness test
7. Izod/ Charpy impact test

Course Outcomes:

At the completion of this course, students should be able to-

CO1	Calculate stresses and strain in different members of the materials.
CO2	Draw Shear force and Bending moment diagram for different types of beams with differer loadings.
CO3	Find out deflection deformation and stress for different types of beams
CO4	Calculate torsion and stresses of shafts.
CO5	Calculate critical load by apply Euler's theory and Rankine's formula for column and strut

Jabalpur Engineering College, Jabalpur (M.P.)
Programme: B.Tech. III-Semester: Industrial & Production Engineering

Credits: 4	IP304	Machine Drawing & CAD	L: 3, T: 0, P: 2

Course Objective:

- To enable the students to prepare a detailed assembly drawing for machine components.
- To provide knowledge of CAD software for 2D and 3D modeling,basic design concepts

MACHINE DRAWING & CAD

(IP304)

Module I

Drawing conventions, drawing and dimensioning IS codes, sectional views and sectioning, surface finish and tolerances ,representation of machine parts such as external and internal threads, slotted heads, square ends ,and flat radial ribs slotted shaft, splined shafts, bearings, springs, gears. Rivet heads and riveted joints, types of welded joints and representation.

Module II

Assembly Machine Drawing: Basic concept, plotting technique, assembly and blow up of parts, bill of materials, product data. Cotter and knuckle joints, pedestal and foot step bearings, cross head, stuffing box, IC engines parts-piston and connecting rods, lathe machine parts.

Module III

CAD software for 2D and 3D modeling, basic design concepts, design process, stages/phases in design, flow chart, problem formulation, CAD applications.

Module IV

Design of components subject to static loads: Riveted joints, welded joints, pin, knuckle, and cotter joints.

References:

1. Bhat,ND;Machine Drawing; Charotar
2. Singh A;Machine Drawing; TMH
3. Narayanaand Reddy; Machine Drawing; Newage, Delhi.
4. Agarwal and agrawal; Engineering Drawing; TMH
5. Shigley J Eetal; Mechanical Engineering Design, TMH
6. Kulkarni S G;Machine Design; TMH
7. Mubeen and Mubeen; Machine Design.

List of Experiments:

1. Introduction to Computer Aided Drafting software for 2D and 3D Modeling
2. Computer Aided Drafting of simple machine parts
3. 3D Modeling of simple solid shapes
4. Design and drawing of parts contained in the syllabus

Course Outcomes:

At the completion of this course , students should be able to-

CO1	Understand Indian standard for machine drawing.
CO2	Understand Fits and Tolerance in technical drawing.
CO3	Draw assembly drawing of joints, couplings and machine elements.
CO4	Draw assembly drawing of I.C.Engine parts and Lathe machine parts.

Mapping of Course outcomes (COs) with Program Outcomes (POs):

Course Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	
CO1	2	1	2	1	0	1	2	1	0	1	1	2
CO2	2	2	2	1	1	1	2	1	0	2	1	2
CO3	3	2	2	2	1	0	1	1	1	3	2	2
CO4	3	2	3	2	1	0	1	1	2	3	2	2

Jabalpur Engineering College, Jabalpur (M.P.)
Programme: B.Tech. III-Semester: Industrial & Production Engineering

Credits: 4	IP305	Thermodynamics	L: 3, T: 0, P: 2

Course Objective:

- To understand laws of thermodynamics, and their applications
- To know heat engine ,heat reservoir ,entropy, entropy change
- To understand Real gas ,its deviation with ideal gas Maxwell relations and their applications
- To understand Pure Substance, phase, phase-transformations use of steam table and Mollier chart
- To know working of Air standard cycles, Carnot, Otto, Diesel, Dual cycles

Course Contents:

THERMODYNAMICS

(IP305)

Module-I

Basic concepts: Basic concepts: Property, Equilibrium, State, Process, Cycle, Zeroth law of thermodynamics, Heat and work transfer. First law of thermodynamics- first law applied to various systems steady flow process, limitations of first law of thermodynamics.

Module-II

Second law of thermodynamics ,heat engine ,heat reservoir, refrigerator, heat pump, COP, EPR , available energy, Carnot's theorem, Carnot's cycle, efficiency of Carnot's cycle, statement of second law reversible and irreversible processes, consequence of second law ,entropy ,entropy change for ideal gas, T-S diagrams, availability and irreversibility. Gibbs and Helmholtz functions.

Module III

Real gas deviation with ideal gas, Vander-wall' sequation, evaluation of its constants, limitations of the equation. The law of corresponding states compressibility factor, generalized compressibility chart, P-V-T surface of a Real gas, thermodynamics relations, Maxwell relation and their applications.

Module-IV

Pure Substance, phase, phase-transformations, formation of steam, properties of steam, PVT surface, HS, TS,PV, PH, TV diagram, processes of vapor measurement of dryness fraction, use of steam table and Mollier chart.

Module-V

Air standard cycles, Carnot, Otto, Diesel, Dual cycles and there comparison, two stroke and four stroke engines, Brayton cycle, non reactive gas mixture, PVT relationship, mixture of ideal gases, properties of mixture of ideal gases, internal energy, enthalpy and specific heat of gas mixtures, enthalpy of gas-mixtures.

References:

1. P.K.Nag; Engineering Thermodynamics ; TMH
2. VanGJ; Thermodynamics; JohnWylen
3. CengelY; Thermodynamics; TMH
4. AroraCP; Thermodynamics ;TMH
5. Engineering Thermodynamics by Omkar Singh New Age International.
6. Engineering Thermodynamics by RathaKrishanan PHI India Pvt. Ltd.
7. Engineering Thermodynamics by M.Achuthan, PHIIndia.

List of Experiments:

List of Experiments:

1. To find mechanical equivalent of heat using Joules apparatus
2. To study working of impulse and reaction steam turbine by models.
3. To study working of Gas turbines by models and to identify various processes of Brayton Cycl
4. To calculate COP of vapor compression refrigeration system and to ploton T-s, p-H diagrams.
5. To plot specific fuel consumption versus rpm diagrams for diesel and petrol engines

Course Outcomes:

At the completion of this course, students should be able to-

CO1	Analyze the laws of thermodynamics, and their applications
CO2	Explain working of heat engine, heat reservoir ,entropy, entropy change.
CO3	Explain Real gas, its deviation with ideal gas Maxwell relations and their applications.
CO4	Analyze Pure Substance, phase, phase-transformations use of steam table and Mollier chart
CO5	Understand working of Airstandard cycles, Carnot, Otto, Diesel, Dual cycles

JABALPUR ENGINEERING COLLEGE, JABALPUR (M.P.)

Branch- Common to All Discipline

CH302	Energy & Environmental Engineering	3L-1T-0P	4 Credits

Module 1:

A. **Introduction to Energy Science:**
World & Indian Energy Scenario, Overview to Energy Systems, Energy sustainability and Environment. Fossil Fuels. Alternatives for fossil fuels: biomass, wind, solar, nuclear, wave, tidal & hydrogen.

B. **Water Pollution:**
Definition, causes, effects and control measures (Primary & Secondary waste water treatment), Acid Rain and marine pollution. Pollution case studies: Minamata Tragedy, Ganga Action Plan, Major oil spills of the 20th & 21st century. Water conservation, Rain water harvesting and water shed management.

Module2: Ecosystems:

Concept of an ecosystem; Structure and function of an ecosystem; Producers, consumers and decomposers; Energy flow in the ecosystem; Ecological succession; Food chains, food webs and ecological pyramids; Introduction, types, characteristic features, structure and function of the following ecosystem (a.)Forest ecosystem (b) Grassland ecosystem (c) Desert ecosystem (d) Aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries)

Causes, effects & Control Measures of Air Pollution: Primary and secondary air pollutants and photo-chemical smog. Climate changes, Global warming, Ozone layer depletion. Pollution case studies: Bhopal gas Disaster and London smog Disaster.

Module 3: Biodiversity and its conservation:

Introduction ,Definition: genetic, species and ecosystem diversity; Bio-geographical classification of India; Value of biodiversity: consumptive use, productive use, social, ethical, aesthetic and option values; Biodiversity at global & National levels; India as a mega-diversity nation; Hot-spots of biodiversity; Threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts; Endangered and endemic species of India; Conservation of biodiversity: In-situ and Ex-situ conservation of biodiversity. Environment Protection Act, Prevention and Control of Pollution Act: Air, water, wild life, forest conservation. Issues involved in enforcement of environmental legislation; Public awareness.

Module 4: Environmental Pollution and Social Issues:

Causes, effects and control measures of Soil pollution, Noise pollution, Thermal pollution, Nuclear hazards, Solid waste Management (urban and industrial wastes), Pollution case studies. Disaster management: floods, earthquake, cyclone and landslides. Environmental ethics, Wasteland reclamation; Consumerism and waste products, issues and possible solutions. Nuclear accidents and holocaust. Case Studies: Chernobyl disaster & the 2004 Asian Earthquake & Tsunami.

Module 5:

A. Corrosion & its prevention:

Theories of Corrosion and Mechanism – Dry (Direct Chemical attack), Wet (Electro Chemical Theory) Atmospheric corrosion, Galvanic Series, Galvanic and Concentration Cell Corrosion, Corrosion by sea water. Factors Influencing and Control of Corrosion – Proper Design, Use of pure metal and metal alloys, passivity, cathodic protection – Sacrificial anode and Impressed Current. Modifying the environment, Use of inhibitors.

Definition, Causes, effects & control measures of water pollution: Acid Rain & Pollution case studies.

B. Batteries:

Classification of Batteries, Important Applications, Lead-Acid battery, Ni-Cd battery & Li battery. Fuel Cell: Hydrogen-Oxygen Fuel cell.

TEXT BOOKS

1. A text book of Engineering Chemistry by Jain & Jain, Dhanpat Rai Publishing Company, New Delhi
2. Chemistry of Engineering Materials by C.P. Murthy, C.V. Agarwal and A. Naidu BS Publication Hyd.
3. A text book of Environmental Chemistry and Pollution control by S.S. Dara & Dr. D. D. Mishra, S. Chand & Co, New Delhi
4. Energy,Environment Ecology and Society by Dr.Pushpendra,Vayu Education of India New Delhi
5. Energy, Environment Ethics and Society, by Dr.S.Deswal & Dr.A.Deswal Dhanpat Rai Publishing Company, New Delhi

REFERENCE BOOKS

1. J.C. Kuriakose and J. Rajaram, "Chemistry in Engineering and Technology", Vol.1 & 2, Tata Mcgraw Hill Publishing Company (P) Ltd., New Delhi
2. Mars G. Fontana, "Corrosion Engineering", Tata Mcgraw Hill Publishing Company (P) Ltd., New Delhi.
3. F.Chau, Y. Liang, J. Gao and X. Shao, "Chemometrics", Wiley Inter Science.
4. De A.K., Environmental Chemistry, Wiley Eastern Ltd.
5. Trivedi R.K., Handbook of Environmental Laws, Rules Guidelines, Compliances and Standards', Vol I and II, Enviro Media (R)
6. Brunner R.C., 1989, Hazardous Waste Incineration, McGraw Hill Inc.
7. Clark R.S., Marine Pollution, Clanderson Press Oxford (TB).
8. Cunningham, W.P. Cooper, T.H. Gorhani, E & Hepworth, M.T. 2001, Environmental Encyclopedia, Jaico Publ. House, Mumabai,
9. Boyle, Godfrey, Bob Everett, and Janet Ramage (Eds.) (2004), Energy Systems and Sustainability: Power for a Sustainable Future. Oxford University Press.
10. Schaeffer, John (2007), Real Goods Solar Living Sourcebook: The Complete Guide to Renewable Energy Technologies and Sustainable Living, Gaiam
11. J.P.Gupta, A Text book of Energy, Environment Ethics & Society" Dhanpat Rai Publishing Company.

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Jabalpur Engineering College ,Jabalpur (M.P)

B.Tech III Sem (Common to all branches)

Course content

EVALUATION						
Sub code	Sub Name	L	T	P	Max. Marks	Credits
CH302	Energy & Environmental Engineering	3	1	-	70	4

COURSE OUTCOME: At the end of the course the student will be able to

CO1	Apply the concept of sustainability of renewable energy to overcome the shortcoming of energy from non-renewable sources. Causes & Control of water Pollution
CO2	Understand the interrelationship of different species in variety of ecosystems and hazards of air pollution.
CO3	Conservation of Biodiversity & awareness of Environmental protection Act
CO4	Identify social issues related to environmental pollution and its preventive measure.
CO5	Recognize the origin as well as types of corrosion and apply appropriate protection mechanism to control corrosion. Devices for energy storage.

Mapping of course outcome with program outcome

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1												
CO2												
CO3												
CO4												
CO5												

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Jabalpur Engineering College, Jabalpur

(Declared Autonomous by MP Govt., Affiliated to RGPV, Bhopal)
(AICTE Model Curriculum Based Scheme)
Bachelor of Technology (B.Tech.) III Semester (Information Technology)

For batches admitted in July 2017 & July 2018 (w.e.f. July 2018)

S.No.	Subject Code	Category Code	Subject Name	Maximum Marks Allotted					Total Marks	Contact Hours Per Week			Total Credits
				Theory			Practical						
				End. Sem.	Mid Sem. Exam.	Quiz/ Assignment	End Sem.	Lab Work		L	T	P	
1	MA331	BSC	Mathematics-III	70	20	10	-	-	100	3	1	-	4
2	CH302	HSMC	Energy & Environmental Engineering	70	20	10	-	-	100	3	1	-	4
3	IT303	PCC	Data Structure & Algorithm	70	20	10	30	20	150	3	-	2	4
4	IT304	PCC	Object Oriented Concept on C++	70	20	10	30	20	150	3	-	2	4
5	IT305	PCC	Electronics & Digital Communication	70	20	10	30	20	150	3	-	2	4
6	IT306	ESC	Software Lab-I	-	-	-	30	20	50	-	-	2	1
7	BT307	DLC/PI	Industrial Training Evaluation	-	-	-	30	20	50	-	-	2	1
			Total	350	100	50	150	100	750	15	2	10	22
8	IT308	DLC	Self-Learning Presentation (SWAYAM/NPTEL/MOOC)	-	-	-	-	-	-	-	-	-	4
NSS/NCC/Swachhata Abhiyan/Rural Outreach				Qualifier									
Additional Course for Honours or Minor Specialization				Permitted to opt for maximum two additional courses in subject code IT308 for the award of Honours (Minor Specialization).									

Note: Departmental BOS will decide list of three optional subjects those are available in MOOC. *Students should contact department for opting DLC optional subject/subjects

1 hour lecture (L) = 1 credit | 1 hour Tutorial (T) = 1 credit | 2 hour Practical (P) = 1 credit

Registrar (Academic)
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Jabalpur - 482 011

Controller (Exam)
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Jabalpur Engineering College, Jabalpur (M.P.)

Branch (CS/IT) w.e.f. July 2018

(Based on AICTE Model Syllabus)

SUBJECT –MATHEMATICS-III (MA331) [L+T+P =TC][3+1+0=4]

Module 1: Numerical Methods-I (08 hours)

Solution of polynomial and transcendental equations – Bisection method, Newton – Raphson method and Regula – Falsi method. Finite differences, Relation between operators, interpolation using Newton's forward and backward difference formulae. Interpolation with unequal intervals: Newton's divided difference and Lagrange's formulae.

Module 2: Numerical Methods-II (10 hours)

Numerical differentiation, Numerical integration: Trapezoidal rule and Simpson's 1/3rd and 3/8 rules. Solution of simultaneous Linear Algebraic equations by Gauss's Elimination, Gauss's Jordan, Crout's methods, Jacobi's Method, Gauss-Seidal, and Relaxation method. Solution of Ordinary differential equations: Taylor's series, Euler and modified Euler's method, Runge Kutta method of fourth order Milne's and Adam's predicator – corrector methods.

Module 3: Basic Probability (08 hours)

Probability spaces, Counting techniques, Probability measure, Conditional probability and Baye's theorem, Random variable and distribution function, Moment, Expected value and Variance of Random variables, Chebychev Inequality, Moment generating function. Bivariate discrete and continuous random variables, Independence of random variables.

Module 4: Probability Distribution (08 hours)

Measures of Central tendency: Moments, Skewness and Kurtosis. Discrete Distributions: Binomial, Poisson's Continuous Distributions: Normal Distribution, Exponential Distribution.

Module 5: Applied Statistics (06 hours)

Curve fitting by the method of least squares- fitting of straight lines, second degree parabolas and more general curves. Test of significance: Large sample test for single proportion, difference of proportions, single mean, difference of means and difference of standard deviations.

Books References:

1. P. Kandasamy, K.Thilagavathy, K. Gunavathi, Numerical Methods, S. Chand & Company, 2nd Edition, Reprint 2012.
2. S.S. Sastry, Introductory methods of numerical analysis, PHI, 4th Edition, 2005.
3. B.S. Grewal, Higher Engineering Mathematics, Khanna Publisher, 35th Edition, 2010.
4. N.P. Bali and Manish Goyal, A text book of Engineering Mathematics, Laxmi Publications, Reprint, 2010.
5. Veerarajan T., Engineering Mathematics, Tata McGraw-Hill, New Delhi, 2008.
6. S. Ross, A First Course in Probability, 6th Edition, Pearson Education India 2002.
7. W. Feller, An Introduction to Probability Theory and its Applications, Vol. 1, 3rd Edition, Wiley 1968. Statistics.
8. Prasanna Sahoo, Probability and Mathematical Statistics, Louisville KY 40292 USA.

Course Outcomes :

At the end of the course the students will able to :

1. Understand Mathematical tools for Numerical Solution of algebraic and transcendental equations.
2. Estimate the value of function by various interpolation methods.
3. Solve the ordinary differential equations by Numerical methods
4. Determine derivative and integrals by numerical methods.
5. Determine the concept of Basic probability.
6. Apply probability distribution and statistics in various techniques dealing with engineering problems.

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Jabalpur Engineering College, Jabalpur
(AICTE Model Curriculum based scheme)
B.Tech. (AICTE) III Sem. (Information Technology)

(w.e.f. July 2018)

Subject Code	Subject Name & Title	Maximum Marks Allotted						Hours/Week			Total Credits
		Theory			Practical		Total Marks	L	T	P	
		End Sem	Mid Sem MST	Quiz, Assignment	End Sem	Lab Work					
IT303	Data Structure & Algorithm	70	20	10	30	20	150	3	-	2	4

Module 1 Introduction Data, data type, data object. Types of data structure – primitive &n non-primitive, linear & non-linear. Operations on data structures – traversing, searching, inserting, deleting. Complexity analysis – worst case, best case, average case. Time – space trade off, algorithm efficiency, asymptotic notations – big oh , omega , theta.

Module 2 Arrays & Structure Introduction , declaration of arrays , operations on arrays – inserting , deleting , merging of two arrays , 1 dimensional & 2 dimensional arrays, row & column major representation , address calculation in array , storing values in arrays , evaluation of polynomial – addition & representation. Searching & sorting – Introduction , sequential search, binary search , Fibonacci search , indexed sequential search, hashed search. Types of sorting with general concepts – bubble , heap , insertion , selection , quick , heap , shell , bucket , radix and merge sort.

Module 3 Stacks & Queues Basic concept of stacks & queues, array representation of stacks, operation on stacks – push , pop , create , getTop , empty , linked representation of stack , multiple stack. Application of stack – Conversion: infix , prefix , postfix and evaluation of arithmetic expression. Linked representation of queue, operations on queue – insertion & deletion. Types of queue with functions – circular , deque , priority queue. Applications of queues – job scheduling , Josephus problem.

Module 4 Linked List Introduction – basic terminology , memory allocation & deallocation for linked list. Linked list variants – head pointer , head node , types linked list – linear & circular linked list. Doubly linked list , creation of doubly list, deletion of node from doubly linked list, insertion of a node from doubly linked list, traversal of doubly linked list. Circular linked list – singly circular linked list , circular linked list with header node , doubly circular linked list. Applications of linked list – polynomial representation & garbage collection.

Module 5 Trees Basic terminology – general tree, representation of general tree, types of trees, binary tree- realization and properties traversal in binary trees – inorder , preorder , postorder , applications of trees. Graph- Basic Terminologies and representations, Graph search and traversal algorithms.

References :

1. Varsha H. Patil "Data Structure Using C++" Oxford.
2. Rajesh K. Shukla "Data Structures Using C & C++" Wiley India.
3. Reema Thareja " Data Structure Using C " Oxford.
4. D. S Malik "Data Structure Using C++ " Second Edition Cengage. 5
5. Kushwaha and Mishra "Data Structure: A programming Approach with C", PHI Learning.
6. A. K Sharma "Data Structure Using C" Pearson.
7. Ellis Horowitz, Sartaj Sahni, "Fundamentals of Data Structures",

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Jabalpur Engineering College Jabalpur, Jabalpur

Department of Information Technology

Semester: III SEM

Subject: Data Structure and Algorithms (IT303)

Course Objectives

1) To impart the basic concepts of various data structure and algorithms.
2) To develop the skills to understand and design the algorithms.
3) To analyze various searching and sorting techniques and compare their performance.
4) To understand the applications of the data structure in solving real life problems.

CO/PEO	1	2	3	4	5	6
1	*					*
2	*					*
3			*			*
4	*		*			*

Jabalpur Engineering College, Jabalpur

(AICTE Model Curriculum based scheme)

B.Tech. (AICTE) III Sem. (Information Technology)

(w.e.f. July 2018)

Subject Code	Subject Name & Title	Maximum Marks Allotted						Hours/Week			Total Credits
		Theory			Practical		Total Marks	L	T	P	
		End Sem	Mid Sem MST	Quiz, Assignment	End Sem	Lab Work					
IT304	Object Oriented Concept on C++	70	20	10	30	20	150	3	-	2	4

Module 1 **Concept of Object Oriented methodology:** Role of programming methodology in software development, Comparison the concepts of structured-oriented programming (SOP) and object-oriented programming (OOP). Need for object oriented programming. Fundamental concepts of object-oriented programming (OOP): abstraction, encapsulation, modularity, data hierarchy through inheritance, Information Hiding, polymorphism and typing, parallelism and stability.

Module 2 **Elements of object oriented:** Object, Class, message passing. Relationships among objects:- links, aggregation. Relationships among classes:- association, aggregation, using, instantiation, meta-class.

Module 3 **Beginning with C++:** What is C++, Difference between C and C++. C++ program life cycle.
Functions in C++: Different forms of functions, function prototyping, call by value; call by Reference, Inline and friend Functions. Command Line Arguments

Module 4 **Encapsulation and Abstraction in C++:** Classes and Objects in C++, defining classes, defining member functions, declaration of objects to class, access to member variables from objects etc, Initialization and assignment for objects. Different forms of member functions, dependence on access specifiers (i.e. Private, public, protected), static data members. Constructor and Destructor in C++: constructors, parameterized constructors Multiple constructors in class dynamic initialization of objects destructors.Implementation of relationship.**Inheritance in C++:** Introduction, types of inheritance, single inheritance, multiple inheritance, multilevel inheritance, hierarchical inheritance, hybrid inheritance etc, virtual base class, abstract class, constructors in derived class.

Module 5 **Polymorphism in C++:** type of polymorphism, function overloading, **operator overloading:-** introduction, defining operator overloading, overloading -(unary, binary operators), overloading binary operators using friends, Rules for overloading operators. **Function overriding:-** introduction to pointers, pointers to objects, this pointer, pointers to derived class, virtual functions, abstract class, pure virtual functions. Introduction to C++ templates.

REFERENCES:

1. Herbert Schildt, " C++ the complete reference", III edition, TMH 1999
2. Balagurusamy, Entrepreneurial, "object oriented programming with C++", TMH
3. Barkakatin," object oriented programming in C++", PHI 1995

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Jabalpur Engineering College Jabalpur, Jabalpur

Department of Information Technology

Semester: III SEM

Object Oriented Concept on C++ (IT304)

Course Objectives

1. To understand the principles used in OOP and its elements.
2. To introduce the C++ programming.
3. To discuss the encapsulation, inheritance and abstraction in C++.
4. To familiarize with the polymorphism and overloading .

CEO\PEO	1	2	3	4	5	6
1	*					
2	*					
3			*			*
4			*	*		*

Jabalpur Engineering College, Jabalpur
(AICTE Model Curriculum based scheme)
B.Tech. (AICTE) III Sem. (Information Technology)

(w.e.f. July 2018)

Subject Code	Subject Name & Title	Maximum Marks Allotted						Hours/Week			Total Credits
		Theory			Practical		Total Marks	L	T	P	
		End Sem	Mid Sem MST	Quiz, Assignment	End Sem	Lab Work					
IT305	Electronics & Digital Communication	70	20	10	30	20	150	3	-	2	4

Module 1 Semi-conductor device, theory of P-N junction, temperature dependence and break down characteristics, junction capacitances. Zener diode, Transistors BJT, FET, MOSFET, types, working principal, characteristics, and region of operation, load line biasing method. Transistor as an amplifier, Feedback amplifier, negative feedback, voltage-series, voltage shunt, current series and current shunt feedback.

Module 2 Switching characteristics of diode and transistor, turn ON, OFF time, reverse recovery time, transistor as switch, Multivibrators, Bistable, Monostable, Astable multivibarators. Operational amplifier characteristics, slew rate, full power bandwidth, offset voltage, bias current, application , inverting , non inverting amplifier , summer , averager , differentiator, integrator, differential amplifier, instrumentation amplifier , log and antilog amplifier , voltage to current and current to voltage converters , comparators.

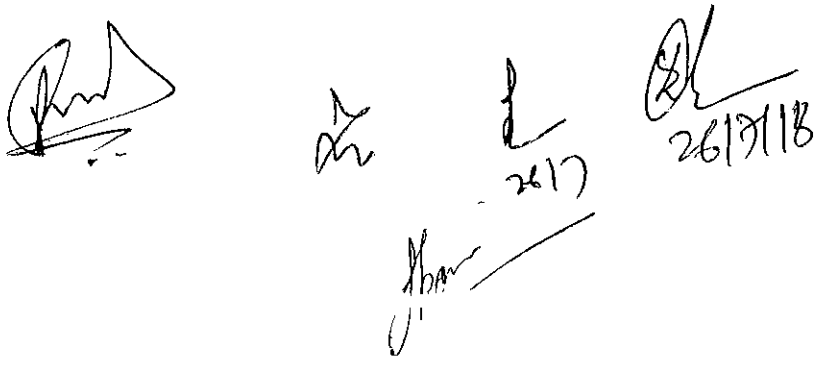
Module 3 Number systems & codes, Binary arithmetic , Boolean algebra and switching function. Minimization of switching function, Concept of prime implicant , Karnaugh map method, Quine & McCluskey's method, Cases with don't care terms, Multiple output switching function.

Module 4 Introduction to logic gates, Universal gate, Analysis and design procedure of Combinational circuits, Half adder, Half subtractor, Full adder, Full subtractor circuits, Series & parallel addition, BCD adders, Lookahead carry generator. Decoders, Encoders, Multiplexers, Demultiplexers, Introduction to various semiconductor memories & designing with ROM and PLA.

Module 5 Analysis and design procedure of synchronous Sequential circuits, Introduction to Shift Registers, Counters, Synchronous & asynchronous counters,

Text Books

1. Digital Design, PHI, 2/e and digital logic and computer design, PHI, by M. Morris Mano
2. Microprocessor Arch. Programming & Application with 8085 by R.S. Gaonkar
3. Digital Computer & Electronics by A.P. Malwino and J.A. Brown, TMH, 3/e
4. 0000 to 8085 Introduction to Microprocessors by P.K. Ghosh & P.R. Sridhar, PHI, 2/e
5. Logic Design Theory, by N.N. Biswas, PHI
6. Milliman Hallkias -Integrated Electronics; TMH Pub.
7. Gayakwad; OP-amp and linear Integrated Circuits; Pearson Education
8. Salivahanan; Electronic devices and circuits; TMH
9. Miliman Grabel; Micro electronics , TMH
10. RobertBoylestad & Nashetsky; Electronics Devices and circuit Theory; Pearson Ed.



For IT

Programme Educational Objectives (PEOs) :

1. Acquire sound knowledge in Information Technology to contribute effectively to the needs of IT industry and the society at large.
2. Gain sufficient capabilities in technologies used particularly in the sectors of communications, distributed computing and testing which are relevant to IT industry.
3. Formulate, analyze and solve real life problems faced in industry.
4. Able to learn the latest trends in Information Technology and ready for life-long learning process.
5. Have awareness about professional ethics of the Software Industry, basic soft skills essential for working in community and professional teams.
6. Able to appear for competitive examinations, in order to reach higher echelons of excellence.

Programme Outcomes (POs) :

1. Graduates will demonstrate basic knowledge in fundamentals of Information Technology and related programming technologies.
2. Graduates will demonstrate basic knowledge of networking with wireless technologies, multimedia technology and distributed computing, software testing and topics of current relevance to IT industry.
3. Graduates will have knowledge of the best practices in software development in industry.
4. Graduates will demonstrate the ability to design creative solutions to real life problems.
5. Graduates will demonstrate capability to work in teams and in professional work environments.
6. Graduates will be able to communicate technical topics in written and verbal forms.
7. Graduates will demonstrate an understanding of the problems of the IT industry.
8. Graduates will demonstrate their ability to use the state of the art technologies and tools including Free and Open Source Software (FOSS) tools in developing software.
9. Graduates will demonstrate good performance at the competitive examinations like GATE, GRE, CAT for higher education and / or seek employment.
10. Graduates will demonstrate their qualities of learning and demonstrating latest technology.
11. Graduates will have developed the capability for self-learning.

Jabalpur Engineering College, Jabalpur
(AICTE Model Curriculum based scheme)
B.Tech. (AICTE) III Sem. (Information Technology)

(w.e.f. July 2018)

Subject Code	Subject Name & Title	Maximum Marks Allotted						Hours/Week			Total Credits
		Theory			Practical		Total Marks	L	T	P	
		End Sem	Mid Sem MST	Quiz, Assignment	End Sem	Lab Work					
IT305	Electronics & Digital Communication	70	20	10	30	20	150	3	-	2	4

Course Outcomes

Students will be able to

1. Apply the knowledge of diode, transistor, FET, MOSFET in various electronic application circuits
2. Construct various circuits using operation amplifier
3. Correlate different types of number system
4. Design combinational and switching circuits
5. Analyse various sequential circuits

JABALPUR ENGINEERING COLLEGE, JABALPUR (M.P.)

Branch- Common to All Discipline

CH302	Energy & Environmental Engineering	3L-1T-0P	4 Credits

Module 1:

A. **Introduction to Energy Science:**
World & Indian Energy Scenario, Overview to Energy Systems, Energy sustainability and Environment. Fossil Fuels. Alternatives for fossil fuels: biomass, wind, solar, nuclear, wave, tidal & hydrogen.

B. **Water Pollution:**
Definition, causes, effects and control measures (Primary & Secondary waste water treatment), Acid Rain and marine pollution. Pollution case studies: Minamata Tragedy, Ganga Action Plan, Major oil spills of the 20th & 21st century. Water conservation, Rain water harvesting and water shed management.

Module2: Ecosystems:

Concept of an ecosystem; Structure and function of an ecosystem; Producers, consumers and decomposers; Energy flow in the ecosystem; Ecological succession; Food chains, food webs and ecological pyramids; Introduction, types, characteristic features, structure and function of the following ecosystem (a.)Forest ecosystem (b) Grassland ecosystem (c) Desert ecosystem (d) Aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries)

Causes, effects & Control Measures of Air Pollution: Primary and secondary air pollutants and photo-chemical smog. Climate changes, Global warming, Ozone layer depletion. Pollution case studies: Bhopal gas Disaster and London smog Disaster.

Module 3: Biodiversity and its conservation:

Introduction ,Definition: genetic, species and ecosystem diversity; Bio-geographical classification of India; Value of biodiversity: consumptive use, productive use, social, ethical, aesthetic and option values; Biodiversity at global & National levels; India as a mega-diversity nation; Hot-spots of biodiversity; Threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts; Endangered and endemic species of India; Conservation of biodiversity: In-situ and Ex-situ conservation of biodiversity. Environment Protection Act, Prevention and Control of Pollution Act: Air, water, wild life, forest conservation. Issues involved in enforcement of environmental legislation; Public awareness.

Module 4: Environmental Pollution and Social Issues:

Causes, effects and control measures of Soil pollution, Noise pollution, Thermal pollution, Nuclear hazards, Solid waste Management (urban and industrial wastes), Pollution case studies. Disaster management: floods, earthquake, cyclone and landslides. Environmental ethics, Wasteland reclamation; Consumerism and waste products, issues and possible solutions. Nuclear accidents and holocaust. Case Studies: Chernobyl disaster & the 2004 Asian Earthquake & Tsunami.

Module 5:

A. Corrosion & its prevention:

Theories of Corrosion and Mechanism – Dry (Direct Chemical attack), Wet (Electro Chemical Theory) Atmospheric corrosion, Galvanic Series, Galvanic and Concentration Cell Corrosion, Corrosion by sea water. Factors Influencing and Control of Corrosion – Proper Design, Use of pure metal and metal alloys, passivity, cathodic protection – Sacrificial anode and Impressed Current. Modifying the environment, Use of inhibitors.

Definition, Causes, effects & control measures of water pollution: Acid Rain & Pollution case studies.

B. Batteries:

Classification of Batteries, Important Applications, Lead-Acid battery, Ni-Cd battery & Li battery. Fuel Cell: Hydrogen-Oxygen Fuel cell.

TEXT BOOKS

1. A text book of Engineering Chemistry by Jain & Jain, Dhanpat Rai Publishing Company, New Delhi
2. Chemistry of Engineering Materials by C.P. Murthy, C.V. Agarwal and A. Naidu BS Publication Hyd.
3. A text book of Environmental Chemistry and Pollution control by S.S. Dara & Dr. D. D. Mishra, S. Chand & Co, New Delhi
4. Energy,Environment Ecology and Society by Dr.Pushpendra,Vayu Education of India New Delhi
5. Energy, Environment Ethics and Society, by Dr.S.Deswal & Dr.A.Deswal Dhanpat Rai Publishing Company, New Delhi

REFERENCE BOOKS

1. J.C. Kuriakose and J. Rajaram, "Chemistry in Engineering and Technology", Vol.1 & 2, Tata Mcgraw Hill Publishing Company (P) Ltd., New Delhi
2. Mars G. Fontana, "Corrosion Engineering", Tata Mcgraw Hill Publishing Company (P) Ltd., New Delhi.
3. F.Chau, Y. Liang, J. Gao and X. Shao, "Chemometrics", Wiley Inter Science.
4. De A.K., Environmental Chemistry, Wiley Eastern Ltd.
5. Trivedi R.K., Handbook of Environmental Laws, Rules Guidelines, Compliances and Standards', Vol I and II, Enviro Media (R)
6. Brunner R.C., 1989, Hazardous Waste Incineration, McGraw Hill Inc.
7. Clark R.S., Marine Pollution, Clanderson Press Oxford (TB).
8. Cunningham, W.P. Cooper, T.H. Gorhani, E & Hepworth, M.T. 2001, Environmental Encyclopedia, Jaico Publ. House, Mumabai,
9. Boyle, Godfrey, Bob Everett, and Janet Ramage (Eds.) (2004), Energy Systems and Sustainability: Power for a Sustainable Future. Oxford University Press.
10. Schaeffer, John (2007), Real Goods Solar Living Sourcebook: The Complete Guide to Renewable Energy Technologies and Sustainable Living, Gaiam
11. J.P.Gupta, A Text book of Energy, Environment Ethics & Society" Dhanpat Rai Publishing Company.

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Jabalpur Engineering College ,Jabalpur (M.P)

B.Tech III Sem (Common to all branches)

Course content

EVALUATION						
Sub code	Sub Name	L	T	P	Max. Marks	Credits
CH302	Energy & Environmental Engineering	3	1	-	70	4

COURSE OUTCOME: At the end of the course the student will be able to

CO1	Apply the concept of sustainability of renewable energy to overcome the shortcoming of energy from non-renewable sources. Causes & Control of water Pollution
CO2	Understand the interrelationship of different species in variety of ecosystems and hazards of air pollution.
CO3	Conservation of Biodiversity & awareness of Environmental protection Act
CO4	Identify social issues related to environmental pollution and its preventive measure.
CO5	Recognize the origin as well as types of corrosion and apply appropriate protection mechanism to control corrosion. Devices for energy storage.

Mapping of course outcome with program outcome

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1												
CO2												
CO3												
CO4												
CO5												

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Jabalpur Engineering College, Jabalpur

(Declared Autonomous by MP Govt., Affiliated to RGPV, Bhopal)
(AICTE Model Curriculum Based Scheme)
Bachelor of Technology (B.Tech.) III Semester (Mechanical Engg.)

For batches admitted in July 2017 & July 2018 (w.e.f. July 2018)

S.No.	Subject Code	Category Code	Subject Name	Maximum Marks Allotted					Total Marks	Contact Hours Per Week			Total Credits
				Theory			Practical						
				End. Sem.	Mid Sem. Exam.	Quiz/ Assignment	End Sem.	Lab Work		L	T	P	
1	MA311	BSC	Mathematics-III	70	20	10	-	-	100	3	1	-	4
2	ME302	PCC	Material Science	70	20	10	-	-	100	3	1	-	4
3	ME303	PCC	Strength of Materials	70	20	10	30	20	150	3	-	2	4
4	ME304	PCC	Manufacturing Process	70	20	10	30	20	150	3	-	2	4
5	ME305	PCC	Thermodynamics	70	20	10	30	20	150	3	-	2	4
6	ME306	ESC	Software Lab-I	-	-	-	30	20	50	-	-	2	1
7	BT307	DLC/PI	Industrial Training Evaluation	-	-	-	30	20	50	-	-	2	1
			Total	350	100	50	150	100	750	15	2	10	22
8	ME308	DLC	Self-Learning Presentation (SWAYAM/NPTEL/MOOC)	-	-	-	-	-	-	-	-	-	4
NSS/NCC/Swachhata Abhiyan/Rural Outreach				Qualifier									
Additional Course for Honours or Minor Specialization				Permitted to opt for maximum two additional courses in subject code ME308 for the award of Honours (Minor Specialization).									

Note: Departmental BOS will decide list of three optional subjects those are available in MOOC. *Students should contact department for opting DLC optional subject/subjects

1 hour lecture (L) = 1 credit	1 hour Tutorial (T) = 1 credit	2 hour Practical (P) = 1 credit

Registrar (Academic)
for Principal
Jabalpur Engineering College
Jabalpur - 482 011 (M.P.)

Controller (Exam)
Jabalpur Engineering College
Jabalpur - 482 011 (M.P.)

DEAN
Academic
JEC, Jabalpur (M.P.)

Principal
Jabalpur Engineering College
Jabalpur - 482 011 (M.P.)

Jabalpur Engineering College, Jabalpur (M.P.)

Branch (CE/ME/IP) w.e.f. July 2018

(Based on AICTE Model Syllabus)

SUBJECT –MATHEMATICS-III (MA 311) [L+T+P =TC][3+1+0=4]

Module 1: Numerical Method-I (08 hours)

Roots of algebraic and transcendental equations: Bisection method, Regula-Falsi method, Newton-Raphson method, iteration method, Graffes root squaring method, Solution of system of linear equations: Gauss elimination method, Gauss Jordan method, LU decomposition method, relaxation method, Jacobi and Gauss-Seidel methods.

Module 2: Numerical Method-II (08 hours)

Interpolation: Finite difference operator and their relationships, difference tables, Newton, Gauss, Bessel and Stirling's interpolation formulae, Divided differences,Lagrange interpolation and Newton's divided difference interpolation. Numerical differentiation and Integration: First and second order derivatives by various interpolation formulae, Trapezoidal, Simpsons 1/3rd and 3/8th rules.

Module 3: Numerical Method-III (10 hours)

Numerical solution of ordinary differential equations: Solution of ODE by Taylor series, Picard's method , Modified Euller method, Runge-Kutta method, Predictor corrector method. Partial differential equations: Finite difference solution two-dimensional Laplace equation and Poission equation, Implicit and explicit methods for one dimensional heat equation (Bendre Schmidt and Crank-Nicholson methods), Finite difference explicit method for wave equation.

Module 4: Applied Statistics (08 hours)

Curve fitting by the method of least squares- fitting of straight lines, second degree parabolas and more general curves. Test of significance: Large sample test for single proportion, difference of proportions, single mean, difference of means and difference of standard deviations.

Module 5: Concept of Probability (06 hours)

Probability Mass function, Probability Density Function, Discrete Distribution : Binomial, Poisson's Distribution , Continuous Distribution: Normal Distribution, Exponential Distribution.

Books References:

1. P. Kandasamy, K.Thilagavathy, K. Gunavathi, Numerical Methods, S. Chand & Company, 2nd Edition, Reprint 2012.
2. S.S. Sastry, Introductory methods of numerical analysis, PHI, 4th Edition, 2005.
3. B.S. Grewal, Higher Engineering Mathematics, Khanna Publisher, 35th Edition, 2010.
4. N.P. Bali and Manish Goyal, A text book of Engineering Mathematics, Laxmi Publications, Reprint, 2010.
5. S. Ross, A First Course in Probability, 6th Edition, Pearson Education India 2002.
6. W. Feller, An Introduction to Probability Theory and its Applications, Vol. 1, 3rd Edition, Wiley 1968. Statistics.

Course Outcomes :

At the end of the course the students will able to :

1. Understand Mathematical tools for Numerical Solution of algebraic and transcendental equations.
2. Estimate the value of function by various interpolation methods.
3. Determine derivative and integrals by numerical methods.
4. Solve the ODE and PDE by finite difference/numerical methods.
5. Apply probability distribution and statistics in various techniques dealing with engineering problems.

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Jabalpur Engineering College, Jabalpur (M.P.)
Programme: B.Tech. III-Semester: Mechanical Engineering (AICTE)

ME302	MATERIAL SCIENCE

Course objective:

1. To give basic knowledge of science behind materials and physical metallurgy.
2. Introduce the concept of structure property relations.
3. Lay the ground work for studies and fields such as solid state physics, mechanical behavior of materials, phase and phase diagram, heat treatment, failure of materials and their protection.

Course Contents:

Module 1

Crystal Atoms of Solid: Structure of atom binding in solids metallic, Vander walls, ionic and covalent, Space lattice and crystal system arrangement of atoms in BCC, FCC and HCP crystal. Manufacture of refractory and ferrous metals, properties uses and selection of acid, basic and natural refractory, metallurgical coke, properties, types, uses and brief description of the manufacturing processes for iron and steel making.

Module 2

Mechanical Property measurement: Tensile, compression and torsion tests; Young'smodulus, relations between true and engineering stress-strain curves, generalized Hooke'slaw, yielding and yield strength, ductility, resilience, toughness and elastic recovery;Hardness: Rockwell, Brinell and Vickers and their relation to strength, Creep fatigue.

Module 3

Plastic Deformation of Metals: Point and line defects in crystals, their relation to mechanical properties, deformation of metal by slip and twinning stress strain curves of poly crystalline materials viz. mild steel cast iron and brass yield point phenomenon. Cold and hot working of metals and their effect on mechanical properties, annealing of cold worked metals, principles of re-crystallization and grain growth phenomenon, fracture in metal and alloys, ductile and brittle fracture, fatigue failure

Module 4

Alloy Formation and Binary Diagram: Phase in metal system solution and inter-metallic compounds. Hume-Rottery's rules, solidification of pure metals and alloy equilibrium diagrams of isomorphous, eutectic peritectic and eutectoid system, non-equilibrium cooling and coring iron, iron carbon equilibrium diagram. Introduction to cast iron and steel

Module 5

Heat Treatment of Alloys Principles of Heat Treatment of Steel: TTT curves heat treating processes, normalizing, annealing spheroidizing, hardening, tempering, case hardening, austempering, mar-tempering, precipitation hardening process with reference to Al, Cu alloys Non Ferrous metals base alloys, Bronze, Brasses, Duralumin, and Bearing Metals.

Powder Metallurgy: Property and Applications of Powder Metallurgy, Various process and methods of making products by powder Metallurgy techniques.

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Evaluation:
Evaluation will be continuous an integral part of the class followed by the final examination as well as through external assessment.

References:

1. Narula GK, KS and GuptaVK; Material science; TMH
2. Raghavan V; Material Science and Engineering, PHI Publication.
3. Raghavan V; Physical Metallurgy Principles and Practice; PHI
4. Rajendran V and Marikani; Material science; TMH
5. Sriniwasan R; Engineering materials and Metallurgy; TMH
6. Navneet Gupta, Material Science & Engineering, Dhanpat Rai.
7. G. E. Dieter, Mechanical Metallurgy, Mc-Graw Hill, 1987
8. D.S.Clark and W. Varney, Physical Metallurgy for Engineers 2ed., East-West, 1994
9. B. K. Agrawal, Introduction to Engineering Materials, TMH.

Course Outcomes:

At the completion of this course, students should be able to

CO1	Explain the crystal structure and classification of materials.
CO2	Illustrate methods of determining mechanical properties and their suitability for applications.
CO3	Interpret the phase diagrams of materials.
CO4	Select suitable heat-treatment process to achieve desired properties of metals and alloys

Mapping of Course outcomes (COs) with Program Outcomes (POs):

Course Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	1	2	1	-	-	-	-	-	-	-	-	-
CO2	2	3	1	-	-	-	-	-	-	-	-	-
CO3	-	2	-	1	-	-	1	-	-	-	-	-
CO4	1	3	2	-	-	-	-	-	-	-	-	-

21/7/2018

Jabalpur Engineering College, Jabalpur (M.P.)
Programme: B.Tech. III-Semester: Mechanical Engineering (AICTE)

ME303 STRENGTH OF MATERIALS

Course Objective:

At the completion of course the students will be able:

- To calculate the stresses and strain of different members of machines.
- To draw shear force and bending moment diagram for various types of beams with different loadings.
- To find the deflection of various types of beams with different loadings.
- To study torsion of shafts and stresses in thin cylinders and spheres.

Course Contents:

Module 1 **Stress and Strain**: Stresses in members of a structure, Axial loading, normal stress, shear stress, analysis of simple structures, stepped rods, bars of varying section, stress-strain diagram, Hooke's law, stress due to temperature, Poisson's ratio, Bulk modulus, shear strain, relation among elastic constants, residual stress, strain energy under axial loads and stresses due to impact of falling weights. Transformation of stress and strain principal stresses, normal and shear stress, Mohr's circle and its application to two dimensional analyses.

Module 2 **Shear Force and Bending Moment:** Shear force and Bending Moment diagram for cantilever, beam supported at ends, beams with overhangs. Point of contraflexure.
Stresses in beams: Pure bending, Theory of simple bending, Neutral layer- neutral axis, Stress distribution in beams, Flexure formula, Section modulus, Bending of symmetric member, Bending of composite sections, Normal and shear stresses in beams.

Module 3 **Deflection Of Beams:** Slope, Deflection and Radius of curvature, Cantilevers subjected to various types of load, Macaulay's method and Area moment method for deflection of Cantilever beam, Simply supported beam and Overhanging beam subjected to various types of loads, Relation between maximum bending and maximum deflection.

Module 4 **Torsion of Shafts**: Theory of pure torsion, Polar modulus, Torsional Rigidity, angle of twist, Torsional stresses in a shafts, Power transmitted by a shaft, Stepped shafts, Composite shafts, Torsional resilience, shafts in series and shafts in parallel, Torsion of a tapering rod.

Module 5 **Columns And Struts:** stability of structures, Crushing load, Crippling load, Euler's formula for columns with different end conditions, Rankine's formula, Limitation of Euler's formula.
Thin Cylinders and Spheres: Circumferential and Longitudinal stresses, Wire bound pipes, Thin spherical shells.

Evaluation:

Evaluation will be continuous an integral part of the class followed by the final examination as well as through external assessment.

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References:

1. Beer FP, Johnson Mechanics of Materials, Sixth Edition; Mc Graw Hills.
1. Debabrata Nag &Abhijet Chanda: Strength of Materials: Wiley.
2. Rattan; Strength of materials;Second Edition , Mc Graw Hills.
3. Nash William; Schaum's Outline Series; fourth Edition Strength of Materials;McGraw Hills.
4. Singh Arbind K; Mechanics of Solids; PHI.
5. Sadhu Singh; Strength of Materials; Khanna Pub.
6. R Subramannian, Strength of materials OXFORD University Press, Third Edition.
7. S Ramamurthum, Strength of materials, Dhanpat Rai.
8. Stephen Timoshenko;Strength of materials; part 1 &2; CBS Pub.

At the completion of this course, students should be able to-

CO1	Calculate stresses and strain in different structural members under uni-axial and combine loading.
CO2	Evaluate stresses in beam and shafts under various loading like torsion, pure bending etc..
CO3	Calculate deflection at any section for different types of beams.
CO4	Analyze stresses in the pressure vessel and critical load in the column.

Mapping of Course outcomes (COs) with Program Outcomes (POs):

Course Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	3	2	-	-	-	-	-	-	-	-	-
CO2	1	2	2	-	-	-	-	-	-	-	-	-
CO3	2	2	3	-	-	-	-	-	-	-	-	-
CO4	1	3	2	1	-	-	-	-	-	-	-	-

Jabalpur Engineering College, Jabalpur (M.P.)
Programme: B.Tech. III-Semester: Mechanical Engineering (AICTE)

ME304	MANUFACTURING PROCESS

Course objective: Students are able to explain and distinguish various Manufacturing processes like casting, metal forming, welding, rolling and press working

Course Contents:

Module 1 . Pattern Making: Types of pattern; Pattern and pattern making, pattern allowances; pattern design considerations, core and core boxes.

Casting: Types of casting process. Molding and Foundry core sands and their properties, gating, runners, risers, solidification, defects and elimination, molding machines, centrifugal casting, dye casting, shell molding; Lost wax molding; continuous casting; cupola description and operation.

Module 2 . Welding: Types of welding ,Gas welding method, flames, gas cutting, Electric arc welding, AC and DC welding machines and their characteristics, flux, electrodes, submerged arc welding, TIG& MIG welding; pressure welding; electric resistance welding spot, seam and butt welding; Consumable estimation for weld length and size, Thermit chemical welding; brazing and soldering, welding defects & remedies. Safety precautions.

Module 3 . Forging: Types of forging operations. Theory and application of forging processes, description of drop and horizontal forging machines.

Module 4 . Press working: Description and operation of processes, process of shearing, punching, piercing ,blanking, trimming, perfecting, notching, lancing, embossing, coining, bending, forging and drawing; press, types of presses, tool dies, die punch clearance, auxiliary equipment, safety devices, stock feeders, scrap cutters, forces, pressure and power requirements .

Module 5 . Rolling: Types of Rolling operations, stages of rolling for formation, General description of machines and process; rolling of structural section plates and sheets; hot and cold rolling techniques.

Evaluation:
Evaluation will be continuous an integral part of the class followed by the final examination as well as through external assessment .

References:

1. Anderson and Tetro; Shop Theory; Mc Graw Hills.
2. Kaushish JP; Manufacturing Processes; PHI Learning.
3. KalpakjianProducting Engineering, PEARSON Education.
4. Chapman; Workshop Technology.
5. Philip F Ostwald; Manufacturing Process &systems: John Wiley.
6. Raghuvanshi; Workshop Technology; Dhanpat Rai.
7. HajraChoudhary; Workshop Technology: Vol I.
8. Bhupendra Gupta, Manufacturing Process; Dhanpat Rai Publishing Co., New Delhi.

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Course Outcomes:

At the completion of this course, students should be able to

CO1	Define the general production processes like casting, forging, press working, welding and spinning.
CO2	Illustrate working principle of metrology instruments used in production shop.
CO3	Explain metal cutting process on Lathe with machining economics.
CO4	Compare various welding processes.

Mapping of Course outcomes (COs) with Program Outcomes (POs):

Course Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	2	1									
CO2	1	2	2									
CO3		3	3	1								
CO4	1	2	2									

List of Experiments:

1. Study of tools used for various manufacturing processes. (It includes application, use and live demonstration)
2. Hands on exercise on patternmaking (make any one type of wooden pattern using simple tools)
3. Study of Molding and Casting process.
4. Performance on Metal Casting of Simple component
5. Performance on Welding of simple work piece (Example Arc and Resistance Welding)
6. Study of forging machine & demonstration of various operations of forging.
7. Study of mechanical, Hydraulic, Pneumatic presses.
8. Demonstration of process like; shearing, punching, piercing, blanking, trimming, drawing, etc.
9. Study of rolling process and evaluation of power requirements.

Course Outcomes: Laboratory

At the completion of this course, students should be able to

CO1	Distinguish among various casting processes.
CO2	Explain Mechanical working of metals.
CO3	Able to apply welding process, press working and rolling process.
CO4	Experiments with forging operations.

Jabalpur Engineering College, Jabalpur (M.P.)
Programme: B.Tech. III-Semester: Mechanical Engineering (AICTE)

ME305	THERMODYNAMICS

Course Objective:

To develop ability and gain insight into the process of problem-solving, with emphasis on thermodynamics .Specially in following manner:

- Apply conservation principles (mass and energy) to evaluate the performance of simple engineering systems and cycles,
- Evaluate thermodynamic properties of simple homogeneous substances,
- Analyze processes and cycles using the second law of thermodynamics to determine efficiency and performance,
- Discuss the physical relevance of the numerical values for the solutions to specific engineering problems and the physical relevance of the problems in general,
- Critically evaluate the validity of the numerical solutions for specific engineering problems.

Course Contents:

Module 1 . **Introduction & Basic Concepts:** Fundamentals - System & Control volume, Property, State & Process, Cycle, Temperature, Types of equilibrium, Zeroth law of thermodynamics, Temperature scales, Various thermometers, Heat & Work transfer.

Module 2 . **The First Law of Thermodynamics:** Heat/work interaction in systems, First Law for Cyclic & Non-cyclic processes, Total energy, Various modes of energy, Internal energy and Enthalpy, First Law for Flow Processes, Steady state flow processes, Unsteady processes, Limitations of first law of thermodynamics.

Module 3 . **The Second Law of Thermodynamics:** Second law-Kelvin-Planck and Clausius statements, Heat engine, Heat reservoir, Refrigerator, Heat pump, Thermal efficiency and COP, Reversible and irreversible processes, Carnot cycle, Internal and external irreversibility, Absolute temperature scale. Clausius inequality, Entropy, Entropy for solids, liquids, ideal gases undergoing various processes, Principle of increase of entropy, T-S diagrams, Irreversibility and Availability, Exergy.

Module 4 . **Properties of Pure Substance:** Pure Substance, Phase, Phase-transformations, Formation of steam, Properties of steam, PVT surface, HS, TS, PV, PH, TV diagram, Processes of vapor, Measurement of dryness fraction, Use of Steam tables and Mollier chart.

Module 5 . **Air Standard Cycles and Non-reactive Gas Mixture:** Carnot, Otto, Diesel, Dual cycles and their comparison,Brayton Cycle, PVT relationship, Mixture of ideal gases, Properties of mixture of ideal gases-Internal energy, Enthalpy and Specific heat of gas mixtures.

Steam Tables, Mollier Charts & tables connected to reactive systems are allowed in Examination hall.

Evaluation:

Evaluation will be continuous and integral part of the class followed by the final examination.

21.7.18

References:

1. P.K.Nag; Engineering Thermodynamics; Mc-Graw Hills Fifth Edition.
1. Cengel Y; Thermodynamics; Mc-Graw Hills, Eight Edition.
2. Kross& Potter Thermodynamics for Engineers CENGAGE Learning.
3. Moran, Shapiro, Boettner Principles of Engineering Thermodynamics Wiley student edition.
4. P Chattopadhya, Engineering Thermodynamics Second Edition, OXFORD University Press.
5. Zemansky Heat & Thermodynamics, Eight Edition, Mc-Graw Hills India Education.
6. R Yadav Applied Thermodynamics, Central Publishing house Allahabad.
7. Van Wylin&Sontak, Thermodynamics by, Wiley, Eastern.

Course Outcomes:

At the completion of this course, students should be able to

CO1	Demonstrate of thermodynamic properties of fluids using standard tables & Charts.
CO2	Illustrate the thermodynamic processes on p-v, T-S, h-S diagrams.
CO3	Estimate of energy interactions of different thermodynamic system.
CO4	Analyze Otto, Diesel, Dual air standard cycles

Mapping of Course outcomes (COs) with Program Outcomes (POs):

Course Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	1										
CO2	1	2										
CO3	1	2	1									
CO4	1	2										

List of Experiments:

1. Verification of First law of Thermodynamics.
2. Study of low pressure boilers.
3. Study of Boiler Mountings and Accessories.
4. Measurement of dryness fraction by Separating Calorimeter.
5. Measurement of dryness fraction by ThrottlingCalorimeter.
6. Measurement of dryness fraction by Separating and Throttling Calorimeter.
7. Study of 2 stroke petrol engine.
8. Study of 4 stroke petrol engine.
9. Study of 2 stroke diesel engine
10. Study of 4 stroke diesel engine.

Jabalpur Engineering College, Jabalpur (M.P.)
Programme: B.Tech. III-Semester: Mechanical Engineering (AICTE)

ME306 SOFTWARE LAB-I (AUTO CAD)

Course Objective

1. Learn the basic concepts and principles of modeling software.
2. Learn the fundamentals of AutoCAD.
3. Will apply the course knowledge to do a design project on AutoCAD.

Course Content:

Basic concepts of AutoCAD tools, introduction to AutoCAD commands like POINT, LINE, POLYGON, CIRCLE, COPY, MOVE, EXTRUDE etc., concepts & techniques of 1D and 2D (surface) modelling using AutoCAD, 2D transformations, mesh preparation, modelling of curves, modelling of B-Spline, 3D modelling (solid modelling) using various techniques, 3D transformations and projections, generation of 3D objects from 2D shapes, an overview of geometric modelling, cubic curve, Bezier curve and Bezier surface, part modelling: assembly.

List of Experiments (Please Expand it):

1. Study of basic AutoCAD tools and commands and to apply them to draw the projections of points.
2. To make use of the basic commands to draw the projections of lines in AutoCAD.
3. To apply the basic commands to draw the projections of planes in AutoCAD.
4. To utilize the basic commands to draw the projections of solids in AutoCAD.
5. To apply the basic knowledge of AutoCAD to draw the solid of revolution and surface of revolution.
6. To utilize the basic knowledge of AutoCAD to draw the plane curves, space curves and lofted solids.

References:

1. George Omura, Steven Keith, Mastering Auto Cad 14 for Mechanical Engineers, Sybex, 1998.
2. Munir Hamad, Autocad 2018, Mercury Learning & Information, 2017.
3. J. Todd, AutoCAD 2007 for DUMMIES, Jason.
4. Steve Heather, AutoCAD 3D Modeling, Industrial Press, Incorporated, 2017.
5. Cheryl R. Shrock, Beginning AutoCAD 2010: Exercise Workbook, Industrial Press, 2009.
6. Ellen Finkelstein, AutoCAD 2015 and AutoCAD LT 2015 Bible, John Wiley & Sons, 2014.

Evaluation:

Evaluation will be continuous and integral part of the class followed by the final practical examination as well as through external assessment

Course Outcomes:

At the completion of this course, students should be able to:

CO1	Demonstrate basic concepts and tools of the AutoCAD software.
CO2	Apply basic concepts of AutoCAD to develop lines, curves, planes and surfaces.
CO3	Illustrate the orthographic projections, solid modelling concepts and techniques.

Mapping of Course outcomes (COs) with Program Outcomes (POs):

Course Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	1	-	2	-	1	-	-	-	-	-	-	1
CO2	1	-	1	-	2	-	-	-	2	-	-	1
CO3	1	-	2	-	2	-	-	-	1	-	-	1

Revised Scheme. (4)

25/1/23

Jabalpur Engineering College, Jabalpur

(Declared Autonomous by MP Govt., Affiliated to RGPV, Bhopal)

(AICTE Model Curriculum Based Scheme)

Bachelor of Technology (B.Tech.) III Semester (Artificial Intelligence & Data Science)

w.e.f. July 2022

S.No.	Subject Code	Category Code	Subject Name	Maximum Marks Allotted					Total Marks	Contact Hours Per Week			Total Credits
				Theory			Practical						
				End. Sem.	Mid Sem. Exam.	Quiz/ Assignment	End Sem.	Lab Work		L	T	P	
1	MA331	BSC	Mathematics - III	70	20	10	-	-	100	3	1	-	4
2	CH302	HSMS	Energy & Enviroment Engineering	70	20	10	-	-	100	3	1	-	4
3	AI303	PCC	Data Structures & Algorithms	70	20	10	30	20	150	3	-	2	4
4	AI304	PCC	Object Oriented Programming Using Java	70	20	10	30	20	150	3	-	2	4
5	AI305	PCC	Digital Logic Design & Computer Organization	70	20	10	30	20	150	3	-	2	4
6	AI306	ESC	Software Lab - I (Python)	-	-	-	30	20	50	-	-	2	1
7	BT307	DLC/PI	Industrial Training Evaluation	-	-		30	20	50	-		2	1
			Total	**350**	**100**	**50**	**150**	**100**	**750**	**15**	**2**	**10**	**22**
8	AI308	DLC	Self-Learning Presentation (SWAYAM/NPTEL/MOOC)	-	-	-	-	-	-	-	-	-	4
Additional Course for Honours or Minor Specialization				Permitted to opt for maximum two additional MOOC courses for the award of Honours (Minor									

Note: Departmental BOS will decide list of three optional subjects those are available in MOOC as well for PEC.

1 hour lecture (L) = 1 credit	1 hour Tutorial (T) = 1 credit	2 hour Practical (P) = 1 credit

BSC: Basic Science Course. PCC: Professional Core Course. PEC: Professional Elective Course. HSMS: Humanities Science Managerial Science. MC: Mandatory Course, PI: Project and Internship, DLC: Distance Learning Course

Jabalpur Engineering College, Jabalpur (M.P.)

Branch (CS/IT) w.e.f. July 2018 | **,AI&DS w.e.f.July 2021**

(Based on AICTE Model Syllabus)

SUBJECT –MATHEMATICS-III (MA331) [L+T+P =TC][3+1+0=4]

Module 1: Numerical Methods-I (08 hours)

Solution of polynomial and transcendental equations – Bisection method, Newton – Raphson method and Regula – Falsi method. Finite differences, Relation between operators, interpolation using Newton's forward and backward difference formulae. Interpolation with unequal intervals: Newton's divided difference and Lagrange's formulae.

Module 2: Numerical Methods-II (10 hours)

Numerical differentiation, Numerical integration: Trapezoidal rule and Simpson's 1/3rd and 3/8 rules. Solution of simultaneous Linear Algebraic equations by Gauss's Elimination, Gauss's Jordan, Crout's methods, Jacobi's Method, Gauss-Seidal, and Relaxation method. Solution of Ordinary differential equations: Taylor's series, Euler and modified Euler's method, Runge Kutta method of fourth order Milne's and Adam's predicator – corrector methods.

Module 3: Basic Probability (08 hours)

Probability spaces, Counting techniques, Probability measure, Conditional probability and Baye's theorem, Random variable and distribution function, Moment, Expected value and Variance of Random variables, Chebychev Inequality, Moment generating function. Bivariate discrete and continuous random variables, Independence of random variables.

Module 4: Probability Distribution (08 hours)

Measures of Central tendency: Moments, Skewness and Kurtosis. Discrete Distributions: Binomial, Poisson's Continuous Distributions: Normal Distribution, Exponential Distribution.

Module 5: Applied Statistics (06 hours)

Curve fitting by the method of least squares- fitting of straight lines, second degree parabolas and more general curves. Test of significance: Large sample test for single proportion, difference of proportions, single mean, difference of means and difference of standard deviations.

Books References:

1. P. Kandasamy, K.Thilagavathy, K. Gunavathi, Numerical Methods, S. Chand & Company, 2nd Edition, Reprint 2012.
2. S.S. Sastry, Introductory methods of numerical analysis, PHI, 4th Edition, 2005.
3. B.S. Grewal, Higher Engineering Mathematics, Khanna Publisher, 35th Edition, 2010.
4. N.P. Bali and Manish Goyal, A text book of Engineering Mathematics, Laxmi Publications, Reprint, 2010.
5. Veerarajan T., Engineering Mathematics, Tata McGraw-Hill, New Delhi, 2008.
6. S. Ross, A First Course in Probability, 6th Edition, Pearson Education India 2002.
7. W. Feller, An Introduction to Probability Theory and its Applications, Vol. I, 3rd Edition, Wiley 1968. Statistics.
8. Prasanna Sahoo, Probability and Mathematical Statistics, Louisville KY 40292 USA.

Course Outcomes :

At the end of the course the students will able to :

1. Understand Mathematical tools for Numerical Solution of algebraic and transcendental equations.
2. Estimate the value of function by various interpolation methods.
3. Solve the ordinary differential equations by Numerical methods
4. Determine derivative and integrals by numerical methods,
5. Determine the concept of Basic probability.
6. Apply probability distribution and statistics in various techniques dealing with engineering problems.

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JABALPUR ENGINEERING COLLEGE, JABALPUR (M.P.)

Branch- Common to All Discipline

CH302	Energy & Environmental Engineering	3L-1T-0P	4 Credits

Module 1:

A. **Introduction to Energy Science:**
World & Indian Energy Scenario, Overview to Energy Systems, Energy sustainability and Environment. Fossil Fuels. Alternatives for fossil fuels: biomass, wind, solar, nuclear, wave, tidal & hydrogen.

B. **Water Pollution:**
Definition, causes, effects and control measures (Primary & Secondary waste water treatment), Acid Rain and marine pollution. Pollution case studies: Minamata Tragedy, Ganga Action Plan, Major oil spills of the 20th & 21st century. Water conservation, Rain water harvesting and water shed management.

Module2: Ecosystems:

Concept of an ecosystem; Structure and function of an ecosystem, Producers, consumers and decomposers; Energy flow in the ecosystem; Ecological succession; Food chains, food webs and ecological pyramids; Introduction, types, characteristic features, structure and function of the following ecosystem (a.)Forest ecosystem (b) Grassland ecosystem (c) Desert ecosystem (d) Aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries)

Causes, effects & Control Measures of Air Pollution: Primary and secondary air pollutants and photo-chemical smog. Climate changes, Global warming, Ozone layer depletion. Pollution case studies: Bhopal gas Disaster and London smog Disaster.

Module 3: Biodiversity and its conservation:

Introduction ,Definition: genetic, species and ecosystem diversity; Bio-geographical classification of India; Value of biodiversity: consumptive use, productive use, social, ethical, aesthetic and option values; Biodiversity at global & National levels; India as a mega-diversity nation; Hot-spots of biodiversity; Threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts; Endangered and endemic species of India, Conservation of biodiversity: In-situ and Ex-situ conservation of biodiversity. Environment Protection Act, Prevention and Control of Pollution Act. Air, water, wild life, forest conservation. Issues involved in enforcement of environmental legislation; Public awareness.

Module 4: Environmental Pollution and Social Issues:

Causes, effects and control measures of Soil pollution, Noise pollution, Thermal pollution, Nuclear hazards, Solid waste Management (urban and industrial wastes), Pollution case studies. Disaster management: floods, earthquake, cyclone and landslides. Environmental ethics, Wasteland reclamation; Consumerism and waste products, issues and possible solutions. Nuclear accidents and holocaust. Case Studies: Chernobyl disaster & the 2004 Asian Earthquake & Tsunami.

Module 5:

A. Corrosion & its prevention:

Theories of Corrosion and Mechanism – Dry (Direct Chemical attack), Wet (Electro Chemical Theory) Atmospheric corrosion, Galvanic Series, Galvanic and Concentration Cell Corrosion, Corrosion by sea water. Factors influencing and Control of Corrosion – Proper Design, Use of pure metal and metal alloys, passivity, cathodic protection – Sacrificial anode and Impressed Current. Modifying the environment, Use of inhibitors.

Definition, Causes, effects & control measures of water pollution: Acid Rain & Pollution case studies.

B. Batteries:

Classification of Batteries, Important Applications, Lead-Acid battery, Ni-Cd battery & Li battery. Fuel Cell: Hydrogen-Oxygen Fuel cell.

TEXT BOOKS

1. A text book of Engineering Chemistry by Jain & Jain, Dhanpat Rai Publishing Company, New Delhi
2. Chemistry of Engineering Materials by C.P. Murthy, C.V. Agarwal and A. Naidu BS Publication Hyd.
3. A text book of Environmental Chemistry and Pollution control by S.S. Dara & Dr. D. D. Mishra, S. Chand & Co, New Delhi
4. Energy,Environment Ecology and Society by Dr.Pushpendra,Vayu Education of India New Delhi
5. Energy, Environment Ethics and Society, by Dr.S.Deswal & Dr.A.Deswal Dhanpat Rai Publishing Company, New Delhi

REFERENCE BOOKS

1. J.C. Kuriakose and J. Rajaram, "Chemistry in Engineering and Technology", Vol 1 & 2, Tata Mcgraw Hill Publishing Company (P) Ltd., New Delhi
2. Mars G. Fontana, "Corrosion Engineering", Tata Mcgraw Hill Publishing Company (P) Ltd., New Delhi.
3. F.Chau, Y. Liang, J. Gao and X. Shao, "Chemometrics", Wiley Inter Science.
4. De A.K., Environmental Chemistry, Wiley Eastern Ltd.
5. Trivedi R.K., Handbook of Environmental Laws, Rules Guidelines, Compliances and Standards', Vol I and II, Enviro Media (R)
6. Brunner R.C., 1989, Hazardous Waste Incineration, McGraw Hill Inc.
7. Clark R.S., Marine Pollution, Clanderson Press Oxford (TB).
8. Cunningham, W.P. Cooper, T.H. Gorhani, E & Hepworth, M.T. 2001, Environmental Encyclopedia, Jaico Publ. House, Mumabai,
9. Boyle, Godfrey, Bob Everett, and Janet Ramage (Eds.) (2004), Energy Systems and Sustainability: Power for a Sustainable Future. Oxford University Press.
10. Schaeffer, John (2007), Real Goods Solar Living Sourcebook: The Complete Guide to Renewable Energy Technologies and Sustainable Living, Gaiam
11. J.P.Gupta, A Text book of Energy, Environment Ethics & Society" Dhanpat Rai Publishing Company.

Jabalpur Engineering College ,Jabalpur (M.P)

B.Tech III Sem (Common to all branches)

Course content

EVALUATION

Sub code	Sub Name	L	T	P	Max. Marks	Credits
CH302	Energy & Environmental Engineering	3	1	-	70	4

COURSE OUTCOME: At the end of the course the student will be able to

CO1	Apply the concept of sustainability of renewable energy to overcome the shortcoming of energy from non-renewable sources. Causes & Control of water Pollution
CO2	Understand the interrelationship of different species in variety of ecosystems and hazards of air pollution.
CO3	Conservation of Biodiversity & awareness of Environmental protection Act
CO4	Identify social issues related to environmental pollution and its preventive measure.
CO5	Recognize the origin as well as types of corrosion and apply appropriate protection mechanism to control corrosion. Devices for energy storage.

Mapping of course outcome with program outcome

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1												
CO2												
CO3												
CO4												
CO5												

11/7/19 11/7/19 11/7/19 11/7/19 11/7/19 11/7/19

AI303	Data Structure & Algorithms	3L:0T: 2P	4 credits

Course Contents:

UNIT1:

Introduction: Basic Terminologies: Elementary Data Organizations, Data Structure Operations: insertion, deletion, traversal etc.; Analysis of an Algorithm, Asymptotic Notations, Time-Space trade off. **Searching:** Linear Search and Binary Search Techniques and their complexity analysis.

UNIT 2:

Stacks and Queues: ADT Stack and its operations: Algorithms and their complexity analysis, Applications of Stacks: Expression Conversion and evaluation–corresponding algorithms, ADT queue, Types of Queue: Simple Queue, Circular Queue, Priority Queue; Operations on each Type of Queues: Algorithms and their analysis.

UNIT 3:

Linked Lists: Singly linked lists: Representation in memory, Algorithms of several operations: Traversing, Searching, Insertion into, Deletion from linkedlist; Linked representation of Stack and Queue, doubly linked list: operations on it. Circular Linked Lists: operations on it.

UNIT 4:

Trees: Basic Tree Terminologies, Different types of Trees: Binary Tree, Threaded BinaryTree, Binary Search Tree, AVL Tree; Tree operations on each of the trees and their algorithms with complexity analysis. Applications of Binary Trees. B Tree, B+ Tree: definitions and operations.

UNIT 5:

Sorting and Hashing: Objective and properties of different sorting algorithms:Selection Sort, Bubble Sort, Insertion Sort, Quick Sort, Merge Sort, Heap Sort; Performance and Comparison among all the methods, Hashing, Collision handling techniques.

Graph: Basic Terminologies and Representations, Graph search and traversal algorithms andcomplexity analysis.

Suggested books:

1. "Fundamentals of data structures in C", S Sahni, Universities Press.
2. "How to Solve it by Computer", R. G. Dromey, PearsonEducation.Data
3. "Data Structures using C and C++", Tenenbaum, PHI publication.
4. "Introduction to algorithms", Cormen, MIT press.

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Course Outcomes: after completion of course student will be able to:

CO1. Describe various data structures such as arrays, linked lists, stacks, queues, trees and graphs and the operations performed on them.

CO2. Apply the concepts of various data structures such as linked lists, stacks, queues, trees and graphs to write algorithms and programs to implement them.

CO3. Analyse various searching and sorting algorithms such as Linear search, Binary search, Selection Sort, Bubble Sort, Insertion Sort, Quick Sort, Merge Sort and Heap sort to estimate their time and space complexity

CO4. Develop solutions of the given problem using appropriate data structures.

List of experiments for DSA Lab

1) Write a program to implement Linear Search and Binary search algorithms. Print the number of comparisons done by the algorithms for the input list.
2) Write a program to implement Stack. Implement its push, pop, peek and display operations.
3) Write a program to implement Queue. Implement its insert, delete and display operations.
4) Write a program to implement Singly Linked List and its operations like insertion and deletion of elements from head and tail.
5) Write a program to implement Circular Linked List and its operations like insertion and deletion of elements from head and tail.
6) Write a program to implement Doubly Linked List and its operations like insertion and deletion of elements from head and tail.
7) Write a program to implement Binary Search Tree and Print the number of comparison required to search an element in it.
8) Write a program to implement Insertion Sort Algorithm.
9) Write a program to implement Quick Sort Algorithm
10) Write a program to implement Knapsack problem using Greedy approach.
11) Write a program to implement All-Pair-Shortest-Path problem.
12) Write a program to implement n-queen problem using Backtracking approach.

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AI304	Object Oriented Programming using Java	3L:0T: 2P	4 credits

Unit-I: Introduction to Object Oriented Thinking & Object Oriented Programming: Comparison with Procedural Programming, features of Object oriented paradigm– Merits and demerits of OO methodology; Object model; Elements of OOPS, IO processing.

Unit-II: Encapsulation and Data Abstraction- Concept of Objects: State, Behavior & Identity of an object; Classes: identifying classes and candidates for Classes Attributes and operations, Access modifiers, Static members of a Class, Instances, Message passing, and Construction and destruction of Objects.

Unit-III: Relationships – Inheritance: purpose and its types, 'is a' relationship; Association, Aggregation. Concept of Abstract classes, interface.

Unit-IV: Polymorphism: Introduction, Method Overriding & Overloading, static and run time Polymorphism.

Unit-V: Multithreading in Java: Differences between multiple processes and multiple threads, thread states, creating threads, interrupting threads, thread priorities, synchronizing threads, inter thread communication.

Java Exception Handling: Try, catch, throw, throws and finally. Types of exceptions: user defined and built-in exceptions.

Suggested Books :

1. An Introduction to Object-Oriented Programming, Timothy Budd, AddisonWesley Publication.
2. Understanding Object- Oriented Programming with Java, T.Budd, Pearson Education
3. Object Oriented programming through Java, P.Radha Krishna, Universities Press
4. Thinking in Java, Bruce Eckel, Prentice Hall
5. Java the complete reference, Herbert Schildt, McGraw Hill.
6. Programming in Java, S.Malhotra and S. Choudhary, Oxford University
7. Object Oriented Analysis& Design, Booch, Addison Wesley.
8. Principles of Object Oriented Analysis and Design, James Martin, Prentice Hall/PTR.

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Jabalpur

Course Outcomes: after completion of course student will be able to:

CO1: Explain the concepts of Object Oriented Programming, and the Java's concepts of Multithreading and Exception Handling.

CO2: Apply the concepts of OOP to solve the given problem via Java Program

CO3: Implement the concepts of OOP, Multithreading and Exception Handling using Java Program.

List of experiments (OOPS Lab)

1) Write a program to demonstrate the encapsulation and data hiding capabilities of classes

2) Write a program to demonstrate the use of constructors.

3) Write a program to implement Function Overloading.

4) Write a program to implement dynamic method dispatching

5) Write a program to implement Single Inheritance

6) Write a program to implement Multi Level Inheritance

7) Write a program to demonstrate Multithreading

8) Write a program to demonstrate Exception Handling

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Jabalpur Engineering College, Jabalpur (M.P.)
Branch (AI&DS) w.e.f. July 2021
(Based on AICTE Model Syllabus)
Subject Code-AI&DS 3015

SUBJECT-DIGITAL LOGIC DESIGN AND COMPUTER ORGANIZATION [L+T+P=TC][3+1+0=4]

Module- I

Basic Structure of Computers: Computer Types, Functional units, Basic operational concepts, Bus structures, Software, Performance, multiprocessors and multi computers, Computer Generations. Data Representation: Binary Numbers, Fixed Point Representation. Floating – Point Representation. Number base conversions, Octal and Hexadecimal Numbers, complements, Signed binary numbers, Binary codes.

Module-II

Digital Logic Circuits - I: Basic Logic Functions, Logic gates, universal logic gates, Minimization of Logic expressions. Flip-flops, Combinational Circuits.

Digital Logic Circuits - II: Registers, Shift Registers, Binary counters, Decoders, Multiplexers, Programmable Logic Devices.

Module-III

Computer Arithmetic: Algorithms for fixed point and floating point addition, subtraction, multiplication and division operations. Hardware Implementation of arithmetic and logic operations, High performance arithmetic.

Instruction Set & Addressing: Memory Locations and Addresses, Machine addresses and sequencing, Various Addressing Modes, Instruction Formats, Basic Machine Instructions. IA-32 Pentium example.

Module-IV

Processor Organization: Introduction to CPU, Register Transfers, Execution of Instructions, Multiple Bus Organization, Hardwired Control, Microprogrammed Control Memory Organization: Concept of Memory, RAM, ROM memories, memory hierarchy, cache memories, virtual memory, secondary storage, memory management requirements.

Module-V

Input / Output Organization: Introduction to I/O, Interrupts- Hardware, Enabling and disabling Interrupts, Device Control, Direct memory access, buses, interface circuits, standard I/O Interfaces.

TEXT BOOKS:

1.Computer Organization – Carl Hamacher, Zvonko Vranesic, Safwat Zaky, fifth edition, McGraw Hill.
2.Computer Architecture and Organization- An Integrated Approach, Miles Murdocca, Vincent Heuring, Second Edition, Wiley India.
3.Computer Systems Architecture – M.Moris Mano, IIIrd Edition, Pearson.
4.Computer Organization and Architecture – William Stallings Sixth Edition, Pearson
5.Computer- organization and Design- David A. Paterson and John L.Hennessy-Elsevier.
6.Fundamentals or Computer Organization and Design, - Sivarama Dandamudi Springer Int. Edition.
7.Digital Design – Third Edition, M.Morris Mano, Pearson Education/PHI.
8.Fundamentals of Logic Design, Roth, 5th Edition, Thomson.

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AI & DS III Sem

SUBJECT-DIGITAL LOGIC DESIGN AND COMPUTER ORGANIZATION

List of Experiment :

(1) To study and verify the Truth Table of Logic Gates
(2) Realization of a Boolean function
(3) Design and implantation using NAND gate.
(4) To study and verify Adders and subtractors
(5) To study and verify Binary to gray Generator
(6) To study and verify Multiplexer ad Demultiplexer
(7) Realization of a Boolean function using logisim
(8) To study and verify Flip Flops
(9) To study and verify Binary Counters

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Course Outcome of DLD

CO1 – Understanding basics of number system and computers.

CO2 – Understanding logic gates and counters, Multiplexer.

CO3 – Advance algorithm comprehension memory, memory addressing

CO4- Conceptual understanding of computer organization, memory organisation and RAM & ROM.

CO5- Hardware component, control, standard I/O Interfaces design.

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Jabalpur Engineering College, Jabalpur (M.P.)
Branch (AI&DS) w.e.f. July 2021
(Based on AICTE Model Syllabus)
Subject Code- AI&DS 305

SUBJECT- Software Lab **[L+T+P=TC] [0+0+2=4]**

Python Programming

1) **Introduction To Python** Installation and Working with Python Understanding Python variables Python basic Operators Understanding python blocks.
2) **Python Data Types** Declaring and using Numeric data types: int, float, complex Using string data type and string operations Defining list and list slicing Use of Tuple data type
3) **Python Program Flow Control** Conditional blocks using if, else and elif Simple for loops in python For loop using ranges. Use of while loops in python Loop manipulation using pass, continue, break and else.
4) **Python Functions, Modules And Packages** Organizing python codes using functions, Organizing python projects into modules, Importing own module as well as external modules, Understanding Packages, Powerful Lamda function, Programming using functions, modules and external packages
5) **Python String, List And Dictionary Manipulations** Understanding string in build methods, List manipulation using in build methods, Dictionary manipulation. Programming using string, list and dictionary in build functions.
6) **Python File Operation** Reading config files in python Writing log files in python Understanding read functions, read(), readline() and readlines() Understanding write functions, write() and writelines() Manipulating file pointer using seek Programming using file operations.
7) **Use of Numpy package**
8) **Use of Pandas package**
9) **Programming with Matplotlib package**

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Jabalpur Engineering College, Jabalpur

(Declared Autonomous by MP Govt., Affiliated to RGPV, Bhopal)
(AICTE Model Curriculum Based Scheme)
Bachelor of Technology (B.Tech.) III Semester (Mechatronics Engineering)

For batches admitted (w.e.f. July 2021)

S.No.	Subject Code	Category Code	Subject Name	Maximum Marks Allotted					Total Marks	Contact Hours Per Week			Total Credits
				Theory			Practical						
				End. Sem.	Mid Sem. Exam.	Quiz/ Assignment	End Sem.	Lab Work		L	T	P	
1	MA-341	BSC	Mathematics-III	70	20	10	-	-	100	3	1	-	4
2	CH-302	HSMC	Energy & Environment Engineering	70	20	10	-	-	100	3	1	-	4
3	MT-303	PCC	Digital Circuit Design	70	20	10	30	20	150	3	-	2	4
4	MT-304	PCC	Strength of Materials	70	20	10	30	20	150	3	-	2	4
5	MT-305	PCC	Sensors and Instrumentation	70	20	10	30	20	150	3	-	2	4
6	MT-306	ESC	Mechanics and Material Lab	-	-	-	30	20	50	-	-	2	1
7	BT-307	DLC/PI	Industrial Training Evaluation	-	-	-	30	20	50	-	-	2	1
			Total	350	100	50	150	100	750	15	2	10	22
8	MT308	DLC	Self-Learning Presentation (SWAYAM/NPTEL/MOOC)	-	-	-	-	-	-	-	-	-	4
NSS/NCC/Swachhata Abhiyan/Rural Outreach				Qualifier / -									
Additional Course for Honours or Minor Specialization				Permitted to opt for maximum two additional courses in subject code ..... for the award of Honours (Minor Specialization).									

Note: Departmental BOS will decide list of three optional subjects those are available in MOOC. *Students should contact department for opting DLC optional subject/subjects

1 hour lecture (L) = 1 credit	1 hour Tutorial (T) = 1 credit	2 hour Practical (P) = 1 credit

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(AICTE Model Curriculum based scheme)

B. Tech. III SEM (AICTE) (Mechatronics Engineering) (w.e.f. July 2021 Onwards)

Subject Code	Subject Name &Title	Maximum Marks Allotted						Hours/Week			Total Credits
		Theory			Practical		Total Marks	L	T	P	
		End Sem	Mid Sem MST	Quiz, Assignment	End Sem	Lab Work					
MA-341	MATHEMATICS -III	70	20	10	-	-	100	3	1	0	4

Module 1: Numerical Methods-I (08 hours)

Finite differences, Relation between difference operators, interpolation using Newton's forward and backward difference formulae. Interpolation with unequal intervals: Newton's divided difference and Lagrange's formulae. Numerical differentiation, Numerical integration: Trapezoidal rule and Simpson's $1/3^{rd}$ and 3/8 rules.

Module 2: Numerical Methods-II (08 hours)

Solution of polynomial and transcendental equations: Bisection method, Newton – Raphson method and Regula–Falsi method. Solution of simultaneous Linear Algebraic equations: Gauss's Elimination, Gauss's Jordan, Crout's methods, Jacobi's Method, Gauss-Seidal and Relaxation method.

Module 3: Transform Calculus-I (06 hours)

Fourier integrals, Fourier sine and cosine integrals, Fourier transform, Fourier sine and cosine transforms and their elementary properties, Convolution theorem, Application of Fourier transformations to solve the boundary value problems.

Module 4: Transform Calculus-II (10 hours)

Hankel Transforms, Mellin transforms and Wavelet transforms with their elementary properties. Z- transform and inverse Z-transform of elementary functions, Shifting theorems, convolution theorem, Initial and final value theorem, Application of Hankel and Mellin transformations to solve the boundary value problems.

Module 5: Probability Distributions and Statistics (08 hours)

Random variables, Probability Mass function, Probability Density function, Discrete Distributions: Binomial Distribution, Poisson Distribution; Continuous Distributions: Normal Distribution, Exponential Distribution, Basics of Statistics.

Books References:

1. B.S. Grewal, Higher Engineering Mathematics, Khanna Publisher, 35th Edition, 2010.
2. S. Ross, A First Course in Probability, 6th Edition, Pearson Education India 2002.
3. W. Feller, An Introduction to Probability Theory and its Applications, Vol. Edition, Wiley1968. Statistics,
4. Advanced Engineering Mathematics by B.S. Grewal, Khanna Publishers.
5. Higher Engineering Mathematics by B.V. Ramana TMH.
6. Prasanna Sahoo, Probability and Mathematical Statistics, Louisville KY 40292 USA.

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

CO1	Understand the knowledge of transform calculus.
CO2	Solve the Boundary value problems by the using transform methods.
CO3	Determine the concept of Basic probability.
CO4	Apply probability distribution and statistics in various techniques dealing with engineering problems.
CO5	Solve practical problems in today's data-centric world.

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Subject Code	Subject Name & Title	Maximum Marks Allotted						Hours/Week			Total Credits
		Theory			Practical		Total Marks	L	T	P	
		End Sem	Mid Sem MST	Quiz, Assignment	End Sem	Lab Work					
CH-302	Energy & Environmental Engineering	70	20	10	-	-	100	3	1	0	4

Module 1:A. Introduction to Energy Science:

World Indian Energy Scenario, Overview to Energy Systems, Energy sustainability and Environment Fossil Fuels. Alternatives for fossil fuels: biomass, wind, solar, nuclear wave, tidal & hydrogen.

B. Water Pollution: Definition, causes, effects and control measures (Primary & Secondary waste water treatment), Acid Rain and marine pollution. Pollution case studies: Minamata Tragedy, Ganga Action Plan, Major oil spills of the 20" & 21" century, Water conservation, Rain water harvesting and water shed management.

Module2: Ecosystems:

Concept of an ecosystem; Structure and function of an ecosystem; Producers, consumers and decomposers, Energy flow in the ecosystem; Ecological succession; Food chains, food webs and ecological pyramids; introduction, types, characteristic features, structure and function of the following ecosystem (a.)Forest ecosystem (b) Grassland ecosystem (c) Desert ecosystem (d) Aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries), Causes, effects & Control Measures of Air Pollution: Primary and secondary air pollutants and photo-chemical smog Climate changes, Global warming, Ozone layer depletion. Pollution case studies: Bhopal gas Disaster and London smog Disaster.

Module 3: Biodiversity and its conservation:

Introduction Definition: genetic, species and ecosystem diversity; Bio-geographical classification of India, Value of biodiversity: consumptive use, productive use, social, ethical, aesthetic and option values; Biodiversity at global & National levels; India as a mega-diversity nation, Hot-spots of biodiversity: Threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts; Endangered and endemic species of India; Conservation biodiversity: In-situ and Ex-situ conservation of biodiversity: Environment Protection Act, Prevention and Control of Pollution Act. Air, water, wild life, forest conservation, Issues involved in enforcement of environmental legislation; Public awareness.

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Module 4: Environmental Pollution and Social Issues:
Causes, effects and control measures of Soil pollution, Noise pollution, Thermal pollution, Nuclear hazards, Solid waste Management (urban and industrial wastes], Pollution case studies. Disaster management: floods, earthquake, cyclone and landslides. Environmental ethics, Wasteland reclamation Consumerism and waste products, issues and possible solutions, Nuclear accidents and holocaust Case Studies: Chernobyl disaster & the 2004 Asian Earthquake & Tsunami.

Module 5:A. Corrosion & its prevention:
Theories of Corrosion and Mechanism - Dry (Direct Chemical attack), Wet (Electro Chemical Theory) Atmospheric corrosion, Galvanic Series, Galvanic and Concentration Cell Corrosion, Corrosion by sea water. Factors Influencing and Control of Corrosion Proper Design, Use of pure metal and metal alloys, passivity, cathodic protection Sacrificial anode and Impressed Current. Modifying the environment, Use of inhibitors: Definition, Causes, effects & control measures of water pollution: Acid Rain &Pollution case studies.

B. Batteries:
Classification of Batteries, Important Applications, Lead-Acid battery, Ni-Cd battery & Li battery. Fuel Cell. Hydrogen-Oxygen Fuel cell.

TEXT BOOKS

1 A text book of Engineering Chemistry by Jain & Jain, Dhanpat Rai Publishing Company, New Delhi
2. Chemistry of Engineering Materials by C.P. Murthy, C.V. Agarwal and A. Naidu B5 Publication Hyd.
3. A text book of Environmental Chemistry and Pollution control by S.S. Dara & Dr. D. D. Mishra, S.Chand & Co, New Delhi
4. Energy, Environment Ecology and Society by Dr. Pushpendra, Vayu Education of India New Delhi
5. Energy. Environment Ethics and Society, by Dr.S Deswal & Dr. A. Deswal Dhanpat Rai Publishing Company, New Delhi

REFERENCE BOOKS

1. J.C. Kuriakose and J. Rajaram, "Chemistry in Engineering and Technology", Vol.1 & 2, Tata Mcgraw Hill Publishing Company (P) Ltd., New Delhi
2. Mars G. Fontana, "Corrosion Engineering", Tata Mcgraw Hill Publishing Company (P) Ltd., New Delhi.
3. F.Chau, Y. Liang, J. Gao and X. Shao, "Chemometrics", Wiley Inter Science.
4. De A.K., Environmental Chemistry, Wiley Eastern Ltd.
5.Trivedi R.K., Handbook of Environmental Laws, Rules Guidelines, Compliances and Standards', Vol I and II, Enviro Media (R)
6. Brunner R.C., 1989, Hazardous Waste Incineration, McGraw Hill Inc.
7. Clark R.S., Marine Pollution, Clanderson Press Oxford (TB).

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8.Cunningham, W.P. Cooper, T.H. Gorhani, E & Hepworth, M.T. 2001, Environmental Encyclopedia, Jaico Publ. House, Mumabai,
9. Boyle, Godfrey, Bob Everett, and Janet Ramage (Eds.) (2004), Energy Systems and Sustainability: Power for a Sustainable Future. Oxford University Press.
10. Schaeffer, John (2007), Real Goods Solar Living Sourcebook: The Complete Guide to Renewable Energy Technologies and Sustainable Living, Gaiam
11. J.P.Gupta, A Text book of Energy, Environment Ethics & Society" Dhanpat Rai Publishing Company.

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

CO1	Apply the concept of sustainability of renewable energy to overcome the shortcoming of energy from non-renewable sources. Causes & Control of water Pollution
CO2	Understand the interrelationship of different species in variety of ecosystems and hazards of air pollution
CO3	Conservation of Biodiversity & awareness of Environmental protection Act
CO4	Identify social issues related to environmental pollution and its preventive measure.
CO5	Recognize the origin as well as types of corrosion and apply appropriate protection mechanism to control corrosion. Devices for energy storage.

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Subject Code	Subject Name & Title	Maximum Marks Allotted						Hours/ Week			Total Credits
		Theory			Practical		Total Marks	L	T	P	
		End Sem	Mid Sem MST	Quiz, Assignment	End Sem	Lab Work					
MT-303	Digital Circuit Design	70	20	10	30	20	150	3	0	2	4

Module- I Boolean Algebra And Switching Function: Minimization of switching function. Concept of prime implicant, Karnaugh's map method, Quine and McCluskey method, cases with don't care terms and multiple output, switching function, Introduction to logic gates, NAND, NOR realization of switching function.

Module-II Design And Analysis Of Combinational Circuits: Design and analysis of code converter, Half-adder, half-subtractor, full adder, full-subtractor circuits, Series and parallel adders and BCD adders, look-ahead carry generator and adders .Decoders, Encoders, multiplexers & de-multiplexers, Designing of combinational circuits with ROM and PLA.

Module-III Specification And Sequential Systems : Characterizing equation and definition of synchronous sequential machines, Realization of state table from verbal description, Mealy and Moore machines state table and transition diagram, minimization of state table of completely specified sequential machines.

Module-IV Design And Analysis Of Sequential Circuits: Design and analysis of registers, synchronous & asynchronous counters etc., Introduction to asynchronous sequential machines, races and hazards, Controllers and data system designing.

Module-V FSM & VHDL: Implementing simple finite state machine from written specifications, Writing VHDL code for simple circuits, Practical applications of digital circuits.

Reference books

1. W.H. Gothman, "Digital Electronics" (PHI).
2. R.J. Tocci, "Digital System Principles And Applications"
3. Z. Kohair (TMH), "Switching and Automata Theory"

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4. M. Mano(PHI) "Digital Logic and Computer Design"
5. M. Mano (PHI) "Digital Design"

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

CO1	Learn various logic gates and simplify Boolean equations.
CO2	Design various combinational circuits.
CO3	Analyze various flip flops, shift registers and determining outputs.
CO4	Design various type of sequential circuits.
CO5	Perform FSM synthesis from a VHDL description.

MT-303L Digital Circuit Design Lab

All experiments with relay Logics. Basic Ladder Programming like-

1. Up-Down Counters (Counter FB)
2. TON, TOF, TP Timers (Timer FB)
3. Push-to-ON & Push-to-OFF using Discrete logic
4. Delay-to-ON & Delay-to-OFF using Timers (Timer FB)
5. Build NOT, AND, OR Logic using Discrete Logic
6. Build NAND, NOR, Logic using Discrete Logic
7. Build XOR, XNOR Logic using Discrete Logic
8. Combination of Timers & Counters (Timer, Counter FB)
9. PTO and PWM Function (Timer FB)
10. Work Hands on experiments for digital logical circuit design thinking,Application of digital circuits in different discipline's projects using digitallymenu operated devices.
11. Many Experiments involving Hardware Interfacing & Software Development system designs.
12. PLC, C++, Linux, Lab View programming controlled hardware circuit designs

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Subject Code	Subject Name & Title	Maximum Marks Allotted						Hours/Week			Total Credits
		Theory			Practical		Total Marks	L	T	P	
		End Sem	Mid Sem MST	Quiz, Assignment	End Sem	Lab Work					
MT-305	Sensors & Instrumentation	70	20	10	30	20	150	3	-	2	4

Module 1

Units and standards, calibration, static and dynamic characteristics of an instrument, error analysis, electromechanical indicating instruments.

Module II

Material science concepts: materials used as sensors and transducers, analog and digital voltmeters, ammeters, millimeters, DC bridges, AC bridges, fault detection-short circuit ,open circuit, shielding and grounding methods.

Module III

Introduction to sensors and transducers, potentiometers, physical quantities and their measurements- strain, force, speed, velocity, acceleration, proximity and range, temperature, pressure, flow level, O2 sensors, breathalyzers, display device, digital CRO, data storage, introduction to data acquisition, elements of data acquisition system, concept of signal conditioning.

Module IV

PLC: Programming formats using contacts and coils, latching etc. Converting simple relay logic diagram to PLC ladder diagram, Digital logic implementation in ladder programming, Timer and counter functions, Arithmetic functions, R-trig/F-trig pulses, shift registers, sequence functions.

Module V

Communication Instruments: Modem, Co-axial Cable, Transmission Line, Fax-Modem, Wireless Sensor, Repeater, Hubs, Bridges & Switches, Routers & Gateways, Industrial Process Automation, Networks and Protocols: AS I-CAN, MODBUS, PROFIBUS-DP, Wi-Fi, Wi-MAX, Connectors.

Books:

1.A.K.Sawhney,A course in Electrical and Electronic Measurements and Instrumentation, (19e), Dhanpat Rai & Co. Publishers, 2012.

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2.A.K.Sawhney,A course in Mechanical Measurement and Instrumentation,(9e), Dhanpat Rai & Co. Publishers, 2012.
3.R.K.Rajput, Electrical & Electronic Measurements & Instrumentation,(2e), S.Chand Publishers, 2010.
4.Bela G.Liptak, Process Measurement and Analysis,(4e),CRC press,2003.
5.Liptak, B.G.(Ed.),Instrument engineers' hand book, Vol.3: Process software and digital networks, (1e) CRC Press, Boca Raton, London, 2002.

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

CO1	Understand fundamentals of measuring instruments theoretically as well as practically.
CO2	Gain knowledge about D.C. & A.C. bridges and its applications.
CO3	Measure various parameters in real world.
CO4	Understand the fundamentals of PLC.
CO5	Gain knowledge of various communication instruments.

MT 305L - Sensor and Instrumentation Lab

1.Behavior of inductive, magnetic, reflection light scanner, and one way barriers, reflection light barrier OBS and an ultrasonic sensor.

2.Path power characteristic curve of inductive analog encoder, reduction factor of reflection light scanner OJ, fitted with an optical waveguide.

3.Response curve of inductive sensor, capacitive sensor, magnetic field sensors.

4.Response analysis of audio and image sensors.

5.Calculation of maximum admissible velocity of an object using ultrasonic sensor.

6.Introduction of PLC, study basic components, networking and different programming technique. Of PLC.

7.Design of circuits using different sensors.

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Subject Code	Subject Name & Title	Maximum Marks Allotted						Hours/Week			Total Credits
		Theory			Practical		Total Marks	L	T	P	
		End Sem	Mid Sem MST	Quiz, Assignment	End Sem	Lab Work					
MT-304	Strength of Materials	70	20	10	30	20	150	3	0	2	4

Module-I INTRODUCTION TO MATERIALS:
Structure and Properties of Engineering Materials, Metals and Alloys, Phase Diagrams, Advanced Material and Tools, Polymers and Composites, Ceramics, Stress Strain Diagram, Iron Carbon Diagram.

Module-II STRESS AND STRAIN :
Stresses in members of a structure, Axial and shear stresses and strains – Elasticity, Hook's law – Lateral strain – Poisson's ratio–Volumetric strain–Elastic constants–Stress in composite bars. Strain energy impact and suddenly applied loads. Analysis of simple structures, stepped rods, Transformation of stress and strain, Principal stresses, normal and shear stress, Mohr's circle and its application to two dimensional analysis.

Module-III SHEAR FORCE AND BENDING MOMENTS:
Pure bending, Bending equation, Flexure formula, Section modulus, Bending of symmetric member, Bending of composite sections, Shear force and bending moment diagrams for beams subjected to different types of loads–Theory of simple bending and assumptions.

Module-IV DEFLECTION OF BEAMS:
Slope, Deflection and Radius of Curvature, Cantilevers subjected to various types of load, Macaulay's method and Area moment Method for deflection of Cantilever beam, Simply supported beam and Over hanging beam subjected to various types of load, Relation between maximum bending and maximum deflection.

Module-V TORSION OF SHAFTS:
heory of pure torsion, Polar modulus, Torsional rigidity, angle of twist, Torsional stresses in a shaft, Power transmitted by a shaft, Stepped shafts, Composite shafts, Torsional resilience, Shafts in series and Shafts in parallel, Torsion of tapering rod.

Reference Books:

1. Timoshenko,S.P.,Gere, M.J., Mechanics of Materials,C.B.S.,Publishers,1980.
2. Ramamurtham,S., Strength of Materials, Dhanpat Rai Publications,2005.
3. Popov,E.P., Engineering Mechanics of Solids, Prentice-Hall,1999.
4. R.K.Rajput A textbook of strength of material,; S.chand Publications
5. S.S.Ratan, Strength of Material, McGraw hill, 2017

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

CO1	Understanding of different types of Materials
CO2	Analyse the different structures,stress and strain.
CO3	Knowledge of all force and bending moments
CO4	Comparative analysis of different loads.
CO5	Design beams,shafts,and structures

MT-304L Strength of Materials Lab

List of Experiments:

1. Standard tensile test on MS and CI test specimen with the help of UTM.
2. Direct/cross Shear test on MS and CI specimen.
3. Transverse bending test on wooden beams to obtain modulus of rupture.
4. Fatigue test.
5. Brinell hardness test.
6. Vicker hardness test.
7. Izod/Charpy test.
8. Rockwell Hardness test.

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(AICTE Model Curriculum based scheme)

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B. Tech. (AICTE) (Mechatronics Engineering) **(w.e.f. July 2021 Onwards)**

Subject Code	Subject Name & Title	Maximum Marks Allotted						Hours/Week			Total Credits
		Theory			Practical		Total Marks	L	T	P	
		End Sem	Mid Sem MST	Quiz, Assignment	End Sem	Lab Work					
	Mechanics & Material LAB	-	-	-	30	20	50	-	-	2	1

Mechanics & Material LAB
List of Experiments

1. Preparation and study of crystal models for simple cubic, body centred cubic, Face centred cubic and hexagonal close packed structured.
2. Preparation and study of the Microstructure of pure metals like Iron, Cu And Al.
3. Grain size measurement by different methods.
4. Preparation and study of the Microstructure of Mild Steels, low carbon steels, High C steels.
5. Study of the Microstructure of Cast Irons.
6. Study of the Microstructure of different alloy steels.
7. Study of the Microstructure of Ferrous alloys.
8. Study of the Microstructure of Heat treated steels.
9. Harden ability of Steels by Jominy end quench test.
10. To find out the hardness of various heat treated and untreated plain carbon steels.

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

CO1	Summarize the crystal structure for SC, BCC, FCC and HCP.
CO2	Outline the microstructure for pure metals and alloys.
CO3	Observe the micro structure of heat treated steels.
CO4	Observe the hardness of alloys metals by using jominy quenching test.
CO5	Describe how and why defects (point, line and interfacial) in materials greatly affect engineering properties and limit their use in service.

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Subject Code	Subject Name & Title	Maximum Marks Allotted						Hours/Week			Total Credits
		Theory			Practical		Total Marks	L	T	P	
		End Sem	Mid Sem MST	Quiz, Assignment	End Sem	Lab Work					
MT- 307	Industrial Training	-	-	-	30	20	50	-	-	2	1

After completion of Industrial training just after last semester as per scheduled in academic calendar, will be evaluated in this semester.

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