Jabalpur Engineering College, Jabalpur

(Declared Autonomous by MP Govt., Affiliated to RGPV, Bhopal)
(AICTE Model Curriculum Based Scheme)
Bachelor of Technology (B.Tech.) IV 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			L	T	P	
				End. Sem.	Mid Sem. Exam.	Quiz/ Assignment	End Sem.	Lab Work					
1	CE401	BSC	Material Science	70	20	10	-	-	100	3	1	-	4
2	CE402	PCC	Transportation Engineering	70	20	10	30	20	150	3	-	2	4
3	CE403	PCC	Geotechnical Engineering-I	70	20	10	30	20	150	3	-	2	4
4	CE404	PCC	Fluid Mechanics	70	20	10	30	20	150	3	-	2	4
5	CE405	PEC	Advance Surveying	70	20	10	-	-	100	3	1	-	4
6	CE406	ESC	Software Lab-I	-	-	-	60	40	100	-	-	2	1
7	CE407	MC	Industrial Training	Minimum Four Weeks Duration. Evaluation will be done in 5th semester									
Total				**350**	**100**	**50**	**150**	**100**	**750**	**15**	**2**	**8**	**21**
8	CE408	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 CE408 for the award of Honours (Minor Specialization).									

Note:1 Departmental BOS will decide list of three optional subjects those are available in MOOC as well for PEC.

2 Industrial training should be apart from laboratory work undertaken in the college rather it should have industrial orientation and practical aspects/field work. Report to be submitted at the beginning of 5th semester and students have to give a presentation in the departement. Evaluation will be done in 5th semester.

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

MOOC/DLC Courses	CE408A Problem Solving and Critical Thinking Skills	CE408B Science and Engineering Ethics	CE408C Building with Nature

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

JABALPUR ENGINEERING COLLEGE, JABALPUR

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

(AICTE Model Curriculum based scheme)

B.Tech IV Semester (Civil Engineering)

COURSE	SUBJECT TITLE	SUBJECT CODE	Contact Hours Per Week			Total Credits
			L	T	P	
B.Tech	MATERIAL SCIENCE	CE401	3	1	-	4

MATERIAL SCIENCE

MODULE-1

Lime: Classification, properties, slaking test, I.S. specification, Manufacture, uses.

Clay Products: Tiles, Different kinds of tiles, manufacture, varities, glazing, Porcelain, Refractory materials, classification, properties.

MODULE-2

Glass: Definition, constituents, manufacture, classification commercial forms, uses of different types of Glasses.

Timber: Definition, uses of Timber, Physical and Mechanical properties, defects, Seasoning, Preservation, Miscellaneous wood product.

Plastics: Classification, Ingredients, General properties, fabrication of plastic products.

MODULE-3

Rubber: Classification, uses, vulcanization, compounding of rubber, reclaimed rubber.

Organic Coating: Ingredients, Types, Luminescent Coating, Fire Retarding Coating.

Laminates and Adhesives: Definitions, Types, Laminated Wood, Compressed Laminated, Plastic, Avtex.

MODULE-4

Concrete – Materials:

Cement, Aggregate, Admixtures, types and properties, workability, segregation and Bleeding, Tensile and Compressive Strength, Modulus of Elasticity, Effect of Shrinkage and Creep, Effect of Temperature on concrete, Mixing, Transporting, Placing, Compaction, Finishing, Curing, Ready mix Concrete.

MODULE-5

Heat Insulating and Acoustic Materials: Classification, Composition, Tests, Sound Absorption, types of Acoustical Materials. Acoustical Treatment, Noise Reduction.

Material Science:

Inter atomic bonds, bonding force, bond energy, intermolecular bonds, thermal energy, classification of solids, imperfections solids.

Behaviour of materials under compression, tension, bending, fatigue, creep, hardness, behaviour of common materials under different loadings: Concrete, Steel, Timber, Plastics, Glass.

References:-

1. Surendra Singh, *Engineering Materials,* Vikas Publishing House.
2. Rangwala, *Engineering Materials,* Charatar Publications.
3. Shetty M.S., *Concrete Technology, Theory and Practical,* S. Chand & Co. Ltd., New Delhi.

Course Articulation Matrix (CIVIL 4th Sem AICTE)

SUBJECT NAME	SUBJECT CODE	STATEMENT	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1
Material Science CE401	CO1	Classify various construction materials	1												1
	CO2	Explain various properties of construction material	2												1
	CO3	Use various construction material	2												1

JABALPUR ENGINEERING COLLEGE, JABALPUR

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B.Tech IV Semester (Civil Engineering)

COURSE	SUBJECT TITLE	SUBJECT CODE	Contact Hours Per Week			Total Credits
			L	T	P	
B.Tech	TRANSPORTATION ENGINEERING	CE402	3	-	2	4

TRANSPORTATION ENGINEERING

MODULE 1

Highways :Classification of Roads, Road Patterns, Brief History of Road Development around the World, Road Development Plans of the India, Typical Cross Sections in Urban and Rural roads, Various Cross Sections Elements, Width of Carriage-way, Shoulders, Medians, Width of Roadways, Right of Way, Camber, Design Speed, Sight Distance, Stopping Sight Distance, Passing Sight Distance, Sight Distance at Inter-Section, Passing Zones, Super Elevations, Set Back, Extra Widening on Horizontal Curve, Transition Curve, Design of Horizontal and Vertical Alignment, Combinations of Horizontal and Vertical Alignment

MODULE - 2

Traffic Engineering : Definition, Road User and Vehicle, Traffic Studies - Speed, Volume, Origin & Destination, Capacity, Parking and Accidents, Traffic Signs, Traffic Markings, Traffic Signals - Types, Signal systems, Warrants and Design, Traffic Management, Intersection Types - At Grade & Grade Separation, Rotary Design, Street Lighting.

MODULE - 3

Highway Materials: Soil, Desirable Properties, Classification, CBR, G. I. Modulus of Subgrade Reaction, Aggregates and their Characterisations, Bitumen Types, Tests on Bitumen, Bituminous Mixes-Requirements and

Design, Concrete Mixes-Design, I.R.C. - 44 Method, Road Note No. 4 Method, ACI., Guidelines by I.S.

MODULE 4

Pavement Design: Pavement Structures, Wheel Load Configuration, Behaviour under Repeated Loading, Function of Various Pavement Components, Factors affecting Pavement Design, Flexible Pavement Design Methods-GI, CBR, California R-Value Method. Triaxial Method, Mcleod Method, Burmister Method, I.R.C. Method Rigid Pavements, Calculation of Wheel Load Stresses and Temperature Stresses, Westergaard Method, Analysis, Joints in Rigid Pavements, I.R.C. Method for Design, Filling and Sealing of Joints, Design of Reinforcement, Dowel Bars and Tie Bars, Pumping of Concrete Pavements.

MODULE-5

Railway Engineering : Early development in rail transport, Permanent Way, Gauges, Sleepers, Ballast, Rails, Rail Fastenings, Calculation of Materials for Permanent way, Coning of Wheels, Rail Cross Section, Tilting of Rails, Wear & Creep of Rails, Geometrics, Gradients, Transition Curves, Widening of Gauges on Curves, Cant & Cant Deficiency.

Points & Crossing - Design of Turn outs and description of Track Junctions, Signalling and Interlocking, Classification of Signals and Points, Control of Train, Track Circuits, Station Yards.

References:-

1. Khanna S.K. & Justo, C.E.G. "Highways Engineering" 10th edition. Nem Chand and Brothers, 2015.
2. O. Flaherty C.A., "Highway Vol. I & II:, Butterworth Heinemann, 2002
3. IRC-58-2015, "Guideline for Design of Rigid Pavements".
4. IRC-37-2012, "Guideline for the Design of Flexible Pavements".
5. Railway Engineering by S.C. Saxena and S.P. Arora; DhanpatRai Publication

List of Experiments:

1. Impact Test of Aggregates.
2. Abrasion Test of Aggregates.
3. Shape test – Elongation and Flakiness Index Test of Aggregates.
4. Penetration Test of Bitumen
5. Softening point Test of Bitumen
6. Ductility test of Bitumen
7. Crushing strength of Aggregate
8. Bituminous mix design by marshal method
9. Specific gravity and water absorption of aggregate
10. CBR of soil sub grade.

Course Articulation Matrix (CIVIL 4th Sem AICTE)

SUBJECT NAME	SUBJECT CODE	STATEMENT	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1
Transportation Engineering CE402	CO1	Calculate geometrical elements of highways and railways.	1	2											
	CO2	Illustrate traffic engineering aspects highways and railways.	1	2									1		
	CO3	Design of Flexible and rigid pavements and components of railway track			2										
	CO4	Explain materials used in construction of highways	2												
Transportation Engineering Lab CE402	CO1	Evaluate properties of materials used in construction of highways.	2								1	1			1

JABALPUR ENGINEERING COLLEGE, JABALPUR
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B.Tech IV Semester (Civil Engineering)

COURSE	SUBJECT TITLE	SUBJECT CODE	Contact Hours Per Week			Total Credits
			L	T	P	
B.Tech	GEOTECHNICAL ENGINEERING-I	CE403	3	0	2	4

GEOTECHNICAL ENGINEERING-I

MODULE-I :

Basic Definitions & Index Properties : Definition and scope of soil mechanics, Historical development. Formation of soils.Soil composition. Minerals, Influence of clay minerals on engineering behavior, Soil structure. Three phase system. Index properties and their determination. Consistency limits. Classification systems based on particle size and consistency limits.

MOLULE - II :

Soil Water and Consolidation : Soil water, Permeability Determination of permeability in laboratory and in field. Seepage and seepage pressure.Flownets, sues of a flownet, Effective, neutral and total stresses. Compressibility and consolidation, Relationship between pressure and void ratio, Theory of one dimensional consolidation. Consolidation test, Fitting Time curves. Normally and over consolidated clays.Determination of preconsolidation pressure, settlement analysis.Calculation of total settlement.

MODULE- III :

Stress Distribution in Soils and Shear Strength of Soils : Stress distribution beneath loaded areas by Boussinesq and water guard'sanalysis. Newmark'sinfluence chart. Contact pressure distibution.Mohr-Coulomb'stheory of shear failure of soils, Mohr'sstress circle, Measurement of shear strength, Shear box test, Triaxial compression test, unconfined compression test. Value shear test, Measurement of pore pressure, pore pressure parameters, critical void ratio, Liquefaction.

MODULE- IV :

Stability of Slopes : Infinite and finite slopes. Types of slope failures, Rotational slips. Stability number. Effect of ground water, selection of shear strength parameters in slope stability analysis.Analytical and graphical methods of stability analysis.Stability of Earth Dams.

MODULE-V :

Lateral Earth Pressure : Active, passive and earth pressure at rest. Rankine, Coulomb, Terzaghi and Culmann'stheories.Analyical and graphical methods of determination of earth pressures on cohesion - less and cohesive soils.Effect of surcharge, water table and wallfriction.Arching in soils.Reinforced earth retaining walls,

Reference Books :

I. Soil Mech. & Found. Engg. By Dr. K.R. Arora - Std Publishers Delhi.
2. Soil Mech. & Found by Dr. B.C.Punmia - Laxmi Publications, Delhi
3. Modem GeotechEngg. By Dr. I Aram Singh - IBT Publishers Delhi
4. GeotechEngg. By C.Venkatramaiah New Age International Publishers, Delhi
5. Soil Mech& Found. Engg. By S.K. Garg - Khanna Publishers, Delhi
6. Soil Testing for Engg. By T.W. Lambe - John Wiley &Soms.Inc.

List of Experiments :

1. Determination of Hygroscopic water content
2. Determination of field density by Core Cutter method.
3. Determination of field density by Sand Replacement method.
4. Determination of field density by Water Replacement method
5. Particle - size analysis
6. Determination of Specific gravity of soil particles
7. Determination of plastic limit
8. Determination of liquid limit
9. Determination of shrinkage limit
10. Permeability test
11. Light Compaction Test (Std. Compaction Test)
12. Heavy Compaction Test (Modifies Compaction Test)

Course Articulation Matrix (CIVIL 4th Sem AICTE)

SUBJECT NAME	SUBJECT CODE	STATEMENT	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1
Geotechnical Engineering - I CE403	CO1	Determine index properties, compressibility and permeability parameters of soil.		2											
	CO2	Calculate shear strength and earthpressure of cohesive and non-cohesive soil.		3											
	CO3	Analyze the stability of finite and in-finite slopes		3											
Geotechnical Engineering Lab ICE403	CO1	Determine insitu density using various methods.	2												1
	CO2	Classify soil as per IS classification.	1				1				2	1			1
											2	1			

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B.Tech IV Semester (Civil Engineering)

COURSE	SUBJECT TITLE	SUBJECT CODE	Contact Hours Per Week			Total Credits
			L	T	P	
B.Tech	FLUID MECHANICS	CE404	3	0	2	4

FLUID MECHANICS

MODULE-I

Review of Fluid Properties: Engineering units of measurement, mass, density, specific weight, volume and gravity, surface tension, capillarity, viscosity, bulk modulus of elasticity, pressure and vapor pressure.

Fluid Static's: Pressure at a point, pressure variation in static fluid, Absolute and gauge pressure, manometers, Forces on plane and curved surfaces (Problems on gravity dams and tainter gates); buoyant force, Stability of floating and submerged bodies, Relative equilibrium.

MODULE-II

Kinematics of Flow : Types of flow-ideal & real , steady & unsteady, uniform & non-uniform, one, two and three dimensional flow, path lines, streak-lines, stream lines and stream tubes; continuity equation for one and three dimensional flow, rotational &irrotational flow, circulation, stagnation point, separation of flow, sources & sinks, velocity potential, stream function, flow nets their utility & method of drawing flow nets.

Dynamics of Flow: Euler's equation of motion along a streamline and derivation of Bernoulli's equation, application of Bernoulli's equation, energy correction factor, linear momentum equation for steady flow, momentum correction factor. The

moment of momentum equation, forces on fixed and moving vanes and other applications.

MODULE-III

Laminar Flow: Introduction to laminar & turbulent flow, Reynolds experiment & Reynolds number, relation between shear & pressure gradient, laminar flow through circular pipes, laminar flow between parallel plates, laminar flow through porous media, Stokes law, lubrication principles.

Turbulent Flow: Laminar and turbulent boundary layers and laminar sub layer, hydro dynamically smooth and rough boundaries, velocity distribution in turbulent flow, resistance of smooth and artificially roughened pipes commercial pipes, aging of pipes.

MODULE-IV

Pipe flow problems : Losses due to sudden expansion and contraction, losses in pipe fittings and valves, concepts of equivalent length, hydraulic and energy gradient lines, siphon, pipes in series, pipes in parallel, branching of pipes.

Pipe Network : Water Hammer (only quick closure case) transmission of power, Hardy Cross Method

Dimensional Analysis and Dynamic Similitude: Dimensional analysis, dimensional homogeneity, use of Buckingham-pi theorem, calculation of dimensionless numbers, similarity laws, specific model investigations

MODULE -V

Turbines: Classifications, definitions, similarity laws, specific speed and unit quantities, Pelton turbine-their construction and settings, speed regulation, dimensions of various elements,

Centrifugal pumps : Various types and their important components, manometric head, total head, net positive suction head specific speed, shut of head, energy losses cavitation, principle of working and characteristic curves.

Reciprocating Pumps: Principle of working, Coefficient of discharge, slip single acting and double acting pump, Manometric head, Acceleration head.

Forces on immersed bodies: Types of drag, drag on a sphere, flat plate, cylinder and an aerofoil development of lift, lifting vanes, magnus effect.

Reference Books-

1. Modi& Seth; Fluid Mechanics; Standard Book House, Delhi
2. Som and Biswas; Fluid Mechnics and machinery; TMH
3. Cengal; Fluid Mechanics; TMH
4. White , Fluid Mechanics , TMH
5. JNIK DAKE; Essential of EnggHyd; Afrikan Network &ScInstt. (ANSTD
6. Franiss JRD; A Text Book of fluid Mech. for Engg. Student
7. R Mohanty; Fluid Mechanics; PHI
8. Gupta; Fluid Mechanics, Pearson.

List of Experiment:

1. To determine the local point velocity with the help of Pitot tube.
2. To find out the terminal velocity of a spherical body in water.
3. Calibration of Orifice meter and Venturi meter
4. Determination of Cc, Cr, Co of Orifices
5. Calibration of Nozzle meter and Mouth Piece
6. Reynolds experiment for demonstration of stream lines & turbulent flow
7. Determination of meta-centric height
8. Determination of Friction Factor of a pipe
9. To study the characteristics of a centrifugal pump.
10. Verification of impulse momentum principle

Course Articulation Matrix (CIVIL 4th Sem AICTE)

SUBJECT NAME	SUBJECT CODE	STATEMENT	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1
Fluid Mechanics CE404	CO1	Explain fluid properties, flow nets, flow measurements, laminar and turbulent flow, similarity laws	2												
	CO2	Solve problems on dynamics, kinematics of fluid flow, fluid statics, laminar & turbulent flow through pipes		3											
	CO3	Calculate pressure,dimension-less numbers, forces on plane & curved surface and fixed & moving vanes		3											
Fluid Mechanics Lab CE404	CO1	Determine local point velocity, terminal velocity, meta-centric height	2								1	1			
		Calibration of Orifice-meter, Venturi-meter, Nozzle-meter and Mouth-piece	1			1					1				

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(AICTE Model Curriculum based scheme)
B.Tech IV Semester (Civil Engineering)

COURSE	SUBJECT TITLE	SUBJECT CODE	Contact Hours Per Week			Total Credits
			L	T	P	
B.Tech	ADVANCE SURVEYING	CE405	3	1	-	4

ADVANCE SURVEYING

MODULE– I:

Reciprocal leveling, profile leveling, cross sectioning, contouring, methods of contouringtrignometrical leveling.

MODULE– II:

Traversing by theodolite, field work checks, traverse computations, latitude and departures,adjustments, computations of co-ordinates, plotting and adjusting of traverse, omittedmeasurements.

MODULE– III:

Tacheometry : Tachometric systems and principles, stadia system, uses of anallatic lens,tangential system, subtense system, instrument constant field work, reduction, direct readingtacheometers, use of tacheometry for traversing and contouring.

MODULE– IV:

Curves : Classification and use; element of circular curves, calculations, setting out curves byoffsets and by theodolites, compound curves, reverse curves, transition curves, cubic spiral andlemniscates, setting outvertical curves.

MODULE-V:

Control Surveys: Providing frame work of control points, triangulation principle, reconnaissanceselection and marking of stations.

Hydrographic Surveying: Sounding, methods of observations, computations and plotting.

Field Astronomy: Spherical trigonometry, Astronomical terms, co-ordinate systems circumpolarstars, astronomical triangle determination of Azimuth & time.

References:

1. Surveying &LevellingVol.I&Vol II T.P. Kanetkar
2. Guggal, Surveying Theory & Practice, Vol.I&II,Tata McGraw Hell Pub co.ltd.
3. Surveying Vol I,II,& III B.C. Punamia
4. Surveying Vol I,II, KR.Arora.

10M

10M

10M

10M

Course Articulation Matrix (CIVIL 4th Sem AICTE)

SUBJECT NAME	SUBJECT CODE	STATEMENT	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1
Adavnce Surveying CE405	CO1	Explain various method of leveling and contouring.	1												2
	CO2	Analyse traversing data obtained using theodolite.		2							1				3
	CO3	Determine horizontal and vertical distances using tacheometry.		2											
	CO4	Set out curves and control point for carrying out any civil engineering work.		2											1

JABALPUR ENGINEERING COLLEGE, JABALPUR
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(AICTE Model Curriculum based scheme)
B.Tech IV Semester (Civil Engineering)

COURSE	SUBJECT TITLE	SUBJECT CODE	Contact Hours Per Week			Total Credits
			L	T	P	
B.Tech	Software lab-I	CE406	-	-	2	1

List of Experiments:

a. Roots of an equation using Newton - Raphson method.
b. Solution of linear simultaneous equations using Gauss elimination.
c. Matrix inversion using Gauss Jordan method
d. Linear regression line of given points
e. Curve fitting using Polynomial Regression
f. Eigen value extraction using Power method Standard packages to solve the above problems-Solution of Linear Programming problems using standard software-Basic 2D objects - line, polyline, circle, ellipse - editing objects - trim, break, change, stretch - dimensioning - preparation of plan, elevation and section drawings of simple structural objects - printing and plotting drawings - script files - introduction to 3D DBMS concepts - Civil Engineering Databases - Manipulation - Spreadsheet concepts - Worksheet calculations in Civil Engineering - Regression, Matrix Inversion, etc

Course Articulation Matrix (CIVIL 4th Sem AICTE)														
SUBJECT NAME	SUBJECT CODE	STATEMENT	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1
Software Lab I CE406	CO1	Design civil engineering structures and its components.				3									2

JABALPUR ENGINEERING COLLEGE, JABALPUR
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(AICTE Model Curriculum based scheme)
B.Tech IV Semester (Civil Engineering)

COURSE	SUBJECT TITLE	SUBJECT CODE	Contact Hours Per Week			Total Credits
			L	T	P	
B.Tech	INDUSTRIAL TRAINING	CE407	-	-	-	

Minimum four week duration and Evaluation will be done in fifth (5th) semester.

Jabalpur Engineering College, Jabalpur

(Declared Autonomous by MP Govt., Affiliated to RGPV, Bhopal)
(AICTE Model Curriculum Based Scheme)
Bachelor of Technology (B.Tech.) IV 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	MA401	BSC	Discrete Structure	70	20	10	-	-	100	3	1	-	4
2	CS402	PCC	Computer Organization and Architecture	70	20	10	30	20	150	3	-	2	4
3	CS403	PCC	Operating Systems	70	20	10	30	20	150	3	-	2	4
4	CS404	PCC	Design and Analysis of Algorithms	70	20	10	30	20	150	3	-	2	4
5	CS405	PEC	Management-I (Organizational Behaviour/Finance & Accounting)	70	20	10	-	-	100	3	1	—	4
6	CS406	ESC	Software Lab-II (PYTHON)	-	-	-	60	40	100	-	-	2	1
7	CS407	MC	Industrial Training	Minimum Four Weeks Duration. Evaluation will be done in 5th semester									
Total				**350**	**100**	**50**	**150**	**100**	**750**	**15**	2	8	**21**
8	CS408	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 CS408 for the award of Honours (Minor Specialization).									

Note:1 Departmental BOS will decide list of three optional subjects those are available in MOOC as well for PEC.

2 Industrial training should be apart from laboratory work undertaken in the college rather it should have industrial orientation and practical aspects/field work. Report to be submitted at the beginning of 5th semester and students have to give a presentation in the departement. Evaluation will be done in 5th semester.

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

MOOC Courses	CS408A Privacy and Security in Online Social Media	CS408B Randomized Algorithms	CS408C Parallel Algorithms

PRINCIPAL
GOVT. ENGINEERING COLLEGE
JABALPUR (M.P.)

Subject Code	Subject Name & Title	Maximum Marks Allotted						Hours/ Week			Total Credits
		Theory			Practical		Total Marks	L	T	P	
		End Sem	Mid Sem Exam	Quiz, Assign ment	End Sem	Lab Work					
MA401	Discrete Structure	70	20	10	-	-	100	3	1	-	4

Module 1: Set theory, relation and function (08 Hours)

Definition of sets, countable and uncountable sets, Venn Diagram, proofs of some general identities on sets relation: Definition, types of relation, composition general identities on sets relation: Definition, types of relation, composition ordering relation Function: Definition one to one, into and onto function, inverse function, composition of functions recursively defined functions, pigeonhole principle.

Module 2: Posets, Hasse diagram and lattices (08 Hours)

Introduction ordered set, Hasse diagram of partially, ordered set, isomorphic ordered set, well ordered set, properties of Lattices, bounded and complemented lattices. Propositional logic Proposition, first order logic, Basic logical operation, truth tables tautologies, contractions, Algebra of Proposition, logical implications, logical equivalence, Rules of inference, Predicates, the statement function.

Module 3: Theorem proving techniques (06 Hours)

Mathematical induction, Recurrence Relation and Generating Function: Introduction to recurrence relation and recursive algorithm, linear recurrence relations with constant coefficients, homogeneous solutions, particular solutions Total solution, generating functions, Solution by method of generating functions.

Module 4: Algebraic structure: Group, Ring, Field (10 Hours)

Definition properties types : semi groups, Monoid groups, Abelian group, properties of groups, Subgroup, cyclic groups, Cosets, Normal subgroup, Homomorphism& Isomorphism of groups, Rings and Fields and finite fields: definition and examples.

Module 5: Graph theory (08 Hours)

Introduction and basic terminology of graphs, Planer graphs Multigraphs and weighted graphs Isomorphic graphs, Paths, Cycles and connectivity, shortest path in weighted graph Introduction to Eulerian paths and circuits, Hamiltonian paths and circuits, Graph coloring, chromatic number.

Books Reference:

1. Elements of Discrete Mathematics by C. L. Liu Tata McGraw-Hill Edition.
2. Discrete Mathematical structure with application in CS by Trembly, J.P. & Manohar; Mc Graw Hill.
3. Graph Theory with application to engineering and computer science by Deo, Narsingh; PHI.
4. Discrete Mathematics by Seymour Lipschutz and and mark Lipson Schaum's Outlines Tata McGraw-Hill Pub.

20.7.18 20/7/18

CO1. Determine the basic principle of Set Theory, Boolean Algebra and Logic.

CO2. Solve the mathematical relations by theorem proving techniques.

CO3. Understand the knowledge of algebraic structures: group, ring and field.

CO4. Apply to graph theory in various engineering problems.

Jabalpur Engineering College, Jabalpur

(AICTE Model Curriculum based scheme)

B.Tech. (AICTE) IV Sem. (Computer Science & 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 Exam	Quiz, Assign ment	End Sem	Lab Work					
CS402	Computer Organization and Architecture	70	20	10	30	20	150	3	-	2	4

Module 1

Functional blocks of a computer: CPU, memory, input-output subsystems, control unit. Instruction set architecture of a CPU – registers, instruction execution cycle, RTL interpretation of instructions, addressing modes, instruction set. Case study – instruction sets of some common CPUs. Data representation: signed number representation, fixed and floating point representations, character representation. Computer arithmetic – integer addition and subtraction, ripple carry adder, carry look-ahead adder, etc. multiplication – shift-and add, Booth multiplier, carry save multiplier, etc. Division restoring and non-restoring techniques, floating point arithmetic.

Module 2:

Introduction to x86 architecture, CPU Control unit design: hardwired and micro-programmed design approaches, Case study – design of a simple hypothetical CPU.

Memory system design: semiconductor memory technologies, memory organization.

Module 3.

Peripheral devices and their characteristics: Input-output subsystems, I/O device interface, I/O transfers – program controlled, interrupt driven and DMA, privileged And non-privileged instructions, software interrupts and exceptions. Programs and Processes – role of interrupts in process state transitions, I/O device interfaces – SCII, USB.

Module 4

Pipelining: Basic concepts of pipelining, throughput and speedup, pipeline hazards. Parallel Processors: Introduction to parallel processors, Concurrent access to memory and cache coherency.

Module 5

Memory organization: Memory interleaving, concept of hierarchical memory organization, cache memory, cache size vs. block size, mapping functions, replacement algorithms, write policies.

Suggested books:

1."Computer Organization and Design: The Hardware/Software Interface", 5th Edition by David A. Patterson and John L. Hennessy, Elsevier.

2. "Computer Organization and Embedded Systems", 6th Edition by Carl Hamacher, McGraw Hill Higher Education Suggested reference books:

3."Computer Architecture and Organization", 3rd Edition by John P. Hayes, WCB/McGraw-Hill

Course Outcomes: On successful completion of the course, the students will be able to:

CO1. Draw the functional block diagram of a single bus architecture of a computer and describe the function of the instruction execution cycle, RTL interpretation of instructions, addressing modes, instruction set.

CO2. Write assembly language program for specified microprocessor for computing 16 bit multiplication, division and I/O device interface (ADC, Control circuit, serial port communication).

CO3. Write a flowchart for Concurrent access to memory and cache coherency in Parallel Processors and describe the process.

CO4. Given a CPU organization and instruction, design a memory module and analyze its operation by interfacing with the CPU.

CO5. Given a CPU organization, assess its performance, and apply design techniques to enhance performance using pipelining, parallelism and RISC methodology.

Jabalpur Engineering College, Jabalpur
(AICTE Model Curriculum based scheme)
B.Tech. (AICTE) IV Sem. (Computer Science & 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 Exam	Quiz, Assign ment	End Sem	Lab Work					
CS403	Operating Systems	70	20	10	30	20	150	3	-	2	4

Module 1:

Introduction: Concept of Operating Systems, Generations of Operating systems, Types of Operating Systems, OS Services, System Calls, Structure of an OS - Layered, Monolithic, Microkernel Operating Systems.

Module 2:

Processes: Definition, Process Relationship, Different states of a Process, Process State transitions, Process Control Block (PCB), Context switching

Thread: Definition, states, Types of threads, Concept of multithreads and its benefit.

Process Scheduling: Foundation and Scheduling objectives, Types of Schedulers, Scheduling criteria: CPU utilization, Throughput, Turnaround Time, Waiting Time, Response Time; CPU Scheduling Algorithms.

Module 3:

Inter-process Communication: Critical Section, Race Conditions, Mutual Exclusion, Hardware Solution, Strict Alternation, Peterson's Solution, The Producer\ Consumer Problem, Semaphores, Event Counters, Monitors, Message Passing, Classical IPC Problems: Reader's & Writer Problem, Dinning Philosopher Problem etc.

Module 4:

Deadlocks: Definition, Necessary and sufficient conditions for Deadlock, Deadlock Prevention, Deadlock Avoidance: Banker's algorithm, Deadlock detection and Recovery.

Module:5

Memory Management: Basic concept, Logical and Physical address map, Memory allocation, Fragmentation and Compaction, Paging, Protection and sharing, Disadvantages of paging.

Virtual Memory: Basics of Virtual Memory ,page fault, Demand paging, Page Replacement Algorithms.

I/O Hardware: I/O devices, Device controllers, Direct memory access Principles of I/O Software,, Secondary-Storage Structure,
Disk scheduling algorithms

File Management: Concept of File, Access methods, File types, File operation, Directory structure, File System structure, Allocation methods, Free-space management, directory implementation, efficiency and performance.

Disk Management: Disk structure, Disk Scheduling Algorithms, Disk reliability, Disk formatting, Case study on UNIX and WINDOWS Operating System.

Suggested books:

1. Operating Systems, 3rd Edition by H.M.Deitel, P.J. Deitel And D.R.Choffnes. Pearson Publications Prentice Hall.
2. Modern Operating Systems, 4th Edition by Andrew S. Tanenbaum. Pearson publication.
3. Operating System Concepts Essentials, 9th Edition by Avi Silberschatz, Peter Galvin, Greg Gagne, Wiley Asia Student Edition.
4. Operating Systems: Internals and Design Principles, 5th Edition, William Stallings, Prentice Hall of India.
5. Operating System: A Design-oriented Approach, 1st Edition by Charles Crowley, Irwin Publishing.
6. Operating Systems: A Modern Perspective, 2nd Edition by Gary J. Nutt, Addison-Wesley.
7. Design of the UNIX Operating Systems, 8th Edition by Maurice Bach, Prentice-Hall of India.
8. Understanding the Linux Kernel, 3rd Edition, Daniel P. Bovet, and Associates.

Course Outcomes: On successful completion of the course, the students will be able to:

CO1. Describe functional architecture of an operating system.
CO2. Understand how process scheduling is occurred, understand about deadlock, ability to avoid deadlock.
CO3. Describe the memory management techniques and formulate solutions for optimally allocating memory to processes.
CO4. Create processes and threads.
CO5. Develop programs to simulate algorithms for process scheduling for a given specification of CPU utilization, Throughput, Turnaround Time, Waiting Time, Response Time.

Jabalpur Engineering College, Jabalpur
(AICTE Model Curriculum based scheme)
B.Tech. (AICTE) IV Sem. (Computer Science & 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 Exam	Quiz, Assign ment	End Sem	Lab Work					
CS404	Design and Analysis of Algorithms	70	20	10	30	20	150	3	-	2	4

Module I:

Algorithm Analysis: Time, Space Tradeoff ,Asymptotic Notations ,Conditional asymptotic notation ,Removing condition from the conditional asymptotic notation, Properties of big-Oh notation ,Recurrence equations ,Solving recurrence equations

Module II:

Divide and Conquer :Design and analysis of algorithms: Binary Search, Heap Sort, Merge Sort, Quick Sort. Multiplication of Large Integers, Strassen's Matrix Multiplication.

Module III:

Greedy Algorithms: Knapsack Problem, Job scheduling algorithm, Huffman Code, Spanning Tree.

Module IV:

Dynamic Programming: General Method , Multistage Graphs ,All-Pair shortest paths , Optimal binary search trees ,0/1 Knapsack ,Travelling salesperson problem .

Backtracking: General Method , 8 Queens problem ,sum of subsets ,graph coloring , Hamiltonian problem ,knapsack problem. Graph Traversals.

Module V:

Branch and Bound: General Methods (FIFO & LC) ,0/1 Knapsack problem . Introduction to NP-Hard and NP-Completeness.

Suggested Books:

1. Horowitz & Sahani; Analysis & Design of Algorithm
2. Anany Levitin, "Introduction to the Design and Analysis of Algorithm", Pearson Education Asia, 2003.
3. Coremen Thomas, Leiserson CE, Rivest RL; Introduction to Algorithms; PHI.
4. Dasgupta; algorithms; TMH
5. Ullmann; Analysis & Design of Algorithm;
6. Michael T Goodrich, Robarto Tamassia, Algorithm Design, Wiely India

Course Outcomes: On successful completion of the course, the students will be able to:

CO1) Explain the concepts of asymptotic notations and different algorithm design techniques such as Greedy strategy, Dynamic Programming, Backtracking, Branch & Bound.

CO2) Analyse a given algorithm or function to find its time and space complexities

CO3) Apply appropriate algorithm design strategy to solve a given problem

CO4) Design algorithms to solve basic problems in computer science domain

Jabalpur Engineering College, Jabalpur

(AICTE Model Curriculum based scheme)

B.Tech. (AICTE) IV Sem. (Computer Science & 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 Exam	Quiz, Assign ment	End Sem	Lab Work					
CS405	Management-I (Organizational Behaviour/Finance & Accounting)	70	20	10	-	-	100	3	1	-	4

Module I: General Management:

General Management Evolution of Management thought; Schools of Management Thought; Scientific Management; Management Concepts; Characteristics of Management; Basic functions of Management; Management and Administration.

Module II: Production Management

Production Management; Production Process; Plant Location and Layout. Market; Marketing Management, Marketing Management Concepts; Market mix, Market Segmentation.

Module III: Principle and Practice of Management

Leadership: Meaning of Leadership, The principal task of Leadership, Approach to Leadership. Communication: Meaning and Importance of Communication, Process of communication.

Module IV:

Motivation; Needs, Theories of motivation. Coordination; Concept and Nature of Coordination, need for coordinating, types of coordination, methods of coordination.

Module V: Inventory Management

Classifications of Inventories, Functions of Inventories, Costs of Inventories, Economic Order Quantity. Project Management; Total Quality Management, Quality circles, Statistical Quality control.

Suggested Books:

1. Introduction to management, John R. Schermerhorn, Wiley Student Edition.
2. Human Resource Management, GuptaC. B. Sultan Chand & Sons New Delhi.
3. Organizational Behaviour, Dubey, C.H., Prentice Hall in India. (PHI)

Course Outcomes: On successful completion of the course, the students will be able to:

CO1. Explain management concepts, management functions and administration, production process, marketing concepts, process of communication, concepts of coordination.
CO2. Understand the importance of leadership and approach of leadership.
CO3. Classify various inventories.
CO4. Apply inventory concepts to forecast demand for inventory.

Jabalpur Engineering College, Jabalpur

(Declared Autonomous by MP Govt., Affiliated to RGPV, Bhopal)
(AICTE Model Curriculum Based Scheme)
Bachelor of Technology (B.Tech.) IV Semester (E&TC 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	EC401	PCC	Electromagnetic Theory	70	20	10	-	-	100	3	1	-	4
2	EC402	PCC	Analog Integrated Circuits	70	20	10	30	20	150	3	-	2	4
3	EC403	PCC	Digital Circuits & Systems	70	20	10	30	20	150	3	-	2	4
4	EC404	PCC	Analog Communication	70	20	10	30	20	150	3	-	2	4
5	EC405	PEC	Mobile Communication	70	20	10	-	-	100	3	1	-	4
6	EC406	ESC	Software Lab-II	-	-	-	60	40	100	-	-	2	1
7	EC407	MC	Industrial Training	Minimum Four Weeks Duration. Evaluation will be done in 5th semester									
Total				**350**	**100**	**50**	**150**	**100**	**750**	**15**	**2**	**8**	**21**
8	EC408	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 EC408 for the award of Honours (Minor Specialization).									

Note:1 Departmental BOS will decide list of three optional subjects those are available in MOOC as well for PEC.

2 Industrial training should be apart from laboratory work undertaken in the college rather it should have industrial orientation and practical aspects/field work. Report to be submitted at the beginning of 5th semester and students have to give a presentation in the departement. Evaluation will be done in 5th semester.

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

MOOC Courses	EC408A Introduction to Acoustics	EC408B Principles of Electronics . Biosensors	EC408C Interfacing with Arduino	EC408D Smartphone Emerging Technology

PRINCIPAL
GOVT. ENGINEERING COLLEGE
JABALPUR (M.P.)

Jabalpur Engineering College Jabalpur
(AICTE Model Curriculum based scheme)
B.Tech. (AICTE) IV Sem. (E&TC 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 Exam	Quiz, Assign ment	End Sem	Lab Work					
EC401	Electromagnetic Theory	70	20	10	-	-	100	3	1	-	4

Course Contents:

Module I Coordinate systems and transformation:
Cartesian coordinates, circular cylindrical coordinates, spherical coordinates .Vector calculus: Differential length, area and volume, line surface and volume integrals, del operator, gradient of a scalar, divergence of a vector and divergence theorem, curl of a vector .Green's and Stoke's theorem, Laplacian of a scalar.

Module II Electrostatics: Electrostatic fields, Coulombs law and field intensity, Electric field due to charge distribution, Electric flux density, Gausses' Law – Maxwell's equation, Electric dipole and flux lines, energy density in electrostatic fields. Electric field in material space: Properties of materials, convection and conduction currents, conductors, polarization in dielectrics, dielectric constants, continuity equation and relaxation time, boundary condition. Electrostatic boundary value problems: Poisson's and Laplace's equations, general procedures for soling Poisson's or Laplace's equations, resistance and capacitance, method of images.

Module III Magnetostatics: Magneto-static fields, Biot-Savart's Law, Ampere's circuit law, Maxwell's equation, application of ampere's law, magnetic flux density- Maxwell's equation, Maxwell's equation for static fields, magnetic scalar and vector potential. Magnetic forces, materials and devices: Forces due to magnetic field, magnetic torque and moment, a magnetic dipole, magnetization in materials, magnetic boundary conditions, inductors and inductances, magnetic energy.

Module IV Waves and applications: Maxwell's equation, Faraday's Law, transformer and motional electromotive forces, displacement current, Maxwell's equation in final form.

ModuleV Electromagnetic wave propagation: Wave propagation in lossy dielectrics, plane waves in lossless dielectrics, plane wave in free space, plain waves in good conductors, power and the pointing vector, reflection of a plain wave in a normal incidence.

Text Book:

1. Hayt, W.H. and Buck, J.A. 'Engineering Electromagnetics Tata McGraw Hill Publishing Co. Ltd., New Delhi Seventh edition.
2. Jordan E.C. and Balmain K.G. 'Electromagnetic' wave and radiating systems. PHI. Second edition.
3. Krauss J. D. 'Electromagnetics ' Tata McGraw Hill Fifth edition.
4. Ramo S, Whinnery T.R. and Vanduzer T, 'Field and Waves in Communication electronics' John Wiely and Sons Third edition.
5. Elements of Engineering Electromagnetics, N.N. Rao, 5th Ed., PHI.
6. Electromagnetic Waves and Antennas: Collins: TMH

Course Outcomes:

Upon successful completion of course students will be able to:

CO1	Understand different coordinate system
CO2	Derive relation between various Laws
CO3	Understand various boundary conditions
CO4	Understand behavior of Electric Field
CO5	Understand behavior of Magnetic Field

Jabalpur Engineering College Jabalpur

(AICTE Model Curriculum based scheme)

B.Tech. (AICTE) IV Sem. (E&TC 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 Exam	Quiz, Assign .ment	End Sem	Lab Work					
EC402	Analog Integrated Circuits	70	20	10	30	20	150	3	-	2	4

Course Contents :

Module I Operational Amplifier:

Ideal Operational amplifier, Operational Amplifier Internal Circuit, Operational amplifier DC Characteristics : Input bias Current, Input offset Current, Input offset Voltage, Thermal Drift, Operational amplifier AC Characteristics : Frequency Response, Stability of an OP-AMP, Frequency Compensation (External & Internal), Slew Rate, CMRR

Module II Basic Operational Amplifier Applications:

Instrumentation amplifier, AC amplifier, Voltage to current and current to Voltage Converter, Op-amp circuits using diodes, Sample and hold circuits ,Log & antilog amplifier Multiplier & Divider, Differentiator, Integrator, Electronic Analog Computation, Operational Transconductance Amplifier(OTA). Current Mirror, Wilson Current Mirror

Module III

Comparator: Regenerative Comparator (Schmitt Trigger), Square Wave generator (Astable Multivibrator), Monstable Multivibrator, Triangular Wave Generator, Basic Principle of Sine Wave Oscillators(RC Phase Shift, Colpitt, Hartley, Wien Brige)

Voltage Regulator: Series OP-AMP Regulator, IC Voltage Regulators, 723 General Purpose Regulators, Switching Regulator,

Active Filters: RC Active filters, Transformation, State variable filter, Switched capacitor filters, Active filters using OTA's.

Module IV

IC 555 Timers: Description of Functional Diagram, Monostable Operation, Astable Operation, Schmitt Trigger,

Phased- Locked Loops: Basic Principles, Phase Detector /Comparator, Voltage Controlled Oscillator (VCO), Low Pass Filter, Monolithic Phase- Locked Loop, PLL Applications.

D-A & A-D Converters: Basic DAC Techniques, A-D Converters.

Module VElectronics Devices Applications:

Diode as a circuit element, Piece-wise linear model, P-N junction diode as a Rectifier, Half wave rectifier ,Full-wave rectifier-Center-tapped and Bridge rectifier, Analysis of filters with Rectifiers- L,C,LC & Pi Filters, Voltage Multipliers, Clipper circuits - series and parallel clipper circuits , Clamper circuits - positive and negative clamper circuits, Transistor biasing,Transistor load lines,DC Load line, Q points, Feedback Amplifiers, Power Amplifiers.

REFERENCES:

1. Millman and Halkias : Integrated Electronics, TMH
2. Gayakwad: OP-AMP and Linear Integrated Circuits, Pearson Education
3. D. Roy Choudhury and Shail B. Jain: Linear Integrated Circuits, New Age
4. Boylestad and Nashelsky: Electronic Devices and Circuit Theory, PHI
5. Sedra and Smith : Microelectronics, Oxford Press
6. Graham Bell : Electronics Devices and Circuits, PHI
7. Donald A Neamen: Electronic Circuits Analysis and Design, TMH
8. S. Rama Reddy: Electronic Devices and Circuits, Alpha Science International Limited

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Course Outcomes:

Upon successful completion of course students will be able to:

CO1	Understand the Integrated Circuit Fabrication Techniques.
CO2	Apply and Interpret the AC and DC Characteristic of Operation Amplifier.
CO3	Design the various Electronic circuits using Operation Amplifier.
CO4	Design various analogue Electronic circuits (i.e. Regulators, Oscillators and Filters).
CO5	Design the various Electronic circuits using 555 timer.

ANALOG INTEGRATED CIRCUITS LAB

(Suggested Exercise)

List of experiments (Expandable) :

1. Study of Adder, Subtractor, Integrator, Differentiator, Log, Antilog amplifier using Op-Amp
2. Study of RC Phase shift Oscillator using Op-Amp
3. Study of Colpitt and Clapp oscillator using Op-Amp
4. Study of Schmitt trigger circuit using Op-Amp
5. Study of Heartley Oscillator using Op-Amp
6. Study Wien Bridge Oscillator using Op-Amp
7. Study of Monostable Multivibrator using IC555
8. Study of Astable Multivibrator using IC555
9. Study of Schmitt trigger using IC555

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	Design various electronics circuits
CO2	Analyze various electronics circuits
CO3	Apply opamp in various applications

Jabalpur Engineering College, Jabalpur
(AICTE Model Curriculum based scheme)
B.Tech. (AICTE) IV Sem. (E&TC 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 Exam	Quiz, Assign ment	End Sem	Lab Work					
EC403	Digital Circuits & Systems	70	20	10	30	20	150	3	-	2	4

Course Contents :

Module I

Boolean algebra and switching function: Minimization of switching function. Concept of prime implicant etc. Karnuagh's map method, Quine & McCluskey's 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 convertor. half – adders, halfsubtractor, full adders, fullsubtractor circuits. Series & parallel adders and BCD adders. look-ahead carry generator and adders. Decoders, Encoders, multiplexers & demultiplexers. Designing of combinational circuits with ROM and PLA.

Module III

Specification of sequential system: Characterizing equation & definition of synchronous sequential machines Realization of State table from verbal description , Mealy and moore machines state table and transition diagram. Minimization of the state table of completely specifies 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.

Module V

Algorithmic state machine: Controllers and data system designing, case studies

Books:

i) W. H. Gothman, "Digital Electronics" (PHI)
ii) R.J. Tocci, "Digital System Principles & Application"
iii) Z. Kohair (TMH), "Switching & Automata Theory"
iv) M. Mano (PHI) "Digital Logic & Computer Design"
v) M. Mano (PHI) "Digital Design".

Course Outcomes:

Upon successful completion of course students will be able to:

CO1	Understand Demorgans Theorem to simplify expression, K Map
CO2	Design and implement logic circuits using reprogrammable logic devices
CO3	Explain synchronous sequential machines, Mealy and Moore Machines
CO4	Design and Analysis of Sequential Circuits, asynchronous sequential machine
CO5	Describe Algorithm State machine

DIGITAL CIRCUIT & SYSTEMS LAB

LIST OF EXPERIMENTS

1. To study the operation & working of various types of logic gets with the help of electronic kit.
2. To study of Binary Adder.
3. To study of Encoder & Decoder.
4. To study of multiplexer and demultiplexer.
5. Experiment on multivibrator, Astable, Bistable, Monostable.
6. Study of Binary subtractor.
7. Study of Analog to Digital convertor.
8. Study of Digital to Analog convertor.

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 logical expressions through logic gates
CO2	Design various Digital combinational circuits
CO3	Convert analog to digital and digital to analog using converters

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Jabalpur Engineering College Jabalpur
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B.Tech. (AICTE) IV Sem. (E&TC 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 Exam	Quiz, Assignment	End Sem	Lab Work					
EC404	Analog Communication	70	20	10	30	20	150	3	-	2	4

Course Contents:

Module I Amplitude Modulation System

Representation of band pass signals, Frequency Translation, A Method of Frequency Translation, Recovery of Baseband Signal, Amplitude Modulation, Maximum Allowable Modulation, Spectrum of an Amplitude Modulated Signal, Generation and Detection of AM waves. Suppressed Carrier Systems (DSB-SC), Single Sideband Modulation, Vestigial Sideband Modulation, Comparison of various AM Systems, Frequency Division Multiplexing, AM Transmitter and AM Radio Broadcasting.

Module II Angle Modulation System

Angle modulation, Phase & Frequency Modulation, Relation between Phase & Frequency Modulation, Phase & Frequency Deviation, Spectrum of an FM Signal, Features of Bessel Coefficient, Narrowband FM, Wideband FM, Bandwidth of FM Signal, Effect of Modulation Index on Bandwidth, Phasor Diagram of FM signal, FM Generation and Detection, FM Radio Broadcasting.

Module III Random Variables

Random Variables, CDF, PDF, relation between CDF & PDF, Average Value of Random Variables, Variance of Random Variable, Tchebycheff's Inequality, Guassian Probability Density, Error Function, Rayleigh Probability Density, Correlation between Random Variables, Central Limit Theorem, Autocorrelation.

Module IV Random Processes

Description of Statistical Average, Stationary, Random Processes and Linear System, Power Spectrum of Stochastic Processes, Transmission over LTI System, Gaussian processes , White processes, Bandlimited Processes and Sampling, Bandpass Processes.

Module V Effect of Noise on Analog Communication Systems

Effect of noise on a Baseband Signal, DSB-SC AM, SSB AM, and Conventional System, The PLL, Effect of Additive Noise on Phase Estimation, Threshold effect in Angle Modulation, Pre-Emphasis and De-Emphasis Filtering, Comparison of Analog Modulation System, Characterization of Thermal Noise Sources, Effective Noise Temperature and Noise Figure, Transmission Losses, Repeaters for Signal Transmission.

Reference Books:

1. H.Taub&D.L.Schilling: Principles of Communication System; TMH
2 Simon Haykins- Communication System; John Wiley
3 B P Lathi- Modern Digital and Analog Communication, Oxford University.
4 J.Prokis and Salehi- Communication Engineering System, Prentice Hall.
5 Hwie. P. Hsu- Schaum's Outline of Analog and Digital Communication

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Course Outcomes:

Upon successful completion of course students will be able to:

CO1	Basic concept of signal, Generation and Detection of Analog Modulated Signals.
CO2	Understanding of Angle and Phase Modulation, generation and detection of Frequency modulated signals
CO3	Basic Concepts of Random Variable and its stastical parameter and understanding of CDF and PDF for different distribution
CO4	Basic concept of Random Process and its characteristics and understanding of Gaussian process
CO5	Understanding of effect of Gaussian noise for Analog Modulated System

ANALOG COMMUNICATION LAB

(Suggested Exercise)

List of Experiments:

1) Study of AM, DSB – SC & SSB.
2) Study of AM Transmitter.
3) Study of AM receiver.
4) Study of FM Generation by Armstrong Method.
5) Study of FM Generation by Reactance Modulator.
6) Study of Superhetrodyne receiver.
7) Study of Sampling Theorem and Reconstruction of Bandlimited signal

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 amplitude modulators and demodulators
CO2	Understand various types of frequency modulators and demodulators
CO3	Study various types of transmitters and receiver circuits

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(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 Exam	Quiz, Assign ment	End Sem	Lab Work					
EC405	Mobile Communication	70	20	10	-	-	100	3	1	-	4

Module -I
Introduction to cellular mobile system

A basic cellular system, performance criteria, uniqueness of mobile radio environment, operation of cellular systems, planning of cellular system. Elements of cellular radio system design General description of problem, concept of frequency reuse channels, co-channel interference reduction factor, desired C/I in an omni-directional antenna system, hand off mechanism, cell splitting, components of cellular systems.

Module-II Cell coverage for signal and traffic

General introduction, mobile point-to-point model, propagation over water or flat open area, foliage loss, propagation in near- in distance, long distance propagation, path loss from point-topoint prediction model, cell site antenna heights and signal coverage cells, mobile-to-mobile propagation. Cell site antennas and mobile antennas Equivalent circuits of antennas, gain and pattern relationship, sum and difference patterns, antennas at cell site, unique situations of cell site antennas, mobile antennas.

Module-III Cochannel interference reduction

Cochannel interference, real time cochannel interference measurement at mobile radio transceivers, design of antenna systems - omni directional and directional, lowering the antenna height, reduction of cochannel interference, umbrella- pattern effect, diversity receiver, designing a system to serve a predefined area that experiences cochannel interference. Types of Noncochannel interference Adjacent channel interference, near-end-far-end interference, effect on near-end mobile units, cross-talk, effects of coverage and interference by applying power decrease, antenna height decrease, beam tilting, effects of cell site components, interference between systems, UHF TV interference, long distance interference.

Module-IV Frequency management and Channel Assignment

Frequency management, frequency spectrum utilization, setup channels, channel assignment, fixed channel assignment, non-fixed channel assignment algorithms, additional spectrum, traffic and channel assignment, perception of call blocking from the subscribers Handoffs and dropped calls Value of implementing handoffs, initiation of handoff, delaying a handoff, forced handoff, queuing of handoff, power- difference handoff, mobile assisted handoff and soft handoff, cell-site handoff and intersystem handoff, dropped call rate formula.

Module-V Digital Cellular Systems

GSM- architecture, layer modeling, transmission, GSM channels and channel modes, multiple access scheme. CDMA- terms of CDMA systems, output power limits and control, modulation

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aracteristics, call processing, hand off procedures. Miscellaneous mobile systems- TDD systems, cordless phone, PDC, PCN, PCS, non cellular systems.

References:

1. Lee: Cellular and Mobile Telecommunication- Analog & digital systems, TMH.
2. Rappaport: Wireless Communications- principles and practice, Pearson Education.
3. Lee: Mobile communications design fundamentals, Wiley India.
4. FaherKamilo: Wireless Digital Communication, PHI Learning.
5. Raj Kamal: Mobile Computing, Oxford University Press

Course Outcome

CO 1:	Understand the fundamental concepts required to study cellular systems.
CO 2:	Identify various signal propagation characteristics with their associated parameters.
CO 3:	Acquire the concept of frequency reuse and its purpose to increase the system capacity.
CO 3:	Learn the method of reduction of interference occurs due to co-channel cells.
CO 4:	Understand the concept of spectrum utilization and channel assignment.
CO 5:	Learn the speech and data transmission in GSM and CDMA.

Jabalpur Engineering College, Jabalpur

(Declared Autonomous by MP Govt., Affiliated to RGPV, Bhopal)
(AICTE Model Curriculum Based Scheme)
Bachelor of Technology (B.Tech.) IV 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						
			Electrical	End. Sem.	Mid Sem. Exam.	Quiz/ Assignment	End Sem.	Lab Work		L	T	P	
1	EE401	BSC	Engineering Materials	70	20	10	-	-	100	3	1	-	4
2	EE402	PCC	Electrical Machines-I	70	20	10	30	20	150	3	-	2	4
3	EE403	PCC	Power System-I	70	20	10	30	20	150	3	-	2	4
4	EE404	PCC	Electrical and Electronic Instrumentation	70	20	10	30	20	150	3	-	2	4
5	EE405	PEC	Electromagnetic ~~Theory~~ Field Theory	70	20	10	-	-	100	3	1	-	4
6	EE406	ESC	Software Lab-II	-	-	-	60	40	100	-	-	2	1
7	EE407	MC	Industrial Training	Minimum Four Weeks Duration. Evaluation will be done in 5th semester									
Total				**350**	**100**	**50**	**150**	**100**	**750**	**15**	**2**	**8**	**21**
8	EE408	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 EE408 for the award of Honours (Minor Specialization).									

Note:1 Departmental BOS will decide list of three optional subjects those are available in MOOC as well for PEC.

2 Industrial training should be apart from laboratory work undertaken in the college rather it should have industrial orientation and practical aspects/field work. Report to be submitted at the beginning of 5th semester and students have to give a presentation in the departement. Evaluation will be done in 5th semester.

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

MOOC Courses	EE408A Bio Medical Signal Processing	EE408B Electronic Systems for Cancer Diagnosis	EE408C Advance Power Electronics and Control	EE408D Electromagnetic Waves in Guided and Wireless Medium

PRINCIPAL
GOVT. ENGINEERING COLLEGE
JABALPUR (M.P.)

Jabalpur Engineering College, Jabalpur

(AICTE Model Curriculum based scheme)

Bachelor of Engineering (Electrical Engineering) Semester: IV

(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					
EE 401	Electrical Engineering Materials	70	20	10	-	-	100	3	1	-	4

Electrical Engineering Materials

Module – I : CONDUCTORS :

Electron theory, conductivity, factor affecting conductivity, classification & properties of conducting materials. Effect of temperature variation, Alloys and their properties, properties and application of high conductivity(copper, aluminium, bronze & brass) & high resistivity(constantan, nichrome, carbon & platinum) materials, Application of conducting materials with their suitability in – Electrical Machines, power systems, Electrical instruments etc. super conducting materials, their properties & Applications.

Module – II : SEMICONDUCTORS :

General concepts , energy band, types of semiconductors, intrinsic and extrinsic semiconductor, variation of electrical conductivity, Elements having semiconducting properties, Fermi Dirac distribution, general application, Hall effect & its applications, conduction in semiconductors, drift, mobility, current flow in semi conductors, P-N Junction formation by alloying, Zener effect.

Module – III MAGNETIC MATERIALS :

Magnetism, classification of magnetic materials(diamagnetic, paramagnetic and ferromagnetic), their properties & applications, eddy currents, Hysteresis loop for hard and soft magnetic materials. magnetic susceptibility, coercive force, curie temperature, magnetostriction, Ferro-electric materials, piezo-electric materials & their properties.

Module – IV : DIELECTRICS AND INSULATORS :

Electrical, mechanical & chemical properties of insulating materials, Classification of Insulating materials, Liquid insulators(transformer oil and its properties), gaseous insulators, solid electrical insulating materials, resins and varnishes.

Properties of gaseous, liquid and solid dielectric, dielectric as a field medium, electric conduction in gaseous, liquid and solid dielectric, breakdown in dielectric materials, mechanical and electrical properties of dielectric materials, effect of temperature on dielectric materials, polarization, loss angle and dielectric loss.

Module – V : SPECIAL MATERIALS:

Photo emissive materials, nanomaterials, metamaterials, special conductive materials(materials for thermoelectric transformation, fuses, solder material etc), material for photovoltaic solar cell.

Reference Books :

1. Electrical Engineering Materials by Kortisky.
2. Electrical Engineering Materials by A.J. Decker
3. Di-electrics by Anderson
4. Materials for Electrical Engineering by B.M. Tareev
5. "A course in electrical engineering materials", S.P.Seth, Dhanpat Rai Publication

EE401 Engineering Materials

After completion of this course students will be able to-

CO1. Select proper conducting material suitable for electrical machines, power system and various electrical measuring instruments.
CO2. Analyze in depth the electrical and magnetic properties of various materials.
CO3. Explain superconductivity of magnetic materials with their applications in various fields.
CO4. Classify various insulating materials along with their properties.
CO5. Elaborate the modern usage of special materials in engineering.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
	Engineering Knowledge	**Problem Analysis**	**Design/Development of Solutions**	**Conduct Investigations of Complex Problems**	**Modern Tool Usage**	**The Engineer and Society**	**Environment and Sustainability**	**Ethics**	**Individual and Team Work**	**Communication**	**Project Management and Finance**	**Life-Long Learning**	**Machine**	**Power System**
EE401(1)	2	-		-	-	-	-	-	-	-	-	-	-	-
EE401(2)	2	-	2	-	-	-	-	-	-	-	-	-	-	-
EE401(3)	1	2	-	-	-	-	-	-	-	-	-	-	1	-
EE401(4)	1		-	1	-	1	1	2	-	-	-	-	1	-
EE401(5)	1											1	-	-
EE-401	**1.4**	**0.4**	**0.4**	**0.2**	**0**	**0.2**	**0.2**	**0.4**	**0**	**0**	**0**	**0.2**	**0.4**	**0**

Jabalpur Engineering College, Jabalpur

(AICTE Model Curriculum based scheme)

Bachelor of Engineering (Electrical Engineering) Semester:IV

(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					
EE 402	Electrical Machines - I	70	20	10	30	20	150	3		2	4

Electrical Machines - I

Module I- TRANSFORMERS

Review of single phase transformers, open circuit and short circuit test, sumpners test, polarity test, Power and distribution transformer, all day efficiency.

Autotransformer: working, equivalent circuit, comparison with two winding transformers and phasor diagram.

Three phase transformer: construction, various groups and connections, harmonics in emf and magnetizing current, Scott connection, Parallel operation and load sharing. Tap changing transformers, Pulse transformers.

Module II-FUNDAMENTAL PRINCIPLES OF ROTATING MACHINES

Energy stored in electric and magnetic fields, energy conversion in singly and doubly excited systems and torque production, Constructional details of dc and ac machines, description of magnetic and electric circuits in cylindrical rotor and salient pole machine, mmf distribution of current carrying single and multiple coils; Armature winding associated mmf and flux density waves; concept of rotating magnetic fields, Torque as a function of flux and mmf.

Module III-DC GENERATOR

Principle of operation, emf equation, classification on the basis of excitations, armature winding and its types, operating characteristics, armature reaction & commutation, losses and efficiency.

Module IV -DC MOTOR

Working, torque equation, types of DC motors, starting methods and speed control, ward Leonard method, solid state control, Swinburn's test, Hopkinson's test, braking. Applications of DC machines.

Module V -SINGLE PHASE INDUCTION MOTOR

EMF equation of 1-φ Induction motor, double field revolving theory, equivalent circuit, starting methods and types of 1-φ Induction motor.

List of Experiment:

1. To separate hysteresis and eddy current losses of a single phase transformer at rated voltage and frequency by conducting no load tests at different frequencies keeping V/f constant.
2. To conduct open circuit and short circuit tests on a 3-Ø three winding transformer and determine the equivalent circuit parameters in pu.
3. To operate two single phase transformer of different KVA rating in parallel and plot the variation of current shared by each transformer v/s load current.
4. To conduct Sumpner's test identical single phase transformer and determine their efficiency at various loads.
5. To perform direct load test on a DC shunt motor and plot the variation of (a) Input current (b) speed (c) torque (d) efficiency v/s output power.
6. To obtain magnetization characteristics of a DC machine. Estimate field circuit resistance of a DC shunt generator at rated speed. Measure field winding and armature winding resistance. Plot the external characteristics of DC shunt generator.
7. To make scott connection of two single phase transformer and to verify the current relation by drawing phasor diagram for balanced and unbalanced resistive load condition.
8. To conduct Swinburn's test on a dc shunt motor. Compute and plot the efficiency at various loads.
9. To conduct direct load test on DC Compound generator with (a) Shunt field alone (b) Cumulative and differential compounding for short shunt connections.
10. To perform speed control of DC shunt motor using armature and field control plot the variation of speed with added resistance.

References:

1. Nagrath and Kothari "ElectricalMchines", TMH Publication.
2. P.S.Bhimbra ,"Electrical Machinery" Khanna. Publication
3. LangsDorf "AC machines" TMH Publication
4. Ashfaq Hussain "Electrical Machines" DhanpatRai. Publication

EE402 ELECTRICAL MACHINES -I

After completion of this course students will be able to-

CO1. Perform various tests of transformers for performance analysis.
CO2. Analyze the principles of rotation machines.
CO3. Realize the operating characteristics of DC Generator.
CO4. Plot operating characteristics of DC Motor.
CO5. Illustrate the performance characteristics of Induction motor.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
	Engineering Knowledge	**Problem Analysis**	**Design/Development of Solutions**	**Conduct Investigations of Complex Problems**	**Modern Tool Usage**	**The Engineer and Society**	**Environment and Sustainability**	**Ethics**	**Individual and Team Work**	**Communication**	**Project Management and Finance**	**Life-Long Learning**	**Machine**	**Power System**
EE402(1)		-	3		-	-	-	-	-	-	-	-	3	-
EE402(2)	3		-	-	-	-	-	-	-	-	-	-	3	-
EE402(3)			2		-	-	-	-	-	-	-	-	2	-
EE402(4)			2										2	
EE402(5)	3	-	-	-	-	-	-	-	-	-	-	-	2	-

Jabalpur Engineering College, Jabalpur

(AICTE Model Curriculum based scheme)

Bachelor of Engineering (Electrical Engineering) Semester: IV

(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					
EE 402	Power System - I	70	20	10	30	20	150	3	0	2	4

Power System - I

Module: I

Sources of Power Generation: Conventional & Non Conventional, Block Diagrams and Auxiliaries used in Power Plants,Comparison between Power Plants, Economic aspects of Power plant operation: Definition, load factor, demand factor, diversity factor, Calculation of Cost of Generation, Power factor improvement, Economic Scheduling of Power Station: Criteria of loading of power plants with and without transmission losses, Load Dispatching in power systems, Co-generation and Coordination of power plants.

Module: II

Overhead Transmission Lines: Types of conductors, Line parameters: calculation of inductance and capacitance of single circuit transmission lines, three phase lines with stranded and bundle conductors, generalized ABCD constants and equivalent circuits of short, medium & long lines. Line performance, regulation and efficiency of short, medium and long lines, series and shunt compensation, FACTS. Real & Reactive power flow, surge impedance,SIL. Transmission system, Various Systems of AC transmission and their comparision,Comparision of HVAC & HVDC transmission, their merits and demerits, Substation layout, Voltage Regulators.

Module: III

Distribution systems: Primary and secondary distribution systems, concentrated and Uniformly distributed loads on distributors fed at one and both ends, ring distribution, voltage drop and power loss calculations, Feeders Kelvin's law and modified Kelvin's law for feeder conductor size and its limitations.

Module: IV

Overhead Line Insulators: Types, string efficiency, grading ring, preventive maintenance. Mechanical design of transmission lines: Different types of tower, sag-tension calculations, strings charts, vibration dampers, line supports, spacing of conductors and ground. Corona losses, radio and audio noise, transmission line- communication line interference.

Module: V

Cables: Classification, construction and characteristics of different types.

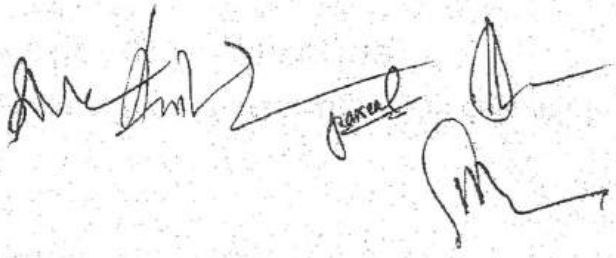
Insulation resistance and capacitance, grading (capacitance and inter sheath), phenomenon of dielectric losses, dielectric stress and sheath loss in cables.

List of Experiments

1. Planning of Electrical design of transmission line.
2. Simulation of Mechanical design of transmission line.
3. Determination of parameters required for tower structure
4. Simulation of string efficiency of different insulators.
5. Simulation of economic operation of power plants.
6. Fault detection of cable by using Megger.
7. Simulation of Ferranti effect using MATLAB.
8. Modeling & Simulation of Transmission line parameter using MATLAB. (Programmers based on sag calculation for different land terrain)

References:

1. Nagrath I J and Kothari DP; "Power System Engineering ", Tata McGraw Hill.
2. John S. Grainger and W.D. Stevenson Jr., "Power System Analysis", McGraw Hill.
3. Deshpande M V; "Electric Power System Design", TMH.
4. Central Electricity Generating Board; "Modern Power System Practice", Vol 1-8 Pergamon Oxford.
5. James J. Burke, "Power Distribution Engineering: Fundamentals and Applications", Marcel Dekker.
6. Westinghouse Electric Corporation; Electric Transmission & Distribution Reference Book; East Pittsburgh.
7. Wadhwa C L ; "Electrical Power System" Wiley Easternrn Limited.
8. Ashfaq Hussain; "Electrical Power System".
9. Gupta B R; "Power System Analysis and Design"Ray; " Electric Power System



EE403 Power System-I

After completion of this course students will be able to-

CO1. Illustrate power generation and its economics.
CO2. Analyze transmission line performance, regulation and efficiency.
CO3. Distinguish various distribution systems.
CO4. Describe overhead line insulators
CO5. Explain various types of cable and its characteristics.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
	Engineering Knowledge	**Problem Analysis**	**Design/Development of Solutions**	**Conduct Investigations of Complex Problems**	**Modern Tool Usage**	**The Engineer and Society**	**Environment and Sustainability**	**Ethics**	**Individual and Team Work**	**Communication**	**Project Management and Finance**	**Life-Long Learning**	**Machine**	**Power System**
EE403(1)	2	-	-	-	-	-	-	-	-	-	-	-	-	1
EE403(2)		3	-	-	-	-	-	-	-	-	-	-	-	1
EE403(3)	1	-	-		-	-	-	-	-	-	-	-	-	1
EE403(4)	1		-	2	-	-	1	-	-	-	-	-	-	2
EE403(5)	1													1
EE403	**1**	**0.6**	**0**	**0.4**	**0**	**0**	**0.2**	**0**	**0**	**0**	**0**	**0**	**0**	**1.2**

Jabalpur Engineering College, Jabalpur

(AICTE Model Curriculum based scheme)

Bachelor of Engineering (Electrical Engineering) Semester: IV

(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					
EE 404	Electrical & Electronic Instrumentation	70	20	10	30	20	150	3	-	2	4

Electrical & Electronic Instrumentation

Module I Cathode Ray Oscilloscope (CRO)

Different parts of CRO, Block diagram, Electrostatic focusing, Electrostatic deflection, post deflection acceleration, Screen for CRTs, Graticule, Vertical & Horizontal deflection system, Time base circuit, Oscilloscope probes, Application of CROs: Measurement of phase, frequency and other application, Special purpose CROs- Multi input, Dual trace, Dual beam, Sampling, Storage (Analog & Digital) Oscilloscopes.

Module II: A.C. Bridges:

Sources and detectors, Use of Bridges for measurement of inductance, Capacitance & Q factor Maxwells bridge, Maxwells inductance capacitance bridge, Hays bridge, Andersons bridge, Owen's Bridge, De-sauty's Bridge, Schering Bridge, High Voltage Schering bridge, Measurement of relative permittivity, Heaviside cambell's bridge, Weins bridge, Universal bridge, Sources of errors in Bridge circuit, Wagner's Earthing device, Q meter and its applications and measurement methods.

Module III Non Electrical Quantities (Transducers):

Classification of Transducers, strain gauge, Displacement Transducer (LVDT) & (RVDT) ,(RTD) Thermistor, Thermocouple, Piezo- -Electric transducers, Optical Transducer, photo emissive, Photoconductive, photo voltaic, Photo diode, Photo Transistor, Nuclear Radiation Detector, Capacitive Transducer.

Module IV

Signal Generators

Signal Generators Fixed & variable frequency AF oscillators, Sine wave generators, Standard signal generator, AF Sine and Square wave generator Function generator, Square and pulse generator, Random noise generator, Sweep generator, TV Sweep generator, Marker generator, Sweep- Marker generator, Wobblyscope, Video pattern generator Vectroscope, Beat frequency oscillator

Wave analyzer

(Frequency selective and Heterodyne) Harmonic Distortion Analyzer, Spectrum Analyzer Network analyzer.

Module V: **Digital Measurement and Instruments:**

Advantages of Digital instruments over analog instruments, Digital to analog conversion (DAC) Variable resistive type R-2R Ladder Type, Binary ladder, Weighted converter using op amp and transistor, Practical DAC. Analog to digital conversion (ADC) ramp Technique, Dual slope Integrating Type, Integrating Type (voltage to frequency) Successive Approximations, digital voltmeters and multi-meters, Resolution and sensitivity of digital meter, PLC structure, Principal of operation, response time and application Digital panel meter, Data acquisition system, Data Transmission and Telemetry.

Digital display system, and indicators instruments used in computer controlled instrumentation RS 232 & IEEE 488, GPIB electric interface.

List of Experiments:

1. Measurement of inductance of a coil using Hay's bridge.
2. Measurement of inductance of a coil using Anderson Bridge.
3. Measurement of inductance and capacitance using Maxwell's inductance- capacitance bridge.
4. Measurement of capacitance of a capacitor using Schering bridge.
5. Measurement of frequency using Wein's bridge.
6. Measurement of Displacement using LVDT.
7. Measurement of speed of a Motor using photoelectric transducer.
8. Temperature measurement & Control using thermo couple & using thermistor.
9. Measurement of frequency of signal using CRO.
10. Measurement of force using strain gauge.

References:

1. H.S. Kalsi : Electronics Instrumentation TMH
2. K.Sawhney: Instrumentation and Measurements, Dhanpat Rai and Co.
3. Helfric and Cooper: Modern Electronic Instrumentation and Measurement Techniques Pearson.

EE404 Electrical and Electronics Instrumentation

After completion of this course students will be able to-

CO1. Analyze different wave forms using DSO/CRO.
CO2. Calculate inductance and capacitance with the help of AC bridges.
CO3. Use transducers to convert non-electrical quantities into electrical.
CO4. Analyze different signal generator and Wave analyzer.
CO5. Design converters to convert analog signals to digital and vice versa.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
	Engineering Knowledge	**Problem Analysis**	**Design/Development of Solutions**	**Conduct Investigations of Complex Problems**	**Modern Tool Usage**	**The Engineer and Society**	**Environment and Sustainability**	**Ethics**	**Individual and Team Work**	**Communication**	**Project Management and Finance**	**Life-Long Learning**	**Machine**	**Power System**
EE404(1)		1	-	-	-	-	-	-	-	-	-	-	-	-
EE404(2)		2	-	-	-	-	-	-	-	-	-	-	-	-
EE404(3)	2		-		-	-	-	-	-	-	-	-	-	-
EE404(4)		-	2		-	-	-	-	-	-	-	-	-	-
EE404(5)	-		2											
EE404	0.4	0.6	0.8	0	0	0	0	0	0	0	0	0	0	0

Jabalpur Engineering College, Jabalpur

(AICTE Model Curriculum based scheme)

Bachelor of Engineering (Electrical Engineering) Semester:IV

(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					
EE 405	Electro-Magnetic Field Theory	70	20	10	-	-	100	3	1	-	4

Electro-Magnetic Field Theory

Module: I

Cartesian, cylindrical & spherical co-ordinate systems, scalar & vector fields, gradient, divergence & curl of a vector field, Divergence theorem & Stokes's theorem, concept of vectors. Electrostatic Fields – Coulomb's law, electric field intensity due to different charge distribution viz. line charge, sheet charge, field due to continuous volume – electric potential, properties of potential function, potential gradient equipotential surfaces, line of force, Gauss law, applications of Gauss law, Gauss law in point form, method of images.

Module: II

Laplace's poisson's equations, solution of Laplace's equation. Electric dipole, dipole moment, potential, electric field intensity due to dipole. Behavior of conductors in an electric field. Conductor & insulator, electric field inside a dielectric, polarization. Boundary value conditions for electric field. Capacitance & capacitances of various types of capacitors. Energy stored and energy density in static electric field. Current density, conduction & convection current density ohms law in point form, equation of continuity.

Module: III

Static Magnetic Field, Biot-Savart's law, Magnetic Field intensity due to straight current carrying filament, circular, square and solenoidal current carrying wire. Relationship between magnetic flux, flux density & magnetic field intensity. Ampere's circuital law and its applications, magnetic field intensity due to infinite sheet and various other configurations, Ampere's circuital law in point form. Magnetic force, moving charge in a magnetic field, Lorentz force on straight and long current carrying conductors in magnetic field, force between two long & parallel current carrying conductors. Magnetic dipole & dipole moment, a differential current loop as dipole, torque on a current carrying loop in magnetic field, Magnetic Boundary conditions.

Module: IV

Scalar magnetic potential and its limitations, vector magnetic potential and its properties, vector magnetic potential due to different simple configurations. Self and Mutual inductances, determination of self & mutual inductances, self inductance of solenoid, toroid coils mutual inductance between a straight long wire & a square loop. Energy stored in magnetic field & energy density. Faraday's law, transformer & motional EMFs. Displacement current, Maxwell's equations as Generalization of circuit equations, Maxwell's equation in free space,

Maxwell's equation for harmonically varying Field static and steady fields. Maxwell's equations in differential & integral form.

Module : 8 Electro Magnetic Waves :

Uniform plane wave in time domain in free space, sinusoidal time varying uniform plane wave in free space, wave equation and solution for material medium, Uniform plane wave in dielectrics and conductors. Poynting vector theorem, instantaneous, average and complex pointing vector, power loss in a plane conductor, energy storage. Polarization of waves. Reflection by conductors and dielectric – normal & oblique incidence. Reflection at surface of conducting medium surface impedance, transmission line analogy.

Books References:

1. Elements of Electromagnetic – Mathew N.O. Sadiku (Oxford)
2. Electromagnetic fields – P.V. Gupta (Dhanpat Rai)
3. Elements of Engineering Electromagnetic – N.N.Rao (PHI)
4. Engineering Electromagnetic – William H.Hayt (TMH)
5. Electromagnetic – John D. Kraus (Mc Graw Hill)
6. Electromagnetic wave & Radiating System – Jordan Balmian (PHI)
7. Fields and Wave Electromagnetic – David K. Cheng (Addison Wesley)
8. Electromagnetic Field – S.P. Seth (Dhanpat Rai & Sons)

EE405 Electromagnetic Theory

After completion of this course students will be able to-

CO1.	Illustrate concept of vectors and theorems of electrostatic fields.
CO2.	Analyze the behavior of electric fields.
CO3.	Determine the parameters of magnetic field using various laws of magnetism.
CO4.	Apply Faradays law and Maxwell's equations in electromagnetic fields.
CO5.	Examine electromagnetic waves in free space and material medium.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
	Engineering Knowledge	**Problem Analysis**	**Design/Development of Solutions**	**Conduct Investigations of Complex Problems**	**Modern Tool Usage**	**The Engineer and Society**	**Environment and Sustainability**	**Ethics**	**Individual and Team Work**	**Communication**	**Project Management and Finance**	**Life-Long Learning**	**Machine**	**Power System**
EE405(1)	2			-	-	-	-	-	-	-	-	-	-	-
EE405(2)		3	-	-	-	-	-	-	-	-	-	-	-	-
EE405(3)			-	1	-	-	-	-	-	-	-	-	-	-
EE405(4)	2													
EE405(5)	2			-	-	-	-	-	-	-	-	-	-	-
EE405	1.2	0.6	0	0.2	0	0	0	0	0	0	0	0	0	0

Jabalpur Engineering College, Jabalpur

(AICTE Model Curriculum based scheme)

Bachelor of Engineering (Electrical Engineering) Semester:IV

(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					
EE406	Software Lab II	-	-	-	60	40	100	-	-	2	1

Software Lab II

In this lab, students learn to simulate the problems associated with power system and electrical machine using MATLAB under SIMULNK environment and via programming in MATLAB.

Various examples related to instrumentation with LABVIEW software help the student to understand the design of complicated circuits.

24/7/2018

Jabalpur Engineering College, Jabalpur

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Bachelor of Engineering (Electrical Engineering) Semester: IV

(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					
EE403(A)	Power System - I	70	20	10	30	20	150	3	0	2	4

Module-I

Introduction: Amount of generation of electric power from Conventional and non conventional sources of energy in India and some developed countries of the world.
choice of site, advantages and disadvantages, Schematic arrangement, functioning and environmental aspects of: Steam power plant, Hydro-electric power plant, Nuclear power plant, Diesel power plant, and Gas Turbine power plant.

Module-II

Tariff and Economic aspects in power Generation: Terms commonly used in system operation, various factors affecting cost of generation: Load curves, load duration curves, Connected load, maximum load, Peak load, base load and peak load power plants, load factor, Plant capacity factor, Plant use factor, Demand factor, diversity factor, Cost of power plant, Tariffs

Power Generation by Non Conventional Energy Sources: . Need of Renewable energy, Power generation by non-conventional energy sources, Brief description of various types power generation – MHD, Thermoelectric, thermioninc converter, Photovoltaic or solar Plants, wind power, Tidal and Geothermal.

Module-III

Electrical design of Transmission Lines: Line parameters, calculation of inductance and capacitance of single circuit transmission lines, three phase lines with stranded and bundle conductors, proximity effect, generalized ABCD constants and equivalent circuits of short, medium & long lines. Line performance, regulation and efficiency of short, medium and long lines.

Module-IV

Mechanical design of transmission lines: Different types of tower, Types of conductors, sag-tension calculations, strings charts, vibration dampers, line supports, spacing of conductors and ground.

Module-V

Distribution systems: Primary and secondary distribution systems, AC distribution system, voltage drop and power loss calculations, Feeders, Kelvin's law and modified Kelvin's law for

feeder conductor size and its limitations.

List of Experiments

1. Planning of Electrical design of transmission line.
2. Simulation of Mechanical design of transmission line.
3. Determination of parameters required for tower structure
4 Simulation of Ferranti effect using MATLAB.
5 Modeling & Simulation of Transmission line parameter using MATLAB. (Programmers based on sag calculation for different land terrain)

References:

1. Nagrath I J and Kothari DP; "Power System Engineering ", Tata McGraw Hill.
2. John S. Grainger and W.D. Stevenson Jr., "Power System Analysis", McGraw Hill.
3. Deshpande M V; "Electric Power System Design", TMH.
4. Central Electricity Generating Board; "Modern Power System Practice", Vol 1-8 Pergamon Oxford.
5. James J. Burke, "Power Distribution Engineering: Fundamentals and Applications", Marcel Dekker.
6. Westinghouse Electric Corporation; Electric Transmission & Distribution Reference Book; East Pittsburgh.
7. Wadhwa C L ; "Electrical Power System" Wiley Easternrn Limited.
8. Ashfaq Hussain; "Electrical Power System".
9. Gupta B R; "Power System Analysis and Design"
10. J. B. Gupta, "A Course in Electrical Power", Kataria Pub.
11. Soni, Gupta & Bhatnagar, "A course in Electrical Power"
12. S.C. Arora, A.V. Domkundwar, S. Domkundwar, "Power Plant Engineering " Dhanpat Rai & Sons.

CO1: Conventional and nonconventional energy sources, based power plant study and the computation of economic aspects.

CO2: Design of transmission lines & evaluation of its performance.

CO3: LT, HT and distribution systems, design and performance analysis.

Jabalpur Engineering College, Jabalpur

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

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	IP401	PCC	Material Science & Metellurgy	70	20	10	-	-	100	3	1	-	4
2	IP402	PCC	Production Process	70	20	10	30	20	150	3	-	2	4
3	IP403	PCC	Theory of Machines & Mechanism	70	20	10	30	20	150	3	-	2	4
4	IP404	PCC	Fluid Mechanics	70	20	10	30	20	150	3	-	2	4
5	IP405	PEC	Machine Design	70	20	10	-	-	100	3	1	-	4
6	IP406	ESC	Software Lab-II	-	-	-	60	40	100	-	-	2	1
7	IP407	MC	Industrial Training	Minimum Four Weeks Duration. Evaluation will be done in 5th semester									
Total				**350**	**100**	**50**	**150**	**100**	**750**	**15**	**2**	**08**	**21**
8	IP408	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 IP408 for the award of Honours (Minor Specialization).									

Note:1 Departmental BOS will decide list of three optional subjects those are available in MOOC as well for PEC. **Online courses under MOOC will be taken with permission of HOD.**

2 Industrial training should be apart from laboratory work undertaken in the college rather it should have industrial orientation and practical aspects/field work. Report to be submitted at the beginning of 5th semester and students have to give a presentation in the departement. Evaluation will be done in 5th semester.

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

PRINCIPAL
GOVT. ENGINEERING COLLEGE
JABALPUR (M.P.)

Jabalpur Engineering College, Jabalpur

(AICTE Model Curriculum based scheme)

B.Tech. (AICTE) IV Sem. (Industrial & Production 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 Exam	Quiz, Assign ment	End Sem	Lab Work					
IP401	Material Science & Metellurgy	70	20	10	-	-	100	3	1	-	4

Course Objective:

- To know science behind materials & physical metallurgy.
- To understand Plastic Deformation of Metals.
- To know phase in metal systemsolidification of pure metals and alloy equilibrium diagrams.
- To study solidification of pure metals and alloy equilibrium diagrams.
- To understand properties of Material.

MATERIAL SCIENCE & METALLURGY

Module I

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 II

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 III

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.

Module IV

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

Module V

Properties of Material: Creep Fatigue etc., Introduction to cast iron and steel, Non Ferrous metals base alloys, Bronze, Brasses, Duralumin, and Bearing Metals. Plastics, Composites and ceramics: Various types of plastics, their properties and selection. Plastic molding technology, FRP, GRP resins adhesive, elastomers and their application. Powder Metallurgy: Property and Applications of Powder Metallurgy, Various process and methods of making products by powder Metallurgy techniques.

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. B. K. Agrawal, Introduction to Engineering Materials,

Course Outcomes:

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

CO1	Analyze the Structure of materials at different levels, basic concepts of crystalline materials like unit cell, FCC, BCC, HCP.
CO2	Explain Plastic Deformation of Metals.
CO3	Explain the concept of phase & phase diagram & understand the basic terminologies associate with metallurgy. Construction and identification of phase diagrams and reactions.
CO4	Analyzesolidification of pure metals and alloy equilibrium diagrams.
CO5	Understand properties of Material.

Jabalpur Engineering College, Jabalpur

(AICTE Model Curriculum based scheme)

B.Tech. (AICTE) IV Sem. (Industrial & Production 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 Exam	Quiz, Assign ment	End Sem	Lab Work					
IP402	Production Process	70	20	10	30	20	150	3	-	2	4

Course Objective:

- To describe crucible furnaces,gating system.
- To describe Solidification and special casting process.
- To know the process of Metal Forming: Nature of plastic deformation working of different types of gears.
- To know Forging,Extrusion ,Wiredrawing process
- To know grinding, balancing, dressing and truing, honing, Lapping, super finishing operations.

Course content:

PRODUCTION PROCESS

Module I- Melting Practices Cupola, capacity of a cupola, cupola operation, zones of cupola, cupola Efficiency, melting furnaces for non-ferrous metals, classification of crucible furnaces, gating system, pouring basin, sprue, runner, gates, types of gates, riser, gating design, numerical simulation, main consideration in design and position of risers, types of risers, feeder location and shapes use of exothermic materials, use of chills.

Module II

Solidification and Special casting process: Solidification of casting, permanent mould Casting, slush casting, die casting, centrifugal casting, investment casting, continuous casting, casting defects and their remedies, cleaning of castings, repair of casting, inspection of casting. Solid modeling of castings.

ModuleIII

Metal Forming: Nature of plastic deformation, stress-strain relation in elastic and plastic deformation, concept of flow stress, deformation mechanism, hot and cold working, rolling principal, rolling stand arrangement, roll passes, break down passes, roll pass sequence, analysis of rolling.

Module IV

Abrasive processes: Grinding wheel, specification, characteristics, abrasive types, grinding operations, cylindrical grinding, surface grinding, centreless grinding, form grinding, internal cylindrical grinding, wheel balancing, dressing and truing, honing, Lapping, super finishing, polishing and buffing.

ModuleV

Forging ,Extrusion and other Processes: Forging operations, forging design, drop forging
Die design, die inserts. Extrusion-principle, forward and backward extrusion, extrusion analysis, imp extrusion, hydrostatic Extrusion, extruding tubes. Wire drawing-Rod and tube drawing, tube mak swaging, drawing analysis.

EVALUATION

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

References:

1. Rao P.N;Manufacturing Technology-foundry, forming:TMH Publishing House
2. Ravi B; Metal casting-CAD and Analysis; PHI Publishing House
3. Jain P.L; principles of foundry technology; TMH Publishing House
4. Hennie& Roshan thall;Metal casting; Mcgraw Hill New York
5. ChambellJ .S; Manufacturing Science; Mcgraw Hill New York

List of Experiments:

1. Study of Molding and Casting process.
2. Study of crucible furnaces.
3. Study of forging operations and tools.
4. Study of Grinding and Drilling machines
5. Study of rolling process and evaluation of power requirements
6. Study of various extrusion process.

Course Outcomes:

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

CO1	To work with crucible furnaces,gating system.
CO2	To describe Solidification and Special casting process.
CO3	To express the process of Metal Forming:Nature of plastic deformation working of differe types of gears
CO4	To understand Forging, Extrusion ,Wiredrawing process
CO5	To explain grinding, balancing, dressing and truing, honing, Lapping, super finishing operations.

Jabalpur Engineering College, Jabalpur

(AICTE Model Curriculum based scheme)

B.Tech. (AICTE) IV Sem. (Industrial & Production 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 Exam	Quiz, Assign ment	End Sem	Lab Work					
IP403	Theory of Machines & Mechanisms	70	20	10	30	20	150	3	-	2	4

Course Objective:

- To describe the working of different mechanism used in machines.
- To find velocity and acceleration of links of different mechanism.
- To know the working of different types of gears, gear trains and cams.
- To know the applications of gyroscopic principle.
- To know the working principles of belt, rope and chain drive.

Course content:

THEORY OF MACHINE & MECHANISM

Module I

Mechanisms and Machines: Mechanism, machine, planer mechanisms, kinematic pairs, kinematic chains and their classification, degrees of freedom, Grubler's criterion, kinematic inversions of four bar mechanism and slider crank mechanism, equivalent linkages, straight line motion mechanisms, pantograph, Davis and Ackermann's steering mechanisms.

Module II

kinematic analysis of planer mechanisms using graphical techniques, relative velocity method, instantaneous center method and its application, Kennedy's theorem, coriolis component of acceleration.

Module III

Governors: Types, porter, proell, hartnell, wilson-hartnell, effort and power, controlling force, sensitiveness, hunting, isochronisms, and stability of governors. Fly wheel, turning moment diagram, energy stored.

Module IV

Gears: Classification of gears, nomenclature, involutes and cycloidal tooth profile properties, Introduction of spur gears, conjugate action, velocity of sliding, arc of contact, path of contact, contact ratio, interference and undercutting, helical, spiral, bevel and worm gears.

Gear Trains: Simple, compound, epicyclic gear trains; determination of gear speeds using vector, analytical and tabular method; torque calculations in simple, compound and epicyclic gear trains.

Module V

Cams: Classification of followers and cams, radial cam nomenclature, analysis of follower motion (uniform, modified uniform, simple harmonic, parabolic, cycloidal), pressure angle, radius of curvature, synthesis of cam profile by graphical approach, cams with specified contours

Gyroscopic Action in Machines: Angular velocity and acceleration, gyroscopic torque/ couple, gyroscopic effect on naval ships, stability of two and four wheel vehicles, rigid disc at an angle fixed to a rotating shaft

References:

1. Rattan SS; Theory of machines; TMH
2. Ambekar AG; Mechanism and Machine Theory; PHI.
3. Sharma CS; Purohit K; Theory of Mechanism and Machines; PHI.
4. Thomas Bevan; Theory of Machines; CBS PUB Delhi.
5. Rao JS and Dukkipati; Mechanism and Machine Theory; NewAge Delhi.
6. Dr.Jagdish Lal; Theory of Machines; Metropolitan Book Co; Delhi –
7. Ghosh,A,.Mallik,AK; Theory of Mechanisms & Machines, 2e,; Affiliated East West Press, Delhi.

List of experiments (expandable)

1. To study all inversions of four-bar mechanisms using models
2. Draw velocity and acceleration polygons of all moving link joints in slider crank mechanisn
3. Determination of velocity and acceleration in above using method of graphical differentiatic
4. To study working of differential gear mechanism.
5. To study working of sun and planet epicycle gear train mechanism usir.g models
6. To plot fall and rise of the follower versus angular displacement of cam and vice versa.
7. Study of universal gyroscope
8. Analytical determination of velocity and acceleration in simple mechanism using Roven's Method.

Course Outcomes:

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

CO1	Describe the working of different mechanisms and their inversions.
CO2	Draw velocity and acceleration of different links of a mechanisms using different methods.
CO3	Design different types of gears and gear trains.
CO4	Draw cam profile for different follower motions.
CO5	Analyze Gyroscopic effect on Naval ship and Stability of Two and Four Wheel Vehicles.

Jabalpur Engineering College, Jabalpur

(AICTE Model Curriculum based scheme)

B.Tech. (AICTE) IV Sem. (Industrial & Production 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 Exam	Quiz, Assignment	End Sem	Lab Work					
IP404	Fluid Mechanics	70	20	10	30	20	150	3	-	2	4

Course Objective

- To introduce and explain fundamentals of Fluid Mechanics and fluid properties.
- To give fundamental knowledge of fluid, its properties and behavior under various conditions of internal and external flows
- To provide knowledge of Euler's equation Bernoulli'sequation and their application.
- To explain velocity measurement, flow measurement.
- Introduction of laminar & turbulent flow, Reynolds experiment & Reynolds number.

FLUID MECHANICS

Module-I: Review of Fluid Properties: Engineering units of measurement, mass, density, specific weight, volumeand gravity, surface tension, capillarity, viscosity, bulk modulus of elasticity, pressure and vapor pressure. Fluid Static's : Pressure at a point, pressure variation in static fluid, Absolute and gauge pressure, manometers, Forces on plane and curved surfaces (Problems on gravity dams and tainter gates); buoyant force, Stability of floating and submerged bodies, Relative equilibrium.

Module-II : Kinematics of Flow : Types of flow-ideal & real , steady & unsteady, uniform & non-uniform, one, twoand three dimensional flow, path lines, streak-lines, streamlines and stream tubes; continuity equation for one and three dimensional flow, rotational & irrotational flow, circulation, stagnation point, separation of flow, sources & sinks, velocity potential, stream function, flow nets their utility & method of drawing flow nets.

Module-III : Dynamics of Flow: Euler's equation of motion along a streamline and derivation of Bernoulli'sequation, application of Bernoulli's equation, energy correction factor, linear momentum equation for steady flow, momentum correction factor. The moment of momentum equation, forces on fixed and moving vanes and other applications.

Flow Measurements: Velocity measurement (Pitot tube, Prandtl tube, current meters etc.), flow measurement(orifices, nozzles, mouth pieces, orifice meter, nozzle meter, venture-meter, weirs and notches).

Module-IV : Dimensional Analysis and Dynamic Similitude: Dimensional analysis, dimensional homogeneity, useof Buckingham-pi theorem, calculation of dimensionless numbers, similarity laws, specific model investigations (submerged bodies, partially submerged bodies, weirs, spillways, rotodynamic machines etc.)

Module-V : Laminar Flow: Introduction to laminar & turbulent flow, Reynolds experiment & Reynolds number,relation between shear & pressure gradient, laminar flow through circular pipes, laminar flow between parallel plates, laminar flow through porous media, Stokes law, lubrication principles.

References:

1. Modi & Seth; Fluid Mechanics; Standard Book House, Delhi
2. Som and Biswas; Fluid Mechnics and machinery; TMH
3. Cengal; Fluid Mechanics; TMH
4. White ; Fluid Mechanics ; TMH
5. JNIK DAKE; Essential of Engg Hyd; Afrikan Network & Sc Instt. (ANSTI)
6. Franiss JRD; A Text Book of fluid Mech. for Engg. Student
7. R Mohanty; Fluid Mechanics; PHI

List of Experiment (Expandable):

1. To determine the local point pressure with the help of pitot tube.
2. To find out the terminal velocity of a spherical body in water.
3. Calibration of Orifice meter and Venturi meter
4. Determination of Cc, Cv, Cd of Orifices
5. Calibration of Nozzle meter and Mouth Piece
6. Reynolds experiment for demonstration of stream lines & turbulent flow
7. Determination of meta-centric height
8. Determination of Friction Factor of a pipe
9. To study the characteristics of a centrifugal pump.
10. Verification of Impulse momentum principle.

Course Outcomes:

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

CO1	Explain fundamentals of Fluid Mechanics and fluid properties..
CO2	Derive Euler's Equation of motion and Deduce Bernoulli's equation.
CO3	Distinguish the types of flows.
CO4	Find velocity measurement by using Pitot tube, Prandtl tube, current meters.
CO5	Find flow measurement by usingorifices, nozzles, mouth pieces, orifice meter, nozzle mete venture-meter, weirs and notches.

Jabalpur Engineering College, Jabalpur

(AICTE Model Curriculum based scheme)

B.Tech. (AICTE) IV Sem. (Industrial & Production 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 Exam	Quiz, Assign ment	End Sem	Lab Work					
IP405	Machine Design	70	20	10	-	-	100	3	1	-	4

Course Objective:

To study the basic design principles and apply the principles to the design of various elements encountered in Mechanical machines and structures.

Course content:

MACHINE DESIGN

ModuleI:

Stress concentration and fatigue: Causes of stress concentration, stress concentration in tension, bending and torsion, reduction of stress concentration, theoretical stress concentration factor, notch sensitivity, fatigue stress concentration factor, cyclic loading, endurance limit, S-N Curve, loading factor, size factor, surface factor. Design consideration for fatigue, Goodman and modified Goodman's diagram, soderberg equation, Gerber parabola, design for finite life, cumulative fatigue damage factor.

ModuleII:

Shafts: Design of shaft under combined bending, twisting and axial loading, shock and fatigue factors, design for rigidity, design of shaft subjected to dynamic load, design of keys and shaft couplings.

Module III:

Design of Bearings: Sliding Bearing, hydrodynamics lubrication, mechanical aspects of bearing design, lubricants, journal bearing design, rolling element bearings.

Module IV:

Brakes & Clutches: Materials for friction surface, uniform pressure and uniform wear theories.
Design of friction clutches: Disk, plate clutches, cone & centrifugal clutches.
Design of brakes: Rope, band & block brake, Internal expending brakes, Disk brakes.

Module V:

Design of Power screws types, screw drives, threaded joints efficiency, stresses in power screws, design procedure and calculation,

References:

1. Shigley J.E; Machine Design; TMH
2. Sharma and Purohit; Design of Machine elements; PHI
3. Wentzell Timothy H; Machine Design; Cengage learning
4. Mubeen; Machine Design; Khanna Publisher
5. Ganesh Babu K and Srithar k; Design of Machine Elements; TMH
6. Sharma & Agrawal; Machine Design; Kataria & sons
7. Maleev; Machnine Design

Course Outcomes:

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

CO1	Understand modes of failure, fatigue and different factors used in design.
CO2	Design cotter joints, knuckle joints and welded joints used in different machines.
CO3	Design shafts under combined bending, twisting and axial loading.
CO4	Select bearing for given conditions using design procedure.
CO5	Design different types of Power screws.

Jabalpur Engineering College, Jabalpur

(Declared Autonomous by MP Govt., Affiliated to RGPV, Bhopal)
(AICTE Model Curriculum Based Scheme)
Bachelor of Technology (B.Tech.) IV 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	MA401	BSC	Discrete Structure	70	20	10	-	-	100	3	1	-	4
2	IT402	PCC	Analysis & Design of Algorithm	70	20	10	30	20	150	3	-	2	4
3	IT403	PCC	Computer Architecture	70	20	10	30	20	150	3	-	2	4
4	IT404	PCC	Principles of Communication	70	20	10	30	20	150	3	-	2	4
5	IT405	PEC	Structured System Analysis & Design	70	20	10	-	-	100	3	1		4
6	IT406	ESC	Software Lab-II	-	-	-	60	40	100	-	-	2	1
7	IT407	MC	Industrial Training	Minimum Four Weeks Duration. Evaluation will be done in 5th semester									
Total				**350**	**100**	**50**	**150**	**100**	**750**	**15**	**2**	**08**	**21**
8	IT408	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 IT408 for the award of Honours (Minor Specialization).									

Note:1 Departmental BOS will decide list of three optional subjects those are available in MOOC as well for PEC.

2 Industrial training should be apart from laboratory work undertaken in the college rather it should have industrial orientation and practical aspects/field work. Report to be submitted at the beginning of 5th semester and students have to give a presentation in the departement. Evaluation will be done in 5th semester.

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

MOOC Courses	IT408A Configuring LINUX Web Servers	IT408B Two Speed IT: BCG Perspective	IT408C Portfolio Management, Governance & the PMO

PRINCIPAL
GOVT. ENGINEERING COLLEGE
JABALPUR (M.P.)

Subject Code	Subject Name & Title	Maximum Marks Allotted						Hours/ Week			Total Credits
		Theory			Practical		Total Marks	L	T	P	
		End Sem	Mid Sem Exam	Quiz, Assign ment	End Sem	Lab Work					
MA401	Discrete Structure	70	20	10	-	-	100	3	1	-	4

Module 1: Set theory, relation and function (08 Hours)

Definition of sets, countable and uncountable sets, Venn Diagram, proofs of some general identities on sets relation: Definition, types of relation, composition general identities on sets relation: Definition, types of relation, composition ordering relation Function: Definition one to one, into and onto function, inverse function, composition of functions recursively defined functions, pigeonhole principle.

Module 2: Posets, Hasse diagram and lattices (08 Hours)

Introduction ordered set, Hasse diagram of partially, ordered set, isomorphic ordered set, well ordered set, properties of Lattices, bounded and complemented lattices. Propositional logic Proposition, first order logic, Basic logical operation, truth tables tautologies, contractions, Algebra of Proposition, logical implications, logical equivalence, Rules of inference, Predicates, the statement function.

Module 3: Theorem proving techniques (06 Hours)

Mathematical induction, Recurrence Relation and Generating Function: Introduction to recurrence relation and recursive algorithm, linear recurrence relations with constant coefficients, homogeneous solutions, particular solutions Total solution, generating functions, Solution by method of generating functions.

Module 4: Algebraic structure: Group, Ring, Field (10 Hours)

Definition properties types : semi groups, Monoid groups, Abelian group, properties of groups, Subgroup, cyclic groups, Cosets, Normal subgroup, Homomorphism& Isomorphism of groups, Rings and Fields and finite fields: definition and examples.

Module 5: Graph theory (08 Hours)

Introduction and basic terminology of graphs, Planer graphs Multigraphs and weighted graphs Isomorphic graphs, Paths, Cycles and connectivity, shortest path in weighted graph Introduction to Eulerian paths and circuits, Hamiltonian paths and circuits, Graph coloring, chromatic number.

Books Reference:

1. Elements of Discrete Mathematics by C. L. Liu Tata McGraw-Hill Edition.
2. Discrete Mathematical structure with application in CS by Trembly, J.P. & Manohar; Mc Graw Hill.
3. Graph Theory with application to engineering and computer science by Deo, Narsingh; PHI.
4. Discrete Mathematics by Seymour Lipschutz and and mark Lipson Schaum's Outlines Tata McGraw-Hill Pub.

20.7.18 HSpalep 20/7/18

CO1. Determine the basic principle of Set Theory, Boolean Algebra and Logic.

CO2. Solve the mathematical relations by theorem proving techniques.

CO3. Understand the knowledge of algebraic structures: group, ring and field.

CO4. Apply to graph theory in various engineering problems.

Jabalpur Engineering College, Jabalpur

(AICTE Model Curriculum based scheme)

B.Tech. (AICTE) IV 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 Exam	Quiz, Assign ment	End Sem	Lab Work					
IT402	Analysis & Design of Algorithm	70	20	10	30	20	150	3	-	2	4

Module1 Algorithm properties. Analysis of Algorithms: Priori analysis and Posteriori analysis. Worst, Best and AverageVcase analysis. RAM model for analysis. Space and Time Complexities of algorithms. Step count and Recurrence, Relation. Asymptotic notations Big O , Big Ω, θ, little o, little ω.

Module 2. Introduction to divide and conquer technique, analysis, design and comparison of various algorithms based on this technique, example binary search, merge sort, quick sort, and Stassen's matrix multiplication.

Module 3 Study of Greedy strategy, examples of greedy method like optimal merge patterns, Huffman coding, minimum spanning trees, knapsack problem, job sequencing with deadlines, single source shortest path algorithm, etc.

Module 4 Concept of dynamic programming, problems based on this approach such as 0/1 knapsack, multistage graph, reliability design, Floyd-Warshall algorithm, etc. Backtracking concept and its examples like 8 queen's problem, Hamiltonian cycle, Graph coloring problem etc.

Module5 Introduction to branch & bound method, examples of branch and bound method like traveling salesman problem etc. Lower bound theory and its use in solving algebraic problem. Deterministic and Non Deterministic Algorithm. NP-completeness: P, NP, NP-Hard and NP-Complete problems.

Text Books:

1. Horowitz & Sahani; Analysis & Design of Algorithm
2. Anany Levitin, "Introduction to the Design and Analysis of Algorithm", Pearson Education Asia,2003.

References:

1. Coremen Thomas, Leiserson CE, Rivest RL; Introduction to Algorithms; PHI.
2. Dasgupta; algorithms; TMH
3. Ullmann; Analysis & Design of Algorithm;
4. Michael T Goodrich, Robarto Tamassia, Algorithm Design, Wiely India
5. VOL-I Fundamentals Of Algorithms by D.E. Kunth.

26/7/18

BE FOURTH SEMESTER(INFORMATION TECHNOLOGY)						
COURSE CONTENT						
SUB. CODE	SUB. NAME	L	T	P	MAX. MARKS	CREDITS
IT402	ANALYSIS & DESIGN OF ALGORITHM LAB	3		2	150	4

ANALYSIS & DESIGN OF ALGORITHM LAB

Experiment List

1. Perform recursive binary and linear search
2. Short a given set of elements using Heap sort technique.
3. Sort a given set of elements using Merge short technique
4. Find solution of Knapsack problem using Greedy approach
5. Implement o/1 knapsack problem using dynamic progeamming.
6. From a given vertex in a weighted connected graph, find shortest paths to other vertices using Dijkstra's algorithm.
7. Sort a given set of elements using Quick sort technique.
8. Find minimum cost spanning tree of a given undirected graph using Kruskal's algorithm.
9. Print all the nodes reachable from a given starting node in a digraph using Breadth first search technique.
1. Implement all pair shortest paths problem using Floyd's algorithm.
2. Find minimum cost spanning tree for a given undirected graph using Prim's algorithm.
3. Print all the nodes reachable from a given starting node in a given digraph using Depth firt search technique.
4. Compute the transitive closure of a given directed graph using Warshall's algorithm.
5. Implement n-Queens problem using backtracking technique.

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Jabalpur Engineering College Jabalpur, Jabalpur

Department of Information Technology

Semester: IV SEM

Analysis and Design of Algorithms (IT-402)

Course Objectives

CO1. To understand the space and time complexities and asymptotic notations for algorithms.
CO2. To familiarize with divide and conquer techniques based algorithms.
CO3. To understand the dynamic programming approach and based algorithms.
CO4. To introduce with the branch and bound methods, deterministic and non deterministic algorithms

C O\P O	1	2	3	4	5	6
1	*					
2	*		*			*
3			*			
4	*					

Jabalpur Engineering College, Jabalpur
(AICTE Model Curriculum based scheme)
B.Tech. (AICTE) IV 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 Exam	Quiz, Assign ment	End Sem	Lab Work					
IT403	Computer Architecture	70	20	10	30	20	150	3	-	2	4

Module 1 Computer Basics and CPU: Von Newman model, various subsystems, CPU, Memory, I/O, System Bus, Memory registers, Program Counter, Accumulator, Instruction register, Micro operations, Register Transfer Language, Instruction Fetch, decode and execution, data movement and manipulation, Instruction formats and addressing modes of basic computer.

Module 2 Control Unit Organization: Hardwired control unit , Micro programmed control unit Control Memory, Address Sequencing, Micro Instruction formats, Micro program sequencer, Microprogramming, Arithmetic and Logic Units: Arithmetic Processor, Addition, subtraction, multiplication and division, Floating point and decimal arithmetic and arithmetic units, design of arithmetic unit.

Module 3 System Organization: Modes of data transfer – program controlled, interrupt driven and direct memory access, Interrupt structures, I/O Interface, Asynchronous data transfer, I/O processor, Multiprocessors: Pipeline and Vector processing, Instruction and arithmetic pipelines, Vector and array processors, Interconnection structure and inter-processor communication.

Module 4 Memory organization: Memory Maps, Memory Hierarchy, Cache Memory - Organization and mappings, Associative memory, Virtual memory, Memory Management Hardware.

Module 5 Introduction to Microprocessor: 8085 architecture and organization, instruction set , counters and timing delays, stacks and subroutines , 8085 I/O structure, Interrupts , basic Interfacing concept , memory mapped and I/O mapped I/O basic programming.

Text Books:

1. Morris Mano: Computer System Architecture, PHI.
2. Gaonkar: Micro processor Architecture, Programming, Applications with 8085; Penram Int.

References:

1. Tanenbaum: Structured Computer Organization, Pearson Education
2. J P Hayes, Computer Architecture and Organizations, Mc- Graw Hills, New Delhi
3. William Stallings: Computer Organization and Architecture, PHI
4. ISRD group; Computer Organization; TMH
5. Cart er; Comp ut er Architecture (Schaum); TMH
6. Carl Hamacher: Computer Organization, TMH

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BE FOURTH SEMESTER(INFORMATION TECHNOLOGY)						
COURSE CONTENT						
SUB. CODE	SUB. NAME	L	T	P	MAX. MARKS	CREDITS
IT 403	COMPUTER ARCHITECTURE LAB	3		2	150	4

COMPUTER ARCHITECTURE LAB

Experiment List

1. REVERSING AN ARRAY : A block of 16 bytes are residing at locations standing from BLOCK1 WAP to transfer the block in reverse order at locations starting form BLOCK 2.
2. SORTING IN ASCENDING ORDER : A block (16 bytes are residing at locations starting from DATA : write a program to arrange the word in the same location in ascending order.
3. BINARY ADDITION : 16 bytes are residing at location starting from DATA WAP : to add all bytes and store the result location SUM and SUM+1
4. BCD ADDITION : 16 BCD NUMBER are residing at location starting from DATA WAP : to add all bytes and store the result location SUM and SUM+1
5. MULTIPLICATION : Two bytes are residing at location DATA 1 and DATA 2. Write a program to multiply the two bytes and store the result at location PROD 1 and PROD 2.
6. BINARY TO BCD : A binary number is residing at location BIN > WAP to convert the binary number into its equivalent BCD and store the result at BCD and BCD + 1
7. BCD TO BINARY : A BCD number is residing at location BCD; write a program to convert the BCD number into its equivalent binary and store the result at BIN
8. MULTIBYTE ADDITION : Two 10 bytes are residing at location starting from DATA 1 and DATA 2 respectively. Write a program to add them up and store the result at location starting from RESULT (result space 11 bytes)
9. MULTIBYTE BCD ADDITION : Two 6 digit BCD numbers are residing at location starting from DATA 1 and DATA 2 respectively. Write a program to add them up and store the result at locations starting from RESULT (Result space 7 bytes.)
10. RST 6.5: A block of 16 bytes is residing at location starting from DATA reverse the block and store the bytes at REVERSE whenever the RST 6.5 key is pressed.
11. EDITING OF ASCII STRING : A string of ASCII characters is residing at locations starting from READ which contain "I$ BE $ AN $ ENGINEER". Edit string in such a way that it should contain "I $ will $ be $ Engineer " keep the edited string in the same locations. Product the string from further editing. ($ stands for a blank)
12. SIGNED BINARY ADDITION : A block of 16 signed binary numbers is residing at location NUMBERS. Add them up and store the result (in signed binary) at locations from RESULT.
13. ASCII CODE CONVERSION : A string of 16 ASCII characters are residing at locations starting from DATA. The string consists of codes for capital letters, small letters and BCD digits (0-9) Convert the ASCII characters in such a way that the codes for capital letters be converted into corresponding codes for small letters, codes for small letters into that of capital letters and codes for BCD digits into that of BCD number and store them at the same locations.
14. PARITY CHECK : A block of 32 bytes is residing at DATA count the number (BCD) of times even and odd PARITY bytes are appearing consecutive memory locations. Keep the count at MATCH.
15. SERIES GENERATION : Two BCD number a and b are residing at locations DATA 1 and DATA 2 respectively. Write a program to form a series in BCD with the elements of a. a + 2b, a + 4b, a+ 6b, ... Stop the generation of the series whenever any element of the series in BCD with the elements of the series exceeds (99). Store the result at locations starting from RESULT. Count the number (BCD) of elements in the series and store it a NUMBER.

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Jabalpur Engineering College Jabalpur, Jabalpur

Department of Information Technology

Semester: IV SEM

Computer Architecture (IT-403)

Course Objectives

1. To give overview of computer basics, organization and subsystems.
2. To familiarize with different control generation techniques and design of A.L.U.
3. To compare various memory management techniques and mapping.
4. To introduce with the microprocessor 8085 architecture and its instruction set .

C O\P O	1	2	3	4	5	6
1	*					
2	*		*			
3	*	*	*			*
4	*	*				*

Jabalpur Engineering College, Jabalpur

(AICTE Model Curriculum based scheme)

B.Tech. (AICTE) IV 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 Exam	Quiz, Assignment	End Sem	Lab Work					
IT404	Principles of Communication	70	20	10	30	20	150	3	-	2	4

Module 1 Data and signal-Analog and digital signals, Time and frequency domain, Composite signals, Bandwidth, bit rate, bit length, Baseband and broadband transmission, Attenuation, distortion, noise, Nyquist bit rate ,Shannon capacity ,Throughout, delay ,Jitter, Bandwidth delay product.

Module 2 Sampling theorem, quantization, PCM, Delta modulation, Adaptive delta modulation, DPCM, bandwidth of PCM and delta modulation.ASK, BPSK, QPSK, DPSK, BFSK.

Module 3 Data transmission – Parallel and serial transmission, synchronous, and Asynchronous transmission, Simplex, half duplex and full duplex , unipolar and polar line codes, Non return to zero codes, return to zero codes, bipolar line codes, bauds , modem, Line configurations Point to point and point to multipoint configuration. Multiplexer: TDM, FDM, WDM. Data compression devices, Inverse multiplexer.

Module 4 Digital interface standards: RS-232 standard, hand shaking, connecting a DTE in RS-232 C, RS 449, RS-422A and RS-423A standards. High-speed desktop serial interfaces. Remote digital transmission carrier ISDN, Packet data network, Modems, multispeed modems, high speed modems, Error Correcting modems, data compression in modems. Short-wave modems.

Module 5 Data Integrity, sources of error control approaches. Implementation of error control Echo checking parity checking and cyclical purity, Hammering code, checksums, Cyclical Redundancy check. Security and security measures.Transmission media-Guided and unguided media, twisted pair, Unshielded twisted pair and Shielded twisted pair, coaxial cable.

Text Book:

1. Data & Computer Communication, William Stallings – Pearson Education.

References:

1 Data & Network Communication, Michael A. Miller – DELMAR (Thomson learning) / Vikas Publication.

2.Understanding Data Communication & Networks, William A Shay–Thomson Learning/Vikas Publication.

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BE FOURTH SEMESTER(INFORMATION TECHNOLOGY)

COURSE CONTENT

SUB. CODE	SUB. NAME	L	T	P	MAX. MARKS	CREDITS
IT 404	PRINCIPLES OF COMMUNICATION	3		2	150	4

PRINCIPLES OF COMMUNICATION LAB

Experiment List

1. To study basic introduction to Data Communication and importance of data communication.
2. To Perform Sampling & Reconstruction of original signal & to calculate the Sampling Frequency
3. To Perform Amplitude shift keying (ASK) thereby determining relative change in Amplitude.
4. To perform frequency shift keying (FSK) thereby determining relative change in Frequency.
5. To perform phase shift keying (PSK) thereby determining relative change in phase.
6. To perform Quadrature phase shift keying (QPSK) thereby determining relative change in Phase.
7. To perform Quadrature Amplitude Modulation (QAM)
8. To perform Adaptive Delta Modulation, Demodulation.
9. To perform Delta Modulation and Compare it with Adaptive Delta Modulation (ADM)
10. To study & perform Transmission & Reception of signal using TDM Technique.
11. To study Quadrature phase shift keying Modulation.
12. Study of PCM Generation & Detention.
13. To study serial interface RS-232 and its applications.
14. To configure the modem of a computer.
15. To study different types of Medium in data communication.
16. To create a network cable for communicating two PC's
17. To study PC to PC communication
18. Write a program in 'C' for PC to PC communication using RS-232 port.
19. To study different types of transmission media.

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Principlesof Communication (IT 404)

I. Course Educational Objectives

The objective of this course is to:

1. Provide the knowledge of data communication, various communication standards and signals used for these tasks.
2. Equip the students with capability to write the programs for implementation of communication protocols.
3. Providing the hand on experience of CRO, Modulation systems kits and other instruments used for data communication.

II. COURSE OUTCOMES

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

CO1: Familiarize with the concepts of communication system, transmission systems and parameters data communication systems.

CO2: Gain practical knowledge of baseband modulation and digital modulation techniques.

CO3: Understand and analyze the data transmission systems, signaling and multiplexing of various channels.

CO4: Understand and implement the serial communication protocol Rs-232 and get familiar with the working of modem and node to node communication.

CO5: Analyze and check the data integrity using the concepts of channel coding and will gain the knowledge about the transmission mediums used for communication.

Jabalpur Engineering College, Jabalpur
(AICTE Model Curriculum based scheme)
B.Tech. (AICTE) IV 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 Exam	Quiz, Assign ment	End Sem	Lab Work					
IT405	Structured System Analysis & Design	70	20	10	-	-	100	3	1	-	4

Module 1 Introduction System Definition and concepts: General Theory systems, Manual and automated systems, Real-life Business Sub-Systems. System Environments and Boundaries, Real-time and distributed systems, Basic principles of successful systems, Approach to system development: Structured System Analysis and Design, Prototype, Joint Application Development, Role and Need of Systems Analyst. Qualifications and responsibilities, System Analysis as a Profession.

Module 2 System Development Cycle Introduction to Systems, Development Life Cycle (SDLC). Various phases of SDLC: Study Analysis, Design, Development, Implementation, Maintenance; Documentation: Principles of Systems Documentation, Types of documentation and their importance, Enforcing documentation discipline in an organization

Module 3 System Planning Data and fact gathering techniques: Interviews, Group Communication -Questionnaires; Assessing Project Feasibility: Technical, Operational, Economic, Cost Benefits Analysis, Schedule, Legal and contractual, Political. Modern Methods for determining system requirements: Joint Application, Development Program, Prototyping, Business Process Re-engineering. System Selection Plan and Proposal **Modular and Structured Design** Module specifications, Top-down and bottom-up design. Module coupling and cohesion. Structure Charts.

Module 4 System Design and Modeling Process Modeling, Logical and physical design, Conceptual Data Modeling: Entity /Relationship Analysis, Entity-Relationship Modeling, ERDs and DFDs, Concepts of Normalization. Process Description: Structured English, Decision Tree, Table; Documentation: Data Dictionary, Recording Data Descriptions.

Module 5 Input/Output and Interface Design Classification of forms, Input/output forms design. User-interface design, Graphical interfaces. Standards and guidelines for GUI design, Designing Physical Files and Databases: Designing Fields, Designing Physical Records, Designing Physical Files, Designing Databases, Introduction to CASE Tools; Features, Advantages and Limitations of CASE Tools, Awareness about some commercial CASE Tools.**System Implementation and Maintenance** Planning considerations, Conversion methods, procedures and controls, System acceptance criteria, System Evaluation and Performance, Testing and Validation. Preparing, User Manual, Maintenance Activities and Issues.

RECOMMENDED BOOKS

1. Hoffer J. A, George J.F, Valacich J.S, and Panigrahi P.K "Modern Systems Analysis and Design", Pearson Education, 2007.
2. A. Dennis and B. H. Wixom, "Systems Analysis and Design", John Wiley & Sons, Inc.

SUPPLEMENTARY READING

1. Whitten J. L, Bentley L. D, "Systems Analysis and Design Methods", Tata McGraw-Hill, 2008.
2. Kendall & Kendall, "Systems Analysis and Design", Seventh Edition, Pearson Education.

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BE FOURTH SEMESTER(INFORMATION TECHNOLOGY)

COURSE CONTENT

S. CODE	SUB. NAME	L	T	P	MAX. MARKS	CREDITS
IT405	STRUCTURED SYSTEM ANALYSIS AND DESIGN	3		2	100	4

STRUCTURED SYSTEM ANALYSIS AND DESIGN LAB

Experiment list

1. Planning and Requirements Analysis
2. Program Design, Pseudocode Data Storage Design – Physical Data Models
3. Business System Interaction Modeling with Use Case Analysis (UCA)
4. User Interface Design, navigation Input Screens, Paper forms, Reports, I/O technologies.
5. Business Process Modeling with Data Flow Diagramming (DFD)
6. Business Process Modeling & Data Modeling
7. Implementation & Security Project work
8. Team Course Project Presentations.

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Jabalpur Engineering College Jabalpur, Jabalpur

Department of Information Technology

Semester: IV SEM

Structured System Analysis and Design (IT-405)

Course Objectives

CO1. To discuss various types of systems and their environment and boundaries.
CO2. To familiarize with System Development Life Cycle .
CO3. To understand the system planning and fact gathering techniques.
CO4. To understand the system design and modeling.
CO5. To give the overview of the system implementation and maintenance.

C O\P O	1	2	3	4	5	6
1	*					
2	*					*
3			*			
4			*	*		
5	*			*		

B.TECH FOURTH SEMESTER (INFORMATION TECHNOLOGY)

COURSE CONTENT (CBGS w.e.f. July 2018)

SUB.	SUB. NAME	L	T	P	MAX. MARKS	CREDITS
IT406	Python Programming Language Lab			2	100	1

Module 1

Introduction to Python Programming Language: Introduction to Python Language, Strengths and Weaknesses, IDLE, Dynamic Types, Naming Conventions, String Values, String Operations, String Slices, String Operators, Numeric Data Types, Conversions, Built In Functions

Module 2

Data Collections and Language Component: Introduction, Control Flow and Syntax, Indenting, the if Statement, Relational Operators, Logical Operators, True or False, Bit Wise Operators, The while Loop, break and continue, the for Loop, Lists, Tuples, Sets, Dictionaries, Sorting Dictionaries, Copying Collections.

Module 3

Object and Classes: Classes in Python, Principles of Object Orientation, Creating Classes, Instance Methods, file Organization, Special Methods, Class Variables, Inheritance, Polymorphism, Type Identification, Custom Exception Classes.

Module 4

Functions and Modules: Introduction, Defining Your Own Functions, Parameters, Function Documentation, Keyword and Optional Parameters, Passing Collections to a Function, Variable Number of Arguments, Scope, Functions - "First Class Citizens", Passing Functions to a Function, Mapping Functions in a Dictionary, Lambda, Modules, Standard Modules – sys, Standard Modules – math, Standard Modules – time, The dir Function

Module 5

I/O and Error Handling In Python: Introduction, Data Streams, Creating Your Own Data Streams, Access Modes, Writing Data to a File, Reading Data From a File, Additional File Methods, Using Pipes as Data Streams, Handling IO Exceptions, Working with Directories, Metadata, Errors, Run Time Errors, The Exception Model, Exception Hierarchy, Handling Multiple Exceptions.

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Suggested list of experiments:

Sr. No	Name of Experiment
1	Write python program to print Hello World
2	Write python program to Hello World using string variable
3	Write python program to store data in list and then try to print them.
4	Write python program to do basic trim and slice on string.
5	Write python program to print list of numbers using range and for loop
6	Write python program to store strings in list and then print them.
7	Write python program to let user enter some data in string and then verify data and print welcome to user.
8	Write python program in which an function is defined and calling that function prints Hello World
9	Write python program in which an function(with single string parameter) is defined and calling that function prints the string parameters given to function.
10	Write python program in which an class is define, then create object of that class and call simple print function define in class.

Reference Book:

1. Dive into Python, Mike
2. Learning Python, 4th Edition by Mark Lutz
3. Programming Python, 4th Edition by Mark Lutz

26/7/18

Jabalpur Engineering College, Jabalpur

(Declared Autonomous by MP Govt., Affiliated to RGPV, Bhopal)
(AICTE Model Curriculum Based Scheme)
Bachelor of Technology (B.Tech.) IV 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	ME401	PCC	Machine Design-I	70	20	10	-	-	100	3	1	-	4
2	ME402	PCC	Fluid Mechanics	70	20	10	30	20	150	3	-	2	4
3	ME403	PCC	Machine Drawing & CAD	70	20	10	30	20	150	3	-	2	4
4	ME404	PCC	Theory of Machines & Mechanisms	70	20	10	30	20	150	3	-	2	4
5	ME405	PEC	Energy Conversion System	70	20	10	-	-	100	3	1	—	4
6	ME406	ESC	Software Lab-II	-	-	-	60	40	100	-	-	2	1
7	ME407	MC	Industrial Training	Minimum Four Weeks Duration. Evaluation will be done in 5th semester									
Total				**350**	**100**	**50**	**150**	**100**	**750**	**15**	02	08	**21**
8	ME408	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 ME408 for the award of Honours (Minor Specialization).									

Note:1 Departmental BOS will decide list of three optional subjects those are available in MOOC as well for PEC.

2 Industrial training should be apart from laboratory work undertaken in the college rather it should have industrial orientation and practical aspects/field work. Report to be submitted at the beginning of 5th semester and students have to give a presentation in the departement. Evaluation will be done in 5th semester.

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

MOOC Courses	ME408A Basics of Finite Element Analysis-I	ME408B Introduction to Machining and Machining Fluids	ME408C Steam and Gas Power Systems	ME408D Introduction to Research

PRINCIPAL
GOVT. ENGINEERING COLLEGE
JABALPUR (M.P.)

(AICTE Model Curriculum based scheme)

B.Tech. (AICTE) IV Sem. (Mechanical 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 Exam	Quiz, Assign ment	End Sem	Lab Work					
ME401	Machine Design-I	70	20	10	-	-	100	3	1	-	4

Course Objective:

To study the basic design principles and apply the principles to the design of various elements encountered in Mechanical machines and structures.

Course Contents:

Module 1. **Mechanical Engineering Design** - Design considerations, Design Procedure, Material selection Modes of failure, causes of stress concentration; stress concentration in tension, bending and torsion; reduction of stress concentration, theoretical stress concentration factor, notch sensitivity.
Fatigue - Cyclic loading, endurance limit, S-N Curve, loading factor, size factor, surface factor.
stress concentration factor, Design consideration for fatigue, Goodman and modified Goodman's diagram, Soderberg equation, Gerber parabola, design for finite life, cumulative fatigue damage.

Module 2. **Design of Fasteners:** Design of cotter joints, Design of knuckle joints, Design of welded joints; Fillet and butt welds, Welded joint subjected to Bending moment, Welded joint subjected to Torsional moment, Design of riveted joints; Design of Longitudinal Butt joint for Boiler shell, Design of Circumferential Lap joint for Boiler shell, Eccentrically Loaded Riveted Joint, Design of bolted joints, Forms of threads, Trapezoidal threads, Power screws.

Module 3. **Shafts and Keys:** Design of shaft under combined bending, twisting and axial loading; shock and fatigue factors, design for rigidity; design of shaft subjected to dynamic load; Design of keys; Design of Square and Flat keys, Design of Kennedy key.

Module 4: **Selection & Design of Bearings:** Reynold's equation, stable and unstable operation, heat dissipation and thermal equilibrium, boundary lubrication, dimensionless numbers, Design of journal bearings, Rolling- element bearing; Types of rolling contact bearing, bearing friction and power loss, bearing life; Radial, thrust & axial loads; Static & dynamic load capacities; Selection of ball and roller bearings; lubrication and sealing.

Module 5. **Design of Springs:** Types of spring, Terminology of Helical Spring, Design of helical compression and tension spring, Design of leaf spring and Torsion springs, Fatigue loading of springs, Surge in springs, Spiral springs, Nipping of leaf spring.

Evaluation:

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

References:

1. Robert C Juvinal, Kurt M Marshek Machine Component design Wiley Student edition.
2. C S Sharma &KamleshPurohit, Design of machine elements PHI.
3. Sharma & Agarwal Machine design.
4. Pandya & Shah, Charottar.
5. J E Shingley Machine design Mc Graw Hills.
6. Gope P C, Machine Design, PHI Learning. 2015.
7. P Kannaiah, Machine Design, SCITECH.
8. Nortan RL, Machine Design, Pearson, Fifth Edition.

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Course Outcomes:

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

CO1	Illustrate modes of failure, fatigue and different factors used in design.
CO2	Design various machine elements such ascotter joints, knuckle joints, welded joints, springs, bearings ar shafts used in different n achines.
CO3	Analyzemachine components againstcombined bending, twisting and axial loading.

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	1	-	-	-	-	-	-	-	-	-
CO2	3	2	2	1	-	-	-	-	-	-	-	-
CO3	1	1	2	2	-	-	-	-	-	-	-	-

(AICTE Model Curriculum based scheme)

B.Tech. (AICTE) IV Sem. (Mechanical 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 Exam	Quiz, Assign ment	End Sem	Lab Work					
ME402	Fluid Mechanics	70	20	10	30	20	150	3	-	2	4

Course Objective:

To be familiar with all the basic concepts of fluids and fluid flow phenomenon, conservation equations and their applications to fluid flow problems.

1. Determination of properties of fluid and their utility
2. To understand the kinematic and dynamic behavior of fluid
3. Determination of discharge through flow measuring instruments
4. Determination of dimensionless numbers by applying mathematical techniques
5. To understand the fluid flow behavior through pipes

Course Contents

Module 1. **Fluid Statics:** Basic concepts &properties of the fluid. Newtons law of viscosity, types of fluids, Pressure measurement by manometers and gauges. pressure variation in static fluid, Absolute and gauge pressure, total force and centre of pressure, hydraulic forces on submersed surfaces – plan, inclined and curved surfaces; buoyancy, meta-center , Stability of floating and submerged bodies, Relative equilibrium.

Module 2. **Kinematics of Flow :** Types of flow-ideal & real , Lagrange and Eulerian methods of study of fluid, steady & unsteady, uniform & non-uniform, one, two and three dimensional flow, path lines, streak-lines, streamlines and stream tubes; continuity equation for one and three dimensional flow, rotational & ir-rotational flow, circulation, stagnation point, separation of flow, source, sink and combination of source-sink flow, velocity potential, stream function, flow net & its applications.

Module 3. **Dynamics of Flow:** Euler's equation of motion along a streamline and derivation of Bernoulli's equation, application of Bernoulli's equation, energy correction factor, linear momentum equation for steady flow; momentum correction factor. Fluid Measurements: Velocity measurement (Pitot tube, current meters etc.); flow measurement (orifices, nozzles, mouthpieces, orifice meter, nozzle meter, venturi-meter, weirs and notches).

Module 4. **Dimensional Analysis:** Dimensional analysis, dimensional homogeneity, use of Buckingham-pi theorem, calculation of dimensionless numbers, similarity laws and model investigations.

Introduction to boundary layer, Boundary layer development on a flat plate and its characteristics - Boundary layer thickness, displacement thickness, momentum thickness, energy thickness. Momentum equation for boundary layer by Von karman, drag on flat plate, boundary layer separation and its control. Aero-foil theory, lift and drag coefficients, streamlined and bluff bodies.

Module 5. **Flow through Pipes :** Reynolds experiment & Reynolds number, laminar & turbulent flow, Introduction to Navier Stoke's Equation, relation between shear & pressure gradient, laminar flow through circular pipes, friction factor, laminar flow between parallel plates, flow through pipes in series and parallel, different types of head losses, friction factor and pressure drop.

Evaluation:

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

21.7.18

References:

1. Streeter VL, Wylie EB, Bedford KW; Fluid Mechanics; Mc Graw Hills
2. FOX , McDonald Pritchard , Fluid Mechanics Wiley students edition
3. White ; Fluid Mechanics ; Mc Graw Hills
4. Cengal; Fluid Mechanics; Mc Graw Hills
5. R Mohanty; Fluid Mechanics; PHI
6. K L Kumar Fluid Mechanics
7. Fluid Mechanics & hydraulic Machines , Modi & Seth
8. CS Jog, Fluid Mechanics Volume II CAMBRIDGE IIScSeries , Third Edition.

COURSE OUTCOMES:

Upon successful completion of this course the student will be able to:

CO1	Define fluid and its properties.
CO2	Explain the characteristics of fluid in static and dynamic conditions
CO3	Apply the equations derived for static and dynamic conditions for flow measurement
CO4	Demonstrate dimensional homogeneity and similarity between model and prototypes

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

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

List of Experiments:

1. Determination of discharge of liquid flow in pipe by using orifice meter.
2. Determination of discharge of liquid through pipe by using venturimeter.
3. Determination of C_c, C_v, C_d of Orifices.
4. Determination of discharge of liquid flow in pipe through Mouth Piece.
5. Determination of discharge of liquid flow in pipe through v notches
6. Determination of discharge of liquid flow in pipe through weirs
7. Determination of discharge of liquid flow in pipe through sluice gate.
8. Reynolds experiment for demonstration of stream lines & turbulent flow.
9. Determination of Friction Factor of a pipe.
10. To determine the discharge of liquid through rotameter.

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 this course the student will be able to:

CO1	Demonstrate devices like Orifice meter, Venturi meter, Nozzle meter, Rotameter etc.
CO2	Examine different parameters of fluid through Orifice meter, Venturi meter, Mouth Piece, V notches, Weirs, Sluice gate, Rotameter etc.
CO3	Analyze laminar flow and turbulent flow.
CO4	Analyze the experimental losses incurred in a pipe

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

Course outcome	PO1	PO2	PO3	PO4	PO5	PO6	PO 7	PO8	PO9	PO10	PO11	PO12
CO1	2	2										
CO2	2	2										
CO3		2	2									
CO4	1	3										

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Jabalpur Engineering College, Jabalpur

(AICTE Model Curriculum based scheme)

B.Tech. (AICTE) IV Sem. (Mechanical 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 Exam	Quiz, Assign ment	End Sem	Lab Work					
ME403	Machine Drawing & CAD	70	20	10	30	20	150	3	-	2	4

Note – Time Duration of Paper : Four Hours.

Course Objective:

To enable the students to prepare a detailed assembly drawing for machine components.

Course Contents:

Module 1. **Drawing Conventions**; IS codes, sectional views and sectioning, surface finish and tolerances representation of machine parts, Conventional representation of materials and machine components , Rivet heads and Riveted joints, Welded joints, Drawing of Threaded fasteners, Limit, Tolerances and fits. 14 marks

Module 2. **Assembly Drawing:** Assembly Machine Drawing, Basic concept of assembly drawing, bill of materials, drawing of different types of keys, Assembly drawing of Cotter and Knuckle joints, Pedestal and footstep bearings. 21 marks

Module 3. **Drawing of Engine Parts:**

Steam Engine Parts:Crosshead for vertical and horizontal engine,Stuffing box for small and large steam engines. 21 marks

IC Engines Parts: Piston, piston rings,connecting rods for petrol and diesel engine, Eccentric.

Lathe Machine Parts: Tool post and Tail Stock.

Module 4. **CAD:** Software and hardware required to produce CAD drawings, Software: operating systems; CAD software packages e g AutoCAD, AutoCAD/Inventor, Micro station, Catia, Pro/ENGINEER, Solid works; minimum system requirements. Preparing & interpreting CAD drawing, orthographic projections; Commands: absolute/relative/polar coordinates; features e.g. line types, grids, snaps, circle, text, hatching, dimensioning, layers/levels, colour; viewing e. g. zoom, pan; inserting other drawings e g symbols, blocks; modifying e g copy, rotate, move, erase, scale, chamfer, fillet Interpret: determine properties of drawn objects e g list, distance, area, volume use CAD software to produce 2D & 3D assembly drawings and 3D views, 3D coordinate entry (x, y, z), wire frame drawing, 2D to 3D (thickness, extrusion); surface models. 14 marks

Evaluation:

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

References:

1. Bhatt, ND; Machine Drawing; Charotar Publication.
2. K C Jain,Machine Drawing, PHI.
3. Singh A; Machine Drawing; TMH publication.
4. Narayana and Reddy; Machine Drawing; New age, Delhi.
5. Shigley JE et al; Mechanical Engineering Design, TMH.

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Outcomes:

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

CO1	Illustrate the Indian standards for machine drawing.
CO2	Explain Fits and Tolerance in technical drawing.
CO3	Draw assembly drawing of joints, couplings, machine elements, 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	PO12
CO1	2	1	-	-	-	-	-	-	-	-	-	-
CO2	2	2	-	-	-	-	-	-	-	-	-	-
CO3	2	2	-	-	-	-	-	1	-	-	-	-

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.

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 (COs)

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

CO1	Apply computer aided drafting software to solve engineering problems.
CO2	Use CAD command for 3D Modeling of simple solid shapes
CO3	Draw assembly drawing of joints, couplings and machine elements, I.C. Engine parts and Lath machine parts.

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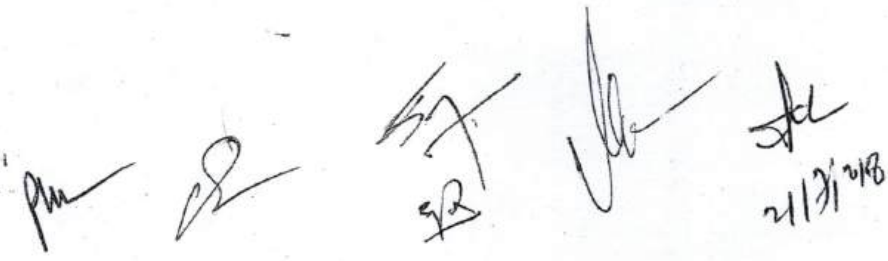
g of Course outcomes (COs) with Program Outcomes (POs):

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



Jabalpur Engineering College, Jabalpur

(AICTE Model Curriculum based scheme)

B.Tech. (AICTE) IV Sem. (Mechanical 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 Exam	Quiz, Assign ment	End Sem	Lab Work					
ME404	Theory of Machines & Mechanisms	70	20	10	30	20	150	3	-	2	4

Course Objective:

At the completion of course the students will be able:

- To describe the working of different mechanism used in machines.
- To find velocity and acceleration of links of different mechanism.
- To know the working of different types of gears, gear trains and cams.
- To know the applications of gyroscopic principle.
- To know the working principles of belt, rope and chain drive.

Course Contents:

Module 1. **Mechanisms and Machines:** Links, Pairs, Chains, Structure, Mechanism, Machine, Equivalentlinkage, Degrees of freedom, Gruebler's&Kutzback's criterion, Inversions of four bar chain,Mechanism with lower pairs Pantograph, Straight line motion mechanisms, Davis andAckermann's steering mechanisms, Hooke's joint, Numerical problems based on above topics.

Module 2. **Motion:** Plane motion, Absolute & Relative motion, Displacement, Velocity and Acceleration ofa point, Velocity and Acceleration Analysis by Graphical & Analytical methods, Velocity of rubbing, Kennedy's Theorem, Acceleration polygon, Coriolisacceleration component, Klein's construction, Numerical problems based on above topics.

Module 3. **Gears:** Classification of gears, Helical, Spiral, Bevel and Spur Gear, Spur GearTerminology, Law of gearing, Tooth profiles, velocity of sliding, Path of contact, Arc ofcontact, Contact Ratio, Interference and Undercutting, , Conjugate action, Numerical problemsbased on above topics.

Gear Trains: Simple, compound, reverted and epi-cyclic gear trains. Velocity ratio and torquecalculation in gear trains.

Module 4. **Cams:** Classification of Cams and Followers, Radial Cam Terminology, Analysis of Followermotion (uniform, modified uniform, simple harmonic, parabolic, cycloidal), Pressure Angle,Radius of Curvature, Cam Profile for radial and offset followers Synthesis of Cam Profile byGraphical Approach, Cams with Specified Contours.

Gyroscope: Gyroscopic Action in Machines, Angular Velocity and Acceleration, Gyroscopictorque/ couple, Gyroscopic effect on Naval Ships, Stability of Two and Four Wheel Vehicles,Rigid disc at an angle fixed to a rotating shaft.

Module 5. **Belt Rope & Chain Drive** : Types of Belts, Velocity ratio of a belt drive, Slip in belts, Length ofopen belt and crossed belt, Limiting ratio of belt-Tensions, Power transmitted by a belt,Centrifugal tension, Maximum tension in a belt, Condition for maximum power transmitted,Initial tension in a belt, Creep in belt, Applications of V-Belt, Rope and Chain drives.

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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rences:

1. Thomas Bevan; Theory of Machines; Pearson Education.
2. Rattan SS; Theory of machines; MC Graw Hills.
3. Ambekar AG; Mechanism and Machine Theory; PHI. Eastern Economy Edition 2015.
4. Uicker&Shigley, Theory of machines & Mechanism Second Edition Oxford University Press.
5. Rao J S and Dukkipati; Mechanism and Machine Theory; New Age Delhi.
6. Abdulla Shariff, Theory of Machines.
7. Theory of machines by R.K.Bansal.

Course Outcomes:

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

CO1	Explain the kinematics of mechanism and their inversions.
CO2	Design different types of gears and gear trains.
CO3	Draw cam profile for different follower motions.
CO4	Analyze Gyroscopic effect on Naval ship and Stability of Two and Four Wheel Vehicles.

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		1								
CO2	2	2		1								
CO3	1	1										
CO4	1	2		1								

of Experiments:

1. To finds out gyroscopic couple.
2. To Find out velocity & acceleration of slider crank mechanism by Klin"s Construction.
3. To find out velocity ratio of various gear trains.
4. To study various types of belt drives & find out the velocity ratio of the drive.
5. To draw the cam profile.
6. Study of working models of various popular mechanisms like quick return mechanism etc.
7. To draw Involute profile of a gear by generating method.

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:

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

CO1	Verify the law of gyroscope. And Describe the working of different mechanisms and their inversions.
CO2	Draw velocity and acceleration of slider crank mechanism by Klein's Construction method.
CO3	Calculate velocity ratio of various gear trains and various types of belt drives.
CO4	Draw cam profile and Involute, profile of a gear by generating method.

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		1								
CO2	2	2		1								
CO3	1	1										
CO4	1	2		1								

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Jabalpur Engineering College, Jabalpur

(AICTE Model Curriculum based scheme)

B.Tech. (AICTE) IV Sem. (Mechanical 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 Exam	Quiz, Assign ment	End Sem	Lab Work					
ME405	Energy Conversion System	70	20	10	-	-	100	3	1	2	4

Course Objectives:

The purpose of this course is to introduce the undergraduate students with

1. To learn applications of energy conversion device to thermal power plant.
2. To provide an overview of steam boilers, condensers, steam nozzles their applications.
3. To perform calculations on related to designing of energy conversion devices.
4. Importance and components of cooling towers and heat exchangers.

Course Contents:

Module I **Steam Generators (Boilers):** Classification of boilers, Requirements of a good boiler, Conventional boilers, High-pressure boilers- Lamont, Benson, Loeffler and Velox steam generators, Fluidized bed boilers (FBB), Selection of boilers, Performance and rating of boilers, Equivalent evaporation, Boiler efficiency, Heat balance sheet, Heat losses in boiler plant, Combustion in boilers, Stoker firing system, Pulverized fuel firing system, Super critical boilers.

Module II **Phase Change Cycles:** Introduction, Classifications of vapour power cycles, Basic elements of steam power plant, Vapor Carnot cycle, its efficiency and limitations, Rankin cycle, its efficiency and assumptions, effect of boiler and Condenser pressure and superheat on efficiency, Modified Rankin cycle, Comparison of Rankine and Carnot cycle, Reheat cycle, Perfect regenerative cycle, its expression of efficiency, Ideal and actual regenerative cycle with single and multiple heaters, Regenerative-reheat cycle, Binary-vapor cycle, properties of binary working fluid, work done and efficiency calculations. Simple numerical problems on Phase change cycles.

Module III **Gas Dynamics:** Introduction and Applications of Gas Dynamics, Concept from fluid mechanics, Continuity equation, Momentum equation, One dimensional gas dynamics, Isentropic condition, Speed of sound in fluid, One dimensional wave motion, Elastic waves, Mach number and its significance, Mach cone, Zone of action, Zone of silence, Stagnation state and properties, One-dimensional isentropic flow through variable area duct, Condition for maximum fluid flow, Effect of area ratio as a function of Mach number, Simple numerical problems on Gas Dynamics.

Module IV **Air Compressors:** Introduction, applications, and Classification of Air Compressors, Reciprocating Air Compressor; working, work done, power required, efficiency, for single and multistage stage compression, Comparison of single stage and multi stage compression, Two stage with intercooler, Condition for minimum work done in two stage. Rotary Compressors; working, classifications. Comparison of reciprocating and rotary compressors. Simple numerical problems on Air Compressors.

Module V

(A) Steam Nozzles: Introduction and types, Flow of steam through nozzles, Effect of friction in nozzle efficiency, Condition for maximum discharge, Physical significance of critical pressure ratio, Super-saturated flow.

(B) Steam Condensers: Introduction, Objective, Classification of condensers,Comparison of jet and surface condensers, Air leakage and its effect on performance, back pressure and its effect on plant performance, Condenser efficiency and factors affecting, Thermal analysis of condenser, Simple numerical problems on Steam Condensers.

(C) Cooling Towers: Introduction, Function, Components and applications, Cooling tower materials, Classifications of cooling towers, Performance assessment of cooling towers, Energy efficiency opportunities, Best design practices for cooling tower.

(D) Heat Exchangers: Introduction and applications, Classification of heat exchangers.

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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. Nag PK; Power plant Engineering; TMH
2. Thermodynamics by Gordon J. Van Wylen
3. P.K.Nag; Basic and applied Thermodynamics; TMH
4. Ganesan; Gas turbines; TMH
5. Heat Engines by V.P. Vasandani& D. S. Kumar
6. R. Yadav Steam and Gas Turbines
7. R.Yadav Thermal Engg.
8. Kadambi& Manohar; An Introduction to Energy Conversion – Vol II. Energy conversion cycles.

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

CO1	Explain steam generation and its utilization to thermal power plant.
CO2	Illustrate air compressors and phase change cycles.
CO3	Apply the basic knowledge of thermodynamics to gas dynamics and steam nozzles.
CO4	Analyze heat exchanger and effects of its different parameters.

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

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

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List of Experiments:

1. Study of Separating & Throttling Calorimeter for measurement of dryness fraction.
2. Study of Benson Boiler.
3. Study of Lamont Boiler.
4. Study of Loeffler Boiler.
5. Study of Velox Boiler.
6. Study of Boiler Draught.
7. Study of Boiler Trial.
8. Study of Cooling Towers.
9. Study of Heat Exchangers.
10. Study of Air Compressor.

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 (COs):

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

CO1	Explain steam generators and its selection and air compressors, working, types and applications.
CO2	Evaluation of performance parameters of boilers.
CO3	Explain the working of cooling tower and its performance.
CO4	Compare types of heat exchangers.

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

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

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

Credits: 01	ME-406	CAD TOOL LAB (Software Lab -II)	L: 0, T: 0, P: 02

Course Objective:

The objective of the module is to make students familiar with AotoCAD software by making them learn the drafting and modelling on the software.

Course Contents:

Introduction to Drafting and Modelling Software Packages like Auto-CAD, Solid Works, CATIA. Etc. 2D, 3D drawings. Drawing and assembly of various machine components. Examples: Sleeve and Cotter joint, Gib and Cotter joint/ Knuckle Joint/ Flanged Coupling, Assembly of Connecting Rod.

List of Experiments:

1. Setting up of the drawing environment by learning the basic features like setting, drawing limits, drawing units, naming the drawing, saving the file with drawing extension, etc.
2. To create a 2D view of the diagrams given using AutoCAD.
3. To make an orthographic dimensioned drawing of a connecting rod.
4. Drawing a Flange.
5. Drawing a Bushing assembly.
6. To draw the orthographic views of a Cotter joint.
7. To create a spiral by extruding the circle.
8. To draw orthographic projection drawing of a lathe machine.
9. Draw 3D models by extruding simple 2D designs.
10. Layout drawing of a building using different layers and line colors indicating all building details.

Evaluation:

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

References:

1. Ibrahim Zeid, Mastering CAD/CAM – SIE, McGraw-Hill Education.
2. P N Rao, CAD/CAM: Principles and Applications, 3rd Edition, TMH publication.
3. Munir Hamad, AutoCAD 2017 3D Modelling, Mercury Learning and Information.
4. CADArtifex, AutoCAD 2018: A Power Guide for Beginners and Intermediate Users, CADArtifex; 3rdedition.
5. Sham Tickoo, SOLIDWORKS 2017 for Designers, 15thEdition, CADCIM Technologies.
6. Sham Tickoo, Exploring Solidworks 2016: A Tutorial Approach, 3ed, Dreamtech Press.
7. Sham Tickoo, CATIA V5R21 for Designers,; 1 edition,CADCIM
8. CATIA V5-6R2015 Basics Part III: Assembly Design, Drafting, Sheetmetal Design, and Surface Design, Amazon Asia-Pacific Holdings Private Limited.
9. David Lomshek, CATIA 3D solid to 2D dimensioned drawings, Amazon Asia-Pacific Holdings Private Limited.
10. User manual of Auto-CAD software.
11. User manual of ANSYS and Fluent software.
12. Mastering AutoCAD 2017 by George Omura.
13. User's Guide, AutoCAD 2013.
14. https://knowledge.autodesk.com.
15. https://www.mycadsite.com.
16. https://thesourcecad.com.

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Course outcomes (COs):

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

CO1	Utilize computer aided drafting software to solve engineering problems.
CO2	Make use of CAD command for 2D and 3D Modeling of simple planes and solid shapes.
CO3	Construct assembly drawing of joints, couplings and machine elements, 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	PO12
CO1	-	1	2	-	2	-	-	-	-	-	-	1
CO2	1	-	2	-	3	-	-	-	1	-	-	1
CO3	-	-	1	-	2	-	-	2	2	-	-	-

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Jabalpur Engineering college, Jabalpur
Dept.of Mechanical Engg.

Recommended MOOCs (NPTEL) Courses
B.Tech Semester-IV (2018-19)

1. Basics of Finite Element Analysis-I
2. Introduction to Machining and Machining Fluids
3. Steam and Gas Power Systems
4. Introduction to research

6/2/19
HOD
Mechanical

Jabalpur Engineering College, Jabalpur

(Declared Autonomous by MP Govt., Affiliated to RGPV, Bhopal)
(AICTE Model Curriculum Based Scheme)
Bachelor of Technology (B.Tech.) IV Semester (Artificial Intellligence & 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			L	T	P	
				End. Sem.	Mid Sem. Exam.	Quiz/ Assignment	End Sem.	Lab Work					
1	MA401	BSC	Discrete Structure	70	20	10	-	-	100	3	1	-	4
2	AI402	PCC	Database Management System	70	20	10	30	20	150	3	-	2	4
3	AI403	PCC	Operating System	70	20	10	30	20	150	3	-	2	4
4	AI404	PCC	Introduction in Artificial Intelligence and Machine Learning	70	20	10	30	20	150	3	-	2	4
5	AI405	PCC	Microprocessor and Microcontroller	70	20	10	-	-	100	3	1	-	4
6	AI406	ESC	Software Lab-II R-Programming	-	-	-	60	40	100	-	-	2	1
7	AI407	MC	Industrial Training	Minimum Four Weeks Duration. Evaluation will be done in 5th semester									
Total				**350**	**100**	**50**	**150**	**100**	**750**	**15**	**2**	**8**	**21**
8	AI408	DLC	Self-Learning Presentation (SWAYAM/NPTEL/MOOC)	-	-	-	-	-	-	-	-	-	8
NSS/NCC/Swachhata Abhiyan/Rural Outreach				Qualifier									
Additional Course for Honours or Minor Specialization				Permitted to opt for maximum three additional courses in subject code AI408 for the award of Honours (Minor Specialization).									

Note:1 Departmental BOS will decide list of three optional subjects those are available in MOOC.

2 Industrial training should be apart from laboratory work undertaken in the college rather it should have industrial orientation and practical aspects/field work. Report to be submitted at the beginning of 5th semester and students have to give a presentation in the departement. Evaluation will be done in 5th semester.

1 hour lecture (L) = 1 credit

1 hour Tutorial (T) = 1 credit

2 hour Practical (P) = 1 credit

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Dean Academic

Jabalpur Engineering College, Jabalpur
(AICTE Model Curriculum based scheme)
B. Tech. (AICTE) IV Sem. (Computer Science & 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 Exam	Quiz, Assign ment	End Sem	Lab Work					
MA401	Discrete Structure	70	20	10	-	-	100	3	1	-	4

Module 1: Set theory, relation and function (08 Hours)
Definition of sets, countable and uncountable sets, Venn Diagram, proofs of some general identities on sets relation: Definition, types of relation, composition general identities on sets relation: Definition, types of relation, composition ordering relation Function: Definition one to one, into and onto function, inverse function, composition of functions recursively defined functions, pigeonhole principle.

Module 2: Posets, Hasse diagram and lattices (08 Hours)
Introduction ordered set, Hasse diagram of partially, ordered set, isomorphic ordered set, well ordered set, properties of Lattices, bounded and complemented lattices. Propositional logic Proposition, first order logic, Basic logical operation, truth tables tautologies, contractions, Algebra of Proposition, logical implications, logical equivalence, Rules of inference, Predicates, the statement function.

Module 3: Theorem proving techniques (06 Hours)
Mathematical induction, Recurrence Relation and Generating Function: Introduction to recurrence relation and recursive algorithm, linear recurrence relations with constant coefficients, homogeneous solutions, particular solutions Total solution, generating functions, Solution by method of generating functions.

Module 4: Algebraic structure: Group, Ring, Field (10 Hours)
Definition properties types : semi groups, Monoid groups, Abelian group, properties of groups, Subgroup, cyclic groups, Cosets, Normal subgroup, Homomorphism& Isomorphism of groups, Rings and Fields and finite fields: definition and examples.

Module 5: Graph theory (08 Hours)
Introduction and basic terminology of graphs, Planer graphs Multigraphs and weighted graphs Isomorphic graphs, Paths, Cycles and connectivity, shortest path in weighted graph Introduction to Eulerian paths and circuits, Hamiltonian paths and circuits, Graph coloring, chromatic number.

Books Reference:

1. Elements of Discrete Mathematics by C. L. Liu Tata McGraw-Hill Edition.
2. Discrete Mathematical structure with application in CS by Trembly, J.P. & Manohar; Mc Graw Hill.
3. Graph Theory with application to engineering and computer science by Deo, Narsingh; PHI.
4. Discrete Mathematics by Seymour Lipschutz and and mark Lipson Schaum's Outlines Tata McGraw-Hill Pub.

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CO1. Determine the basic principle of Set Theory, Boolean Algebra and Logic.

CO2. Solve the mathematical relations by theorem proving techniques.

CO3. Understand the knowledge of algebraic structures: group, ring and field.

CO4. Apply to graph theory in various engineering problems.

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

AI402	Database Management System	L-3 : T-0 : P-2	Credits 4

Module 1: Introduction:

General introduction to database systems, DBMS Concepts and architecture, Data models-Hierarchical, Network and Relational, Three-schema architecture of a database, Data independence- Physical and Logical data independence. Challenges in building a DBMS, Various components of a DBMS

Module II. Entity Relationship Model:

Conceptual data modeling-motivation, Entities, Entity types, Various types of attributes, Relationships, Relationship types. ER diagram notations, Keys, Super key, Candidate key, Primary Key, Alternate key and Foreign key. Extended ER features: Specialization, Generalization, Aggregation, Examples

Module III: Relational Data Model:

Relational Data Model: Concept of relations, Schema-instance distinction, Keys, referential integrity and foreign keys, Relational Algebra: Selection, Projection, Cross product, Various types of joins, Division. Example queries; Converting the database specification in E/R notation to the relational schema; SQL: Introduction, Data definition in SQL, Table, key and foreign key definitions, Update behaviors, Querying in SQL, Basic select-from- where block and its semantics, Nested queries, Aggregation functions group by and having clauses.

Module IV: Functional Dependencies and Normal forms:

Importance of a good schema design, Problems encountered with bad schema designs, Motivation for normal forms, dependency theory-functional dependencies, Armstrong's axioms for FD's, Closure of a set of FD's, Minimal covers, Definitions of INF, 2NF, 3NF and BCNF, Decompositions and desirable properties of them: Multi-valued dependencies and 4NF, Join dependencies and definition of 5NF.

Module V: Transaction Processing and Recovery Concepts:

Concepts of transaction processing, ACID properties, Testing for Serializability of schedules, conflict view serializable schedule, recoverability, Concurrency Control: Locking based protocols for CC, Deadlock handling, Recovery from transaction failures: Log based recovery, Checkpoints:

Suggested Books:

1. Avi Silberschatz, Henry F. Korth, S. Sudarsan, Database System Concepts:
2. Elmasi, R. and Navathe, S.B., "Fundamentals of Database Systems", Pearson Education.
3. Date, C. J., "Introduction to Database Systems", Pearson Education.
4 Ramakrishnan, R. and Gekhre, J., "Database Management Systems", McGraw-Hill.
5. Vipin C Desai, "An Introduction to database systems", Galgotia.

Jabalpur Engineering College, Jabalpur (M.P.)

Branch- AI & DS w.e.f. July 2021

(Based on AICTE Model Syllabus)

Database Management System (AI402)

Course Outcomes:

After completion of course the students will be able to:

CO1: Explain the fundamental concepts of Database Management Systems. Data models, Normalization, Transaction management & Recovery.

CO2: Apply normalization concepts for designing database.

CO3: Design ER Model and Relation Model of the database for the given problem.

CO4: Formulate SQL commands (DDL, DML, DQL) for the given problem statement.

Jabalpur Engineering College, Jabalpur (M.P.)

Branch- AI & DS w.e.f. July 2021

(Based on AICTE Model Syllabus)

AI402	Database Management System	L-0 : T-0 : P-2	Credits 1

List of Experiment

1. Implementation of DDL commands of SQL with suitable examples
   - Create table, Alter table, Drop Table
2. Implementation of DML commands of SQL with suitable examples
   - Insert, Update, Delete
3. Implementation of different types of function with suitable examples
   - Number function, Aggregate Function, Character Function, Conversion Function, Date Function
4. Implementation of different types of operators in SQL
   - Arithmetic Operators, Logical Operators, Comparison Operator, Special Operator, Set Operation
5. Implementation of different types of Joins
   - Inner Join, Outer Join, Natural Join etc..
6. Study and Implementation of
   - Group By & having clause, Order by clause, Indexing
7. Study & Implementation of
   - Sub queries, Views
8. Study & Implementation of different types of constraints.
9. Study & Implementation of Database Backup & Recovery commands.Study & Implementation of Rollback. Commit, Savepoint.
10. Creating Database /Table Space, Managing Users: Create User, Delete User, Managing roles:-Grant, Revoke.
11. Study & Implementation of PL/SQL.
12. Study & Implementation of SQL Triggers.

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

AI403	Operating System	L-3 : T-0 : P-2	Credits 4

Module I: Introduction to Operating System

Architecture Goals & Structures of Operating System, Basic functions, interaction of OS. & hardware architecture, System calls, Batch, multiprogramming Multitasking time sharing, parallel distributed & Real Time Operating System. Basics of Network Operating System Server Operating System and Real Time Operating System.

Module II: Process Management

Process Concept Process states. Process control, Threads, Uni-processor Scheduling Types of scheduling Preemptive, Non preemptive, scheduling algorithms: FCFS, SJF, RR, Priority, Thread Scheduling, Real Time Scheduling System calls, like Ps, fork, join, exec family, wait. I/O Devices, Organization of I/O functions, Operating System Design issues.

Module III: Concurrency control

Concurrency Principles of Concurrency, Mutual Exclusion: s/w approaches, H/W Support, Semaphores, pipes, Message Passing signals, Monitors, Classical Problems of Synchronization Readers Writers, Producer Consumer, and Dining Philosopher problem Deadlock: Principles of deadlock, Deadlock Prevention Deadlock Avoidance, Deadlock Detection, System calls like signal, kill

Module IV: Memory Management

Memory Management requirements, Memory partitioning Fixed and Varta Partitioning Memory Allocation Allocation Strategies (First Fit, Best Fit, and Worst Fit). Fragmentation, Swapping, and Paging Segmentation, Demand paging Virtual Memory Concepts management of VM, Page Replacement Policies (FIFO, IRU, Optimal, Other Strategies), Thrashing, /D Buffering Disk Scheduling IFCFS, SCAN, C-SCAN, SSTF), RAID, Disk Chiche

Module V: Inter Process Communication and Multi-Processors

Basic Concepts of Concurrency, Cooperating process, Advantage of Cooperating process, Bounded Buffer Shared-Memory Solution, Inter-process Communication (IPC), Basic Concepts of inter Communication and Synchronization, Multi-Processor based and Virtualization Concepts, Virtual machines, supporting multiple operating systems simultaneously on a single hardware platform running one, operating system on top of another educing the software Engineering effort of developing operating systems for new hardware architectures. True or pure virtualization Para virtualization; optimizing performance of virtualization system, hypervisor call interface and process.

Suggested Books:

1. Silberschatz, A, Galvin, PB and Gagne, G., "Operating System Concepts, John Wiley (2004) 7th ed
2. W Stallings, "Operating Systems internals and Design Principles, Prentice Hall (2009) 6th ed
3. Andrew S. Tanenbaum, "Operating Systems: Design and Implementation, Pearson (2006)
4. Andrew S. Tanenbaum, Modern Operating Systems, Pearson 4th edition (2014)
5. Dhamdhere, DM "Operating Systems A Concept Based Approach, McGraw Hill (2008) 2nd ed

Jabalpur Engineering College, Jabalpur (M.P.)

Branch-AI & DS

Operating System (AI403)

Course Outcomes:

After completion of course the students will be able to:

CO1: Understanding basic architecture of operating system, multi programming and multitasking.

CO2: Comparative process management, Real time scheduling operating system design issues.

CO3: Developing concept of concurrency and deadlock, Deadlock avoidance.

CO4: Design of memory segmentation virtual memory, multiprocessor, Disk scheduling, Cache.

Jabalpur Engineering College, Jabalpur (M.P.)

Branch- AI & DS w.e.f. July 2021

(Based on AICTE Model Syllabus)

AI403	Operating System	L-0 : T-0 : P-2	Credits 1

List of Experiment based on Program to implement

1. FCFS CPU scheduling algorithm.
2. SJF CPU scheduling algorithm.
3. Priority CPU Scheduling algorithm.
4. Round Robin CPU scheduling algorithm
5. Classical inter process communication problem (producer consumer).
6. Classical inter process communication problem (Reader Writers)
7. Classical inter process communication problem (Dining Philosophers).
8. FIFO page replacement algorithm.
9. LRU page replacement algorithm
10. LFU page replacement.
11. Optimal page replacement.

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

AI404	Introduction to Artificial Intelligence and Machine Learning	L-3 : T-0 : P-2	Credits 4

Module I: Introduction to AI and State Space Search:
Meaning and definition of artificial intelligence. Study and comparison of breadth first search, depth first Search Techniques, hill Climbing, Best first Search, A* algorithm, AO* algorithms etc., and various types of control strategies.
Representation of Knowledge: Knowledge Representation, Problems in representing knowledge, knowledge representation using propositional and predicate logic, comparison of propositional and predicate logic. Resolution, refutation, deduction, theorem proving, inferencing, monotonic and no monotonic reasoning

Module II: Knowledge Inference & Reasoning:
Probabilistic reasoning, Baye's theorem, semantic networks scripts schemas, frames, conceptual dependency, fuzzy logic, forward and backward reasoning.
Game Playing: Game playing techniques like minimax procedure, alpha-beta cut-offs etc, planning, Study of the block world problem in robotics.

Module III: Machine Learning 2.2.23
Introduction to Machine Learning: Basic Concepts, Understand and Formalize the Learning Problem, Model and Parameters, Training, Validation and Test Data. Metrics for Evaluation of Model Performance: Accuracy, Precision, Recall, Confusion Matrix, Bias Variance tradeoffs, Overfitting and Under fitting. Types of Learning.

Module IV: Supervised Learning:
Classification, Linear Regression, Linear Regression of One Variable using Gradient Descent Algorithm, Linear Regressions of Multiple Variables using Gradient Descent Algorithm. Logistic Regression. Decision Trees. Ensemble Learning-Boosting-Bagging, Naive Bayes Classifier, k-Nearest Neighbors Classifier, Support Vector Machine.

Module V: Unsupervised Learning:
Hierarchical Clustering, k-Means Clustering, Mixture Models, Density-Based Spatial Clustering of Applications with Noise (DBSCAN), Ordering Points to identify the Clustering Structure (OPTICS).
Introduction to Neural Network: Perceptron, Basic Neural Network Structure, Forward Propagation, Cost Functions, Error Backpropagation Algorithm, Training by Gradient Descent

Book's:

1. Kevin Night and Elaine Rich, Nair B., "Artificial Intelligence (SIE)", Mc Graw Hill.

2. Nelsson N.J., Principles of Artificial Intelligence, Springer Verlag, Berlin.

3. Deepak Khemani "Artificial Intelligence". Tata Mc Graw Hill Education.

4. Dan W. Patterson, "Introduction to Al and ES", Pearson Education..

5. Stephen Marsland, "Machine Learning-An Algorithmic Perspective", CRC Press.

6. Chapman and Hall, Machine Learning and Pattern Recognition Series", CRC Press.

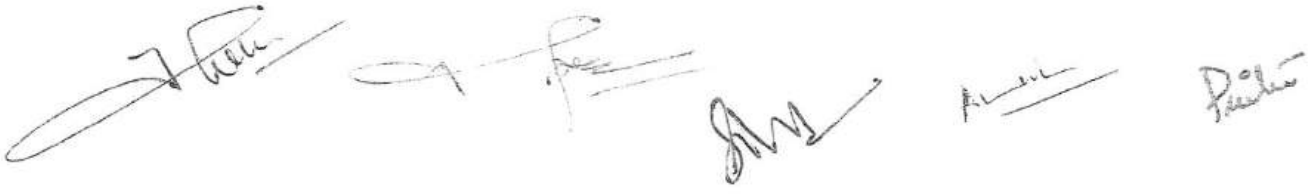
7. Tom M Mitchell, "Machine Learning", McGraw-Hill Education.

8. Peter Flach, "Machine Learning: The Art and Science of Algorithms that Make Sense of Data",

9. Jason Bell, "Machine learning-Hands on for Developers and Technical Professionals", Wiley.

10. Ethem Alpaydin, "Introduction to Machine Learning 3e (Adaptive Computation and Machine Learning Series)", MIT Press.

11. Lan Goodfellow, Yoshua Bengio, Aaron Courville, "Deep Learning", MIT Press. Cambridge University Press.



Jabalpur Engineering College, Jabalpur (M.P.)

Branch-AI & DS

Introduction to Artificial Intelligence and Machine Learning (AI404)

Course Outcomes:

After completion of course the students will be able to:

CO1: Understanding preliminary concept of artificial intelligence Depth search and Breath search.

CO2: Developing concept of probabilistic reasoning, semantic network output.

CO3: Understanding and formulating machine learning problems, metrics for evaluation model.

CO4: Complete compressive study of supervised and unsupervised learning.

Jabalpur Engineering College, Jabalpur (M.P.)

Branch- AI & DS w.e.f. July 2021

(Based on AICTE Model Syllabus)

AI404	**Introduction to Artificial Intelligence and Machine Learning**	L-0 : T-0 : P-2	**Credits 1**

List of experiments for AI and ML Lab

1. Write a program to implement BFS and DFS search strategies
2. Write a program to implement A* algorithm and AO* algorithms
3. Write a program to implement Min Max procedure.
4. Write a program to implement Linear Regression. Use appropriate dataset for training and testing. Compare the performance of your program of Linear Regression with that of sklearn's implementation.
5. Write a program to demonstrate the working of the decision tree based ID3 algorithm. Use an appropriate data set for building the decision tree and apply this knowledge to classify a new sample
6. Write a program to implement Nearest Neighbour algorithm to classify the iris data set, Print both correct and wrong predictions. Compare the performance of your implementation with that of sklearn's implementation.
7. Write a program to implement the naive Bayesian classifier for a sample training data set stored as a CSV file. Compute the accuracy, precision and recall of the classifier, considering few test data sets.
8. Write a program to implement k-Means clustering algorithm. Use appropriate dataset for training and testing. Compare the performance of your Implementation with that of sklearn's implementation.
9. Write a program to compare the results of DBSCAN and OPTICS clustering algorithms: Use appropriate Dataset to demonstrate the clusters identified by these algorithms. You can use Python ML library classes of DBSCAN and OPTICS.
10. Build an Artificial Neural Network by implementing the Backpropagation algorithm and test the same using appropriate data sets.

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

AI405	Microprocessor and Microcontroller	L-3 : T-1 : P-0	Credits 4

Module I: Basic microprocessor concepts.

Von newmann model-CPU, Memory, I/O, System Bus, Memory address register, Memory data register, program Counter, Accumulator, Instruction register, Micro operations, Register Transfer Language, Instruction Fetch, decode and execution, Instruction formats.

Control Unit Organization: Hardwired control Unit, Micro programmed Control Unit, Control Memory, Address Sequencing, Micro instruction formats, Micro program sequencer, Microprogramming.

Memory organization: RAM, ROM, Memory maps, Cache memory, Cache mapping, Associative memory, Virtual memory. Memory management hardware.

Module II: Introduction to 8085

Architecture of 8085, pin configurations, machine cycles and bus timings, Instruction classification and data formats, addressing modes, Data transfer operations, Arithmetic operations, Logic operations, Branch operations. Interrupts; 8085 interrupt process, multiple interrupt and priorities, vectored interrupts, Writing Assembly Language programs.

Module III: Interfacing

Memory interfacing, Interfacing I/O devices, Memory mapped I/O, Interfacing of 8085 with RAM and ROM, 8279 programmable Keyboard/Display interface, 8255A programmable Peripheral interface, Interfacing keyboard and seven-segment display using 8255A, 8254 programmable Interval Timer, 8259A programmable Interrupt Controller, Direct Memory Access (DMA), 8257 DMA Controller. Basic concept of serial I/O, Standards in serial I/O; RS 232C standard, 8085-serial I/O lines, 8251 USART, interfacing scanned multiplexed displays and Liquid Crystal Displays, Interfacing a matrix keyboard.

Module IV: Intel 8086 microprocessor:

Introduction to 16-bit microprocessor, 8086 architecture, pin functions. Register organization, Instruction Format; Addressing modes of 8086, Minimum and Maximum mode configuration, memory interfacing with 8086 in minimum and maximum mode. Interrupts, Instruction set of 8086; Data Transfer Instruction, Arithmetic Instructions, Branching and Looping Instructions, Flag Manipulation and machine control Instructions, Logical, Shift and Rotate Instructions, String Instructions, Assembler Directives and Operators; Assembly language Programming of microprocessor 8086.

Module V: Microcontroller:

Introduction to micro controller 8051, its architecture, Signal descriptions, Register set, Operational features: Program status word (PSW), memory and I/O addressing by 8051, I/O configuration, Counters and Timers, Interrupts and stack of 8051, Addressing modes and instruction set of 8051.

Consider as compulsory subject for AI405

2.2.23

Reference Books:

1. Microprocessor architecture, Programming and Applications with the 8085 by Ramesh S.Gaonkar
2. Morris Mano, "Computer System Architecture" (PHI).
3. William Stalling, "Computer Organization and Architecture" (PHI).
4. BB Brey, "The Intel Microprocessors, Architecture, Programming and Interfacing" (PHI)
5. K M Bhurchandi and AK Ray, "Advanced Microprocessors and Peripherals" (Me-Graw Hill

Jabalpur Engineering College, Jabalpur (M.P.)

Branch-AI & DS

Microprocessor and Microcontroller (AI405B)

Course Outcomes:

After completion of course the students will be able to:

CO1: Understand the fundamental concepts of computer system architecture

CO2: Learn the operation and programming of 8085 microprocessor.

CO3: Illustrate how the different peripherals are interfaced with microprocessor

CO4: Analyze the architecture and working of 8086 microprocessor.

CO5: Analyze of the working of 8051 microcontroller.

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Branch (AI & DS) w.e.f. July 2021

(Based on AICTE Model Syllabus)

AI406	Software Lab-II (R-Programming)	L-0 : T-0 : P-2	Credits 1

R-Programming

History and overview of R. install and configuration of R programming Environment, Basic language elements and data structures, R+ knit r+ Markdown+ Git Hub, Data input/output Data storage formats Sub-setting objects Vectorization, control structures, Functions, Scoping Rules Loop functions Graphics and visualization Grammar of data manipulation (dplyr and related tools).Debugging/profiling Statistical simulation.

List of Experiments

Study of data analysis using MS-Excel (Prerequisite).

1. Study of basic Syntaxes in R.
2. Implementation of vector date objects operation.
3. Implementation of matrix, array and factors and perform va in R.
4. Implementation and use of data frames in R.
5. Create Sample (Dummy) Data in Rand perform data manipulation with R.
6. Study and implementation at various control structures in R.
7. Data Manipulation with dplyr package.
8. Data Manipulation with data table package.
9. Study and implementation of Data Visualization with gplot2.
10. Study and implementation data transpose operations in R.

Text Books

URL:http://cran.r-project.org/doc/manuals/r-release/R-intro.pdf (Online Resources).

R Cookbook paperback- 2011 by Teetor Paul O Relly Publications.

Beginning R: The Statistical Programming Language by Dr. Mark Gardener, Willey Publication.

R Programming For Dummies by Joris Meys Andrie de Vries, Wiley Publications

Reference Books:

Hands-on Programming with R by Grolemunds, o Reilly Publications.

R for Everyone:- Advanced Analytics and Graphics, 1e by Lander, Pearson Ltd.

R for Data Science Learning Dan Toomey December 2014 Packt Publishing Limited.

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Branch (AI & DS) w.e.f. July 2021

(Based on AICTE Model Syllabus)

AI407	Industrial Training Evaluation	L-0 : T-0 : P-2	Credits 1

- Students of 2nd /4th / 6th semester have to undergo four week mandatory industrial training during summer vacation in Govt. Organizations / PSU / Private sectors.
- Industrial must be related to subject included in the scheme of branch of specialization.
- At the completion of industrial training students are required to submit the certificate from the competent authority where from student have undergone the industrial training.
- The periodic evaluation of the industrial training in the form of presentation shall be carried out during the stipulated period mention in time table of 3rd / 5th / 7th semester.
- Also, a complete project report (comprise of 25 to 40 pages) describing all the activities/ learnings performed during industrial training and same will be submitted to the head of the department.
- There shall be end semester examination / viva-voce on the industrial training with project report. Marks are mentioned on the scheme of 3rd / 5th / 7th semester.

Jabalpur Engineering College, Jabalpur

(Declared Autonomous by MP Govt., Affiliated to RGPV, Bhopal)
(AICTE Model Curriculum Based Scheme)
Bachelor of Technology (B.Tech.) IV 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	MT-401	PCC	Electronics Drives and Devices	70	20	10	-	-	100	3	1	-	4
2	MT-402	PCC	Manufacturing Processes	70	20	10	30	20	150	3	-	2	4
3	MT-403	PCC	Theory of Machines	70	20	10	30	20	150	3	-	2	4
4	MT-404	PCC	Microcontroller Theory and Design	70	20	10	30	20	150	3	-	2	4
5	MT-405	PEC	Linear Control Theory	70	20	10	-	-	100	3	1	-	4
6	MT-406	ESC	CAD and Kinematics SimulationLab	-	-	-	60	40	100	-	-	2	1
7	MT-407	MC	Industrial Training	Minimum Four Weeks Duration. Evaluation will be done in 5th semester									
Total				**350**	**100**	**50**	**150**	**100**	**750**	**15**	**1**	**8**	**21**
8	MT408	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:1 Departmental BOS will decide list of three optional subjects those are available in MOOC as well for PEC.

2 Industrial training should be apart from laboratory work undertaken in the college rather it should have industrial orientation and practical aspects/field work. Report to be submitted at the beginning of 5th semester and students have to give a presentation in the departement. Evaluation will be done in 5th semester.

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

MOOC/DLC Courses	MT408A Introduction to Internet of Things	MT408B Concept of Thermodynamics	MT408C Enclosure Designof Electronics Equipments	MT408D BioMEMS and Microfluidics

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Jabalpur Engineering College, Jabalpur (M.P.)

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					
MT-401	Electronics Drives and Devices	70	20	10	-	-	100	3	1	0	4

MODULE I : OVERVIEW OF ELECTRICAL DRIVE:
Basic Elements – Types of Electric Drives – factors influencing the choice of electrical drives – heating and cooling curves – Loading conditions and classes of duty – Selection of power rating for drive motors with regard to thermal overloading and load variation factors.

MODULE II: ELECTRICAL MOTORS:
Constructional details, principle of operation and performance characteristics of D.C. motors, single phase induction motor, three phase induction motor, synchronous motor, universal motor, servo motor, stepper motor and reluctance motor .

MODULE III : MOS Field-Effect Transistors (MOSFETs):
Introduction, Device Structure & Physical Operation, Current-Voltage Characteristics, JFET,MOSFET Circuits at DC, MOSFET Biasing, MOSFET Amplifier, Basic Principles, Small-Signal Operation & Models.

MODULE IV : Integrated Circuits:
Introduction, The Two-Stage CMOS Op Amp: The Circuit, Input Common-Mode Range and Output Swing, DC Voltage Gain, CMRR, Frequency Response, Slew Rate, Design Trade-Offs, Application of OP-Amp based circuits.

MODULE V : CMOS Digital Logic Circuits: Digital Logic Inverters, The CMOS Inverter: Circuit Operation, The Voltage-Transfer Characteristics (VTC), Dynamic Operation of the CMOS Inverter, Transistor Sizing, Power Dissipation.

Text Books:

1. Electric Drives- Kothari D.P. And Rakesh Singh Lodhi, Willey.
2. Electric Drives- Concepts and Applications: Vedam Subrahmanyam , TMH.
3. Microelectronic Circuits- Sedra & Smith: Oxford Univ. Press.
4. Semiconductor Physics & Devices- Donald A. Neamen, TMH.
5. Integrated Electronics- Millman & Halkias, TMH

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

CO1	Understand various types of Elctrical Drives.
CO2	Analyse operations of Electrical Machines.
CO3	Understanding of Electronic devices MOSFETS, and Integrated circuits design..
CO4	Knowledge of advanced Digital IC technology and its design techniques.

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Jabalpur Engineering College, Jabalpur (M.P.)

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					
MT-402	Manufacturing Processes	70	20	10	30	20	150	3	1	0	4

Module-I Introduction to Manufacturing Processes:
Importance of manufacturing processes, classification, economic and technological definitions of manufacturing processes. Foundry Practice , **Pattern making-** Types, material, allowances, core–types, materials and its properties. **Mould Making and Casting** - Types of sand moulding, design considerations, moulding machines and moulding procedure, mouldings and– types, properties, composition and applications. Casting deffects. **Special Casting Processes**: Investment casting, centrifugal casting, shell moulding, CO_2 moulding, slush casting, die casting.

Module-II Welding:
Principles of Welding, survey and allied processes
Arc Welding: TIG and MIG processes and their parameter selection, atomic hydrogen welding, welding of cast iron, welding electrode–types, composition, specification.
Resistance Welding: Principle , equipment and processes, Thermit Welding, brazing & soldering ,Internal and external welding defects, Inspection & testing of weld.

Module- III Machine Tool Technology :Cutting Tool:
Types, requirements, specification &application Geometry of Single Point Cutting Tool – Tool angel, Tool angle specification system, ASA,ORS and NRS Mechanics of Metal Cutting: Theories of metal cutting, Chip formation, types of chips, chip breakers, Orthogonal and Oblique cutting, stress and strain in the chip, velocity relations, power and energy requirement in metal cutting.

Module-IV Machine tool Lathe:
Introduction , type, specification, construction, work holding device sand tools , mechanism and attachments for various operations, taper turning, thread cutting operations, capstan and turret lathe.
Shaper: Introduction, type, specification, Quick return Mechanisms, Table feed mechanism, work holding devices, shaper operations.
Slotter and Planner: Introduction, specification, types of drives, types of machines.
Milling Machine: Introduction, specification, types, mechanisms and attachments for milling, milling operations, Indexing-simple, compound and differential.

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Module- V

Drilling: Introduction, drill nomenclature, types of drilling machines, other operations like counter boring, counters inking, spot facing etc.

Reaming: Introduction, description of reamers, type of reaming operations.

Boring: Introduction, types of boring machines, boring operations, boring tools.

Broaching: Introduction, types of broaches ,nomenclature of broach, types of broaching machines.

Surface finishing operations: Honing, lapping, super finishing, polishing, buffing, process parameters and attainable grades of surface finish.

Text Books:-

1. Manufacturing Technology (Vol.–I&II)–P.N.Rao–Tata McGraw Hill, New Delhi
2. A Text Book of Production Technology (Manufacturing Processes)– P.C.Sharma, S.Chand and Company Ltd., New Delhi.
3. Production Technology –R.K. Jain– Khanna Publishers, New Delhi
4. Text Book of Production Technology (Vol. I & II), O.P.Khanna, Dhanpat Rai & Sons, New Delhi.
5. Shop Theory –James Anderson and Earl E. Tatro Tata McGraw Hill, New Delhi. Manufacturing Process (Vol-I&II) - H.S.Bawa

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

CO1	Learn about patterns and casting of metals.
CO2	Understand the concept of Arc, Spot, TIG welding and brazing process.
CO3	Understand the Process of simple, compound and progressive press and Hydraulic press
CO4	Learn the Moulding process of plastic materials
CO5	Understand the processing of different materials in the lab.

MT402L Manufacturing Process Lab

List of Experiments:

1. To design and making of pattern - for one casting drawing.
2. To determine sand properties- Exercise -for strengths, and permeability.
3. To Prepare Mould for Casting.
4. To prepare a butt joint with the specimens by Arc Welding.
5. To join the sheets by Spot Welding operation.
6. To join the specimens by TIG welding process.
7. To perform Plasma welding and Brazing.
8. To perform blanking & piercing operation.
9. To perform deep drawing and extrusion operation.
10. To prepare the product by Injection Moulding machine.
11. To prepare the product by Blow Moulding machine.
12. Design & processing of IC Engine components by 3D printing.

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Jabalpur Engineering College, Jabalpur

(AICTE Model Curriculum based scheme)

B. Tech. III SEM (AICTE) (Mechatronics Engineering)

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					
MT- 403	Theory of Machines	70	20	10	30	20	150	3	-	2	4

Module I: Mechanisms and Machines:

Mechanism, machine, plane and space mechanisms, kinematic pairs, kinematic chains and their classification, degrees of freedom, Grubler's criterion, kinematic inversions of four bar mechanism and slider crank mechanism, equivalent linkages, pantograph, straight line motion mechanisms, Davis and Ackermann's steering mechanisms, Hooke's joint.

Module II: Kinematics of Machines

Kinematic analysis of plane mechanisms using graphical and Cartesian vector notations: Planar kinematics of a rigid body, rigid body motion, translation, rotation about a fixed axis, absolute general plane motion. General case of plane motion, relative velocity method, velocity and acceleration analysis, instantaneous center and its application, Kennedy's theorem, relative motion, Coriolis component of acceleration; velocity and acceleration analysis using complex algebra (Raven's) method.

Module III

Gears: Classification of gears, nomenclature, involutes and cycloidal tooth profile properties, synthesis of tooth profile for spur gears, tooth system, conjugate action, velocity of sliding, arc of contact, path of contact, contact ratio, interference and undercutting, helical, spiral, bevel and worm gears.

Module IV

Cams: Classification of followers and cams, radial cam nomenclature, analysis of follower motion (uniform, modified uniform, simple harmonic, parabolic, cycloidal), pressure angle, radius of curvature, synthesis of cam profile by graphical approach, cams with specified contours. Gear Trains: Simple, compound, epicyclic gear trains; determination of gear speeds using vector, analytical and tabular method; torque calculations in simple, compound and epicyclic gear trains.

Module V

Gyroscopic Action in Machines: Angular velocity and acceleration, gyroscopic torque/ couple, gyroscopic effect on naval ships, stability of two and four wheel vehicles, rigid disc at an angle fixed to a rotating shaft.

References:

1. Rattan SS; Theory of machines; TMH
2. Ambekar AG; Mechanism and Machine Theory; PHI.
3. Sharma CS; Purohit K; Theory of Mechanism and Machines; PHI.
4. Thomas Bevan; Theory of Machines; CBS PUB Delhi.
   Rao JS and Dukkipati; Mechanism and Machine Theory; NewAge Delhi.

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(AICTE Model Curriculum based scheme)

B. Tech. III SEM (AICTE) (Mechatronics Engineering)

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					
MT-403L	Machines Lab	-	-	-	30	20	50	-	-	2	1

List of experiments (expandable):

1. To study all inversions of four-bar mechanisms using models
2. Draw velocity and acceleration polygons of all moving link joints in slider crank mechanism
3. Determination of velocity and acceleration in above using method of graphical differentiation
4. To study working of differential gear mechanism.
5. To study working of sun and planet epicycle gear train mechanism using models
6. To plot fall and rise of the follower versus angular displacement of cam and vice versa.
7. Study of universal gyroscope
8. Analytical determination of velocity and acceleration in simple mechanism using Roven's M.

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B. Tech.IIIsem (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					
MT-404	Microcontroller Theory & Design	70	20	10	30	20	150	3	-	2	4

Module-I INTEL 8086 MICROPROCESSOR:
Introductionto16-bit microprocessors, 8086 pin functions Minimum and maximum mode operations. 8086 Architecture, register organization, addressing Modes, 8086 Memory banks and Memory organization, 8086 Instruction set and Assembly language programming.

Module-II I/O INTERFACING & MEMORY INTERFACING: Introduction to the interfacing chips 8255. Interfacing keyboards, printers, LEDS with Intel 8086 Microprocessor. Interfacing of 8254 programmable interval timer, 8259A Programmable interrupt controller & 8257 DMA controller with Intel 8086 Microprocessor. Interfacing of RAM and ROM with Intel 8086 Microprocessor. RS 232C standards, Interfacing of USART chip 8251 with Intel 8086 Microprocessor.

Module-III MICROCONTROLLERS: Introduction to micro controller 8051, its architecture, Register set, operational features, pin description, I/O configuration, interrupts, addressing modes, an overview of 8051instructionset, Various Microcontrollers: PIC, Atmega, ARM, AVR, Arduino

Module-IV APPLICATIONS OF MICROCONTROLLERS: Square wave generation using port pins of 8051, Square & Triangular Waveform generation using DAC, Water level controller, Temperature controller using ADC (0808/09), Stepper motor control for clockwise, anticlockwise rotation, Traffic light controller.

Module V IOT and Applications:

Introduction to Internet of Things; Sensors, Microcontrollers, and their Interfacing, Communication devices: LPWAN, LPPAN, Zigbee, Introduction to Raspberry Pi, Raspberry Pi as a gateway device.

BOOKS:

1. B.B.Brey (PHI), "The Intel Microprocessors, Architecture, Programming and Interfacing".
2. A Triebel & Avtar Singh(PHI),"The 8088 & 8086 Microprocessor".
3. D.Hall (Mc-Graw Hill), "Advanced Microprocessor and Interfacing".

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4. A.Pal (TME), "Microprocessors Principles & Applications".
5. A.P.Mathur (TMA),"Introduction to Microprocessors". Intel Corporation Microprocessors Data manuals.
6. Vibha Soni, "IOT for Beginners"-bpb publications.

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

CO1	Understand the Microprocessors and architecture
CO2	Aware of all the advancement in Processors
CO3	Aware with all interfaces and additional architecture.
CO4	Learn about Different types of Microcontrollers
CO5	Design of Industrial devices based on Application of Microcontrollers.

MT-404L Microcontroller Programming Lab

List of Experiments:

Programming of-

1. Byte multiplication.
2. Word multiplication
3. Packed BCD from ASCII
4. BCD multiplication
5. BCD division
6. BCD subtraction
7. Signed byte to word
8. Scan string for character
9. If then else implementation
10. BCD to hex (register parameter).
11. Application based programming.

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B. Tech. IV 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					
MT-405	Linear Control Theory	70	20	10	30	20	150	3	-	2	4

Module-I Basic Control System:
Introduction and Classification of control System, open and closed loop systems Linear Control System, Mathematical models of physical systems, Transfer function, Block Diagram Representation, Signal flow Graph, MIMO, Mason's gain formula, Linearization.

Module-II Error Analysis:
-Effects of Feedback on gain and time constant, pole location, bandwidth, Sensitivity, Disturbance signal, Control over System .Standard Test Signals, Time Response of 1st Order System, Design of Higher order system, Steady-State Errors and Error coefficients, error Constants, Effects of Additions of Poles and Zeros to Open Loop and Closed Loop System, Design Specification of Dynamic first and higher order system, Performance Indices.

Module-III Time Domain Stability Analysis:
Concept of Stability of Linear Systems, Effects of Location of Poles on Stability, Necessary Conditions for Stability, Routh-Hurwitz Stability Criteria, Relative Stability Analysis, Root Locus technique, Experimental determination of transfer function.
Frequency Domain Stability Analysis- Performance Specification in Frequency Domain, Co-relation between frequency Domain and Time Domain, Bode Plot, Minimum-Phase and Non-Minimum Phase System, Polar Plots, Inverse Polar Plot, Nyquist Stability Criterion, Assessment of Relative Stability (Phase Margin, Gain Margin and Stability), Constant-M and N Circle, Nichols Chart.

Module IV Compensators & Controllers:
PID control- Analytical design for PD, PI, PID control systems.
Design of compensators using Bode plots-Cascade lead compensation-Cascade lag compensation-Cascade lag-lead compensation.

Module V State Space Analysis:
State variable representation-Conversion of state variable models to transfer functions, Conversion of transfer functions to state variable models, Solution of state equations, Concepts of Controllability and Observability, Stability of linear systems-Equivalence between transfer function and state variable representations.

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Text Books:

1. Ziemer R.E., Tranter W.H. & Fannin D.R., "Signals and Systems", Pearson Education Asia
2 Ogata K., "Modern Control Engineering", Prentice Hall India
3. Nagarath I.J. & Gopal M., "Control System Engineering", Wiley Eastern Ltd.
4.Kuo B.C., "Digital Control Systems", Oxford University Press

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

CO1	Describe mathematical model of the electrical and mechanical systems and simplify complex systems using different graphical techniques in closed and open loop systems.
CO2	Apply time domain analysis and steady state response in control systems
CO3	Analyze Time Domain and frequency domain stability Techniques in control systems .
CO4	Design control systems with the desired phase and gain performance.
CO5	Demonstrate the concept of state, state variable and state model and apply this knowledge in steady state analysis and design of automation systems.

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B. Tech. IV semester(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 SemMst	Quiz, Assignment	End Sem	Lab Work					
MT-406L	CAD & Kinematics Simulation Lab	-	-	-	30	20	50	-	-	2	1

CAD & Kinematics Lab

List of Experiments:

1. Introduction to simulation tools
2. 2D sketcher exercises of simple machine components, solid modeling and assembly exercise of machine components like 6 axis robot, CPU fan, bench vice, screw jack etc...
3. Kinematic analysis of simple mechanisms like slider crank mechanism,
4. 4 bar mechanism, cam and follower mechanism.

References:

2. Gopal krishna K. R., Machine Drawing, Subhas Publications, Bangalore, 2002.
3. Bhat N.D., Machine Drawing, Charotar Publishing House, Anand, 2002.
4.Venugopal K., Engineering drawing and graphics + Auto CAD, New age International publishers, Delhi 2002.
5. Narayana K.L. and Kannaiah P, Text Book on Engineering drawing, Scitech Publications, Chennai 2002.
6. Sham Tickoo, CATIA – for Engineers and Designers, Dreamtech Press, New Delhi 2005

Course Outcomes

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B.Tech IV semester (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					
MT- 407	INDUSTRIAL TRAINING	-	-	-	30	20	50	-	-	2	1

INDUSTRIAL TRAINING

Students must undergo industrial training of minimum four weeks duration.

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