Jabalpur Engineering College, Jabalpur

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

(AICTE Model Curriculum Based Scheme)

Bachelor of Technology (B.Tech.) VII Semester (Civil Engg.)

w.e.f. July 2017-18 batch

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	CE701	PCC	Environmental Engg.-II	70	20	10	30	20	150	3	-	2	4
2	CE702	PCC	Structural Design & Drawing-III (RCC)	70	20	10	30	20	150	3	-	2	4
3	CE703	PCC	Non Destructive Testsing	70	20	10	30	20	150	3	-	2	4
4	CE704	PEC	Professional Elective Course-II	70	20	10	-	-	100	3	1	-	4
5	CE705	OEC	Open Elective Course-III	70	20	10	-	-	100	3	1	-	4
6	CE706	PI	Project-II (Problem Formulation & Design)	-	-	-	-	50	50	-	-	4	2
7	CE707	MC	Viva Industrial Training	-	-	-	30	20	50	-	-	2	1
8	CE708	DLC	Self-Learning Presentation (SWAYAM/NPTEL/MOOC)	-	-	-	-	-	-	-	-	-	-
			Total	**350**	**100**	**50**	**120**	**130**	**750**	**15**	**2**	**12**	**23**
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 CE708 for the award of Honours (Minor Specialization) maximum 8 credit can be earned.									

Note: Departmental BOS will decide list of three elective subjects for each PEC /OEC. Industrial training viva shall take place in VII Sem. which students have already done in VI Sem.

Professional Elective Course-II		
S.No.	**Subject Code**	**Subject Name**
1	CE704A	Advanced Water Resource Engineering
2	CE704B	Advanced Foundation Design
3	CE704C	Bridge Engineering

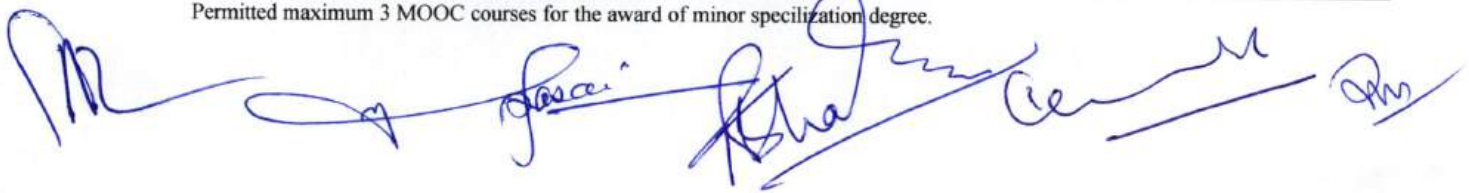
Open Elective Course-III		
S.No.	**Subject Code**	**Subject Name**
1	CE705A	Project Management
2	CE705B	Computational Methods in Structural Engineering
3	CE705C	Environmental Impact Assessment

PEC: Professional Elective (Branch Specific), OEC: Open Elective Course (Interdisciplinary), PCC: Professional Core Course, DLC/PI: Digital Learning Courses/Project and Internship, MC: Mandatory Courses

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

MOOC/DLC Courses	MOOC subjects shall be taken with permission of HOD/Coordinator

Permitted maximum 3 MOOC courses for the award of minor specilization degree.



Course	Subject Title	Subject Code	Category Code	Hours/week	Total Credits
B. Tech	Environmental Engg.-II	CE701	PCC	3-0-2	4

ENVIRONMENTAL ENGINEERING-II

Course Outcomes-

After the completion of this course student will be able to-

CO1	Apply matrices method (stiffness and flexibility matrices) for different structural elements
CO2	Examine the structures by stiffness matrices method for different loads including temperature, shrinkage, prestressing forces.
CO3	Modify the matrices in order to increase the efficiency for solving time taking computational problems by various methods
CO4	Analyze the continuum structures and two dimensional Isoperimetric elements using finite element concept

MODULE-I

Sewerage schemes and their importance, collection & conveyance of sewage, storm water quantity, fluctuation in sewage flow, flow through sewer, design of sewer, construction & maintenance of sewer, sewer appurtenances, pumps & pumping stations.

MODULE-II

Characteristics and analysis of waste water cycles of decomposition, physical, chemical & biological parameters. Oxygen demand i.e. BOD & COD, TOC, TOD, ThOD, Relative Stability, population equivalent, instrumentation involved in analysis, natural methods of waste water disposal i.e. by land treatment & by dilution, self-purification capacity of stream, oxygen sag analysis.

MODULE-III

Unit operations for waste water treatment, preliminary treatment such as screens, grit chamber, floatation tank, sedimentation and chemical clarification, role of micro-organism in biological treatment, Sewage filtration- theory & design.

MODULE-IV

Methods of Biological Treatment (Theory & Design) - Activated Sludge process, Oxidation ditch, stabilization ponds, aerated lagoon, anaerobic lagoons, septic tank & inhoff tank, sources & treatment of sludge, sludge thickening and digestion sludge drying beds, sludge disposal.

MODULE-V

Advanced Waste Water treatment - Diatomaceous earth filters, ultrafiltration, Adsorption by activated carbon, Phosphorus removal, Nitrogen removal, Physico-chemical waste water treatment, Solid waste disposal - classification, composition, collection, & disposal methods. Rural sanitation - collection & disposal of refuse, sullage & night soil.

Reference Books :-

l. Water Supply & Sanitary Engg. - G.S. Birdie - Dhanpat Rai Publishing Company,(P) Ltd. New Delhi

2. Waste Water Engg. by B.C. Punmia - Laxmi Publication (P) Ltd. New Delhi

3. Environmental Engg. - M.L. Davis & D.A. Cornwell - Mc Graw Hill Company

4. Chemisfy for Environmental Engg. - Sawyer & Mc Carty - Mc Graw Hill Book Company New Delhi

5. Water & Waste Water Technology - Mark J Hammer - Prentice - Hall of India, New Delhi

6. Waste Water Engineering - Metcalf & Eddy - Mc Graw Hill Book Company New Delhi

List of experiments:

1. To study the various standards for waste water.

2. To study the sampling techniques for waste water.

3. To determine the alkalinity in water sample.

4. To determine the acidity in water sample.

5. Determination of Dissolved Oxygen in the water and waste water sample.

6. Determination of Biological Oxygen demand of a waste water sample.

7. Determination of Chemical Oxygen demand of a waste water sample

8. Determination of various types of solids in the waste water sample

9. Determination of bacterial number by membrane filter Technique

10. Determination of bacterial colonies by standard plat count method

Course	Subject Title	Subject Code	Category Code	Hours/week	Total Credits
B. Tech	Structural Design & Drawing.-III (RCC)	CE702	PCC	3-0-2	4

STRUCTURAL DESIGN & DRAWING -III (RCC)

Course Outcomes-

After the completion of this course student will be able to-

CO1	Explain bracing elements, shearwall, sway/non-sway buildings, prestressing systems
CO2	Analyse slab bridges, prestressed concrete beams and slabs
CO3	Design multi storey building, retaining walls, overhead and underground water tank, silos and bunkers.

MODULE-I

Design of Multi-storey Buildings - Sway and non sway buildings, Shear walls and other bracing elements.

MODULE-II

Earth Retaining Structures: Cantilever and cowter fort types retaining walls.

MODULE-III

Water Tanks: Tanks on ground and underground tanks: Square, rectangular, circular tanks, Overhead tanks: square, rectangular, circular & intze tanks.

MODULE-IV

Silos and Bunkers

MODULE-V

T-beam & Slab bridges- for highway loading (IRC Loads). Prestessing concepts materials, systems of preshessing & losses Introduction to working & limit State Design.

Reference Books:

l. R.C.C. by O.P. Jain Vol. II

2. R.C.C. by B.C. Punmia

3. Essentials of Bridge engineering . D.J. Victor

4. Bridge Engineering - Ponnuswamy

5. Advanced R.C.C. Desigr by N.K. RAJU

6. N.Ikishna Raju, Prestessed Concrete, Tata Mc Graw Hill, New Delhi.

7. Pre stresses concrete . T.Y. Lin

List of experiments

1 .Design and drawing of multistory building.

2. Design and drawing of cantilever retaining walls.

3. Design and drawing of counter fort retaining wall.

4. Design and drawing of water tanks resting on ground.

5. Design and drawing of underground water tank.

6. Design and drawing of overhead water tanks.

7. Design and drawing of silor.

8. Design and drawing of bunkers.

9. Design and drawing of RCC slab for highway loading

Course	Subject Title	Subject Code	Category Code	Hours/week	Total Credits
B.Tech	Non Destructive Testing	CE703	PCC	3-0-2	4

NON DESTRUCTIVE TESTING

Course Outcomes-

After the completion of this course student will be able to-

CO1	Differentiate between destructive and non-destructive testing
CO2	Illustrate types of defects in structural element
CO3	Asses the quality of concrete structures by using various NDT methods

MODULE – I

Fundamentals of and introduction to destructive and non-destructive testing. Scope and limitations of NDT, Visual examination methods, Different visual examination aids.

MODULE – II

Dye penetrant Testing/ liquid penetrant testing: Principle, procedure, characteristics of penetrant, types of penetrants, penetrant testing materials, fluorescent penetrant testing method– sensitivity, application and limitations

MODULE – III

Magnetic Particle Testing: Important terminologies related to magnetic properties of material, principle, magnetizing technique, procedure, equipment, fluorescent magnetic particle testing method, sensitivity, application and limitations

MODULE –IV

Radiographic testing: X-ray and Gamma-Ray radiography, Their principles, methods of generation, Industrial radiography techniques, inspection techniques, applications, limitations, Types of films, screens and penetrameters. Interpretation of radiographs, Safety in industrial radiography

MODULE – V

Leak and pressure testing: Definition of leak and types, Principle, Various methods of pressure and leak testing, Application and limitation Eddy current testing: Principle, instrument , techniques, sensitivity, application, limitation Thermal methods of NDT

Reference Books :-

1. Baldev Raj, T.Jayakumar, M.Thavasimuthu "Practical Non-Destructive Testing", Narosa Publishing House, 2009.
2. Ravi Prakash, "Non-Destructive Testing Techniques", 1st revised edition, New Age International Publishers, 2010

List of experiments:

1. Determine the compressive strength of slabs, beams, columns using Schmidt Hammer
2. Determine the compressive strength of rigid pavement using Schmidt Hammer
3. Determine the quality of concrete beams, columns Ultrasonic Pulse Velocity method
4. Determine the quality of concrete slabs and rigid pavement Ultrasonic Pulse Velocity method
5. Determine the crack length in concrete by Ultrasonic Pulse Velocity method.

Course	Subject Title	Subject Code	Category Code	Hours/week	Total Credits
B. Tech	Advanced Water Resource Engineering	CE704A	PEC	3-1-0	4

ADVANCED WATER RESOURCE ENGINEERING

Course Outcomes-

After the completion of this course student will be able to-

CO1	Calculate the forces acting on gravity dam and stability analysis of hydraulic structures.
CO2	Determine the rate of seepage using flow-net
CO3	Design various types of spillways, energy dissipaters and canal regulating structures.
CO4	Explain the functioning & elements of hydropower plants.

MODULE -I Gravity dams

Design Criteria, forces acting on gravity dams, elementary profiie, low and high gravity dams, stability analysis, evaluation of profile by method of zoining, practical profile, foundation treatment, construction joints, galleries in gravity dams.

MODULE - II Earth and Rock fill dams

Earth Dams : Types, causes of failure and design criteria, soils suitable for earth dam construction, construction methods, foundation requirements, typical earth dam sections, estimation of seepage through and below the dam, seepage control, stability of slopes by slip circle method of analysis, pore presswes, sudden draw down, steady seepage and construction pore pressure condition.

MODULE - III Spillways

Spillways : Various Types of Spillways, Ogee spillway and its design details of siphon shaft, chute and side channel spillways, emergency spillways.

MODULE - IV

Energry dissipation and gates : Principles of energy dissipation, Energy dissipaters based on tail water rating curve and jump height curves spillway crest gates - vertical lift and radial gates, their design principles and details. Design of canal regulating structutes, detailed design of sarda type canal fall. Types of cross drainage works - Aqueduct siphon aqueduct, super passage, level crossing & inlet & outlets.

MODULE - V

Hydropower Plants : Introduction of Hydropower development, assessment of power potential, types of hydropower plants, general features of hydro-electric schemes, selection of turbines, draft fubes, surge tanks, penstocks, power house dimensions, development of micro hydel stations, tidal plants, pumped storage plants and their details.

Reference Books :-

1. Engineering for Dams (Volumes I,II&ID by Creager. Justin & Hinds
2. Hydroelectric Hand Book by Creager.

Course	Subject Title	Subject Code	Category Code	Hours/week	Total Credits
B. Tech	Advanced Foundation Engineering	CE704B	PEC	3-1-0	4

ADVANCED FOUNDATION ENGINEERING

Course Outcomes-

After the completion of this course student will be able to-

CO1	Investigate the soil properties by modern investigation methods
CO2	Calculate bearing capacity and settlement of shallow and deep foundation
CO3	Determine the slope stability using various methods
CO4	Analyze the properties of expansive soil for foundation construction.

MODULE -I

Modern methods of soil investigations, Geophysical methods; soil resistivity methods seismic refraction method, stress below ground due to loads.

MODULE -II

Bearing capacity and settlement analysis of shallow foundations: Meyerhof and Hansen's bearing capacity equations, BIS bearing capacity equation, immediate and consolidation settlements in cohesive soil, De-Beer and Schmmertman's methods of settlement prediction in non-cohesive soil.

MODULE -III

Classification of piles, load carrying capacity of single piles in clay, silt and sand by dynamic and static methods, Pile load test, Pile group, Negative skin friction, Settlement of pile group.

MODULE – IV

Foundation on expansive soil, Construction on expansive soil, Alteration of soil condition, under-reamed piles. Elements of well foundation, Shape, Depth of scour, well sinking, Tilt, shift and their prevention.

MODULE -V

Stability of slopes, Limit equilibrium method, Method of slices, Simplified Bishop method, Stability Charts. Soil behavior under dynamic loads, Machine foundation: classification, definitions, design principle in brief, Barken's method.

Reference Books :-

1. J. E. Bowles – Analysis and Design of Foundation.
2. V. N. S. Murthy – Soil Mechanics and Foundation Engineering.
3. K. R. Arora – Soil Mechanics & Foundation Engineering.
4. Alam Singh – Modern Geotechnical Engineering.
5. GopalRanjan and A. S. R. Rao – Basic and Applied Soil Mechanics
6. B. M. Das – Foundation Engineering, CENGAGE Learning.

Course	Subject Title	Subject Code	Category Code	Hours/week	Total Credits
B. Tech	Bridge Engineering	CE704C	PEC	3-1-0	4

BRIDGE ENGINEERING

Course Outcomes-

After the completion of this course student will be able to-

CO1	Explain the design procedure of girders and bridges by using various theories
CO2	Calculate various kinds of loads on a bridge
CO3	Design slab, girder, truss and cantilever steel bridges

MODULE - I

Standard Specifications and Code of practice for general requirements of Road Bridges. Design loads for Bridges, IRC loading Standards, Traction Forces and Temperature Effect. General Design requirements. Economic Span of Bridge. Various Types of Bridges.

MODULE - II

Design of Solid Slab and Girder Slab Bridges, Courbon's Theory and Pigeaud' Theory for design of Girders and Slabs.

MODULE - III

Design of Balanced Cantilever Bridges. Design of Cantilever section, Suspended Span and Articulations.

MODULE - IV

Design of Supporting Structures, Piers and Abutments, Solid and Hollow Piers. Single Cellular and Multi Cellular Piers, Design of Bearings. Introduction of Continuous and Arch Bridges.

MODULE - V

Steel Bridges subjected to Railway Loading, Truss Bridges, Girder Bridges, Design of Rocker and Roller Bearing.

Reference Books :-

1. D. Johnson Victor, *Essentials of Bridge Engineering.*
2. Aswani M.G., Vazirani V.N., Ratwani M.M., *Design of Concrete Bridges.*
3. Ratwani M.M., *Steel Structures Vol. III.*
4. Ponnuswamy S., *Bridge Engineering.*

Course	Subject Title	Subject Code	Category Code	Hours/week	Total Credits
B. Tech	Project Management	CE705A	OEC	3-1-0	4

PROJECT MANAGEMENT

Course Outcomes-

After the completion of this course student will be able to-

CO1	Illustrate formwork, job layout, construction equipments, various types of contracts, various specification of engineering work, assignment models, functional organization
CO2	Analyse a construction project by forming a network/bar chart
CO3	Draft a tender for a constructional project and measurement of a work

MODULE-I

Preliminary and detailed investigation method: Methods of construction, formwork and centering, Schedule of construction, Job layout, Principles of construction management, Modern management techniques like CPM/PERT with network analysis

MODULE-II

Construction Equipments: Factors affecting selection, Investment and operating cost, Output of various equipments, Brief study of equipments required for various jobs i.e. Earthwork, Dredging, Conveyance, Concreting, Hoisting, Pile driving, Compaction and Grouting

MODULE-III

Contracts: Different types of controls, Notice inviting tenders, Contract document, Departmental method of construction, Rate list, Security deposit and Earnest money, Conditions of contract, Arbitration, Administrative approval, Technical sanction

MODULE-IV

Specifications & Public Works Accounts: Importance, Types of specifications, Specifications for various trades of engineering works, Various forms used in construction works, Measurement book, Cash book, Materials at site account, Imprest account, Tools and plants, Various types of running bills, Secured advance, Final bill

MODULE-V

Site Organization & Systems Approach to Planning: Accommodation of site staff, contractor's staff, Various organization charts and manuals, Personnel in construction, Welfare facilities, Labour laws and human relations, Safety engineering, Problem of equipment management, Assignment model, Transportation model and Waiting line modals with their applications, Shovel truck performance with waiting line method

Reference Books:-

1. Construction Equipment by Peurify
2. CPM by L.S. Srinath
3. Construction Management by S.Seetharaman
4. CPM & PERT by Weist & Levy
5. Construction, Management & Accounts by Harpal Singh
6. Tendering & Contracts by T.A. Talpasai.

Course	Subject Title	Subject Code	Category Code	Hours/week	Total Credits
B. Tech	Computational Methods in Structural Engineering	CE705B	OEC	3-1-0	4

COMPUTATIONAL METHODS IN STRUCTURAL ENGINEERING

Course Outcomes-

After the completion of this course student will be able to-

CO1	Apply matrices method (stiffness and flexibility matrices) for different structural elements
CO2	Examine the structures by stiffness matrices method for different loads including temperature, shrinkage, prestressing forces.
CO3	Modify the matrices in order to increase the efficiency for solving time taking computational problems by various methods
CO4	Analyze the continuum structures and two dimensional Isoperimetric elements using finite element concept

MODULE - I

Matrix formulation for the principle of virtual work and energy principles, principle of contragradience, stiffness and flexibility matrices, Degree of Freedom. Axial, bending, shear and torsional deformations.

Local and Global Element stiffness matrices for bar, beam, shaft, grid, shear wall, beam column, beam with rigid ends, beam on elastic foundation and elements with special boundary conditions. Non-prismatic and curved elements, forces and displacements in general coordinate axes, structure stiffness matrix.

MODULE - II

Basics of the Direct Stiffness method - Analysis of pin-jointed frames, rigid jointed structures, plane grids and composite structures for different loads including temperature, shrinkage, prestressing forces. Elastic stability analysis of 2-D rigid jointed frames, (Sway & Non-sway)

MODULE - III

Concepts of Bandwidth, various storage schemes & equation solvers; Reduction in order of stiffness matrix - use of substructures, static condensation method, Exploiting symmetry, skew symmetry and cyclic symmetry in structures, Imposition of Constraints – Lagrange Multiplier and Penalty Methods.

MODULE - IV

Analysis of continuum structures - Fundamental equations of theory of elasticity (2D), basic concepts of Finite Element Analysis, derivation of generalized element stiffness matrix and load vectors, convergence requirements, stiffness matrices for various elements using shape functions, Triangular and Rectangular elements. (PSPS)

MODULE - V

Two Dimensional Isoparametric elements, shape functions for Simplex. Lagrangian and Serendipity family elements in natural coordinates, computation of stiffness matrix for isoparametric elements, degrading of elements, plate bending elements.

Reference Books:-

1. Ghali A & Neville M., Structural Analysis - A Unified Classical and Matrix Approach,

Chapman and Hall, New York.

2. Weaver William & Gere James M., Matrix Analysis of Framed structures, CBS Publishersand Distributors, New Delhi.

3. Cook R.D., Concepts and Applications of Finite Element Analysis, Wiley, New York.

4. Gallagher R., Finite Element Analysis Fundamentals, Prentice-Hall, Englewood Cliffs, NJ.

5. Rubenstein M.F., Matrix Computer Analysis of structures, Prentice Hall, Englewood Cliffs, N.J.

6. Zeinkiewicz O.C & Taylor R.L., The Finite Element Method, McGraw Hill, London

Course	Subject Title	Subject Code	Category Code	Hours/week	Total Credits
B. Tech	Environmental Impact Assessment	CE705C	OEC	3-1-0	4

ENVIRONMENTAL IMPACT ASSESSMENT

Course Outcomes-

After the completion of this course student will be able to-

CO1	Explain the significance of environment impact assessment
CO2	Identify the environmental impact using various methods
CO3	Assess the impact of various environmental agencies and summarize EIA report
CO4	Demonstrate role of public in environmental decision making.

MODULE-I

Concept of EIA: Introduction of EIA, Utility and scope of EIA, Significant Environmental Impacts, Stage of EIA, Environmental Inventory, Environmental Impact Statement (EIS)

MODULE-II

Methods of Impact Identification: Environmental Indices and indicators for describing the affected environment, matrix methodologies, network, checklist, and other method.

MODULE-III

Impact analysis: Framework, statement predication and assessment of impact of air, water, noise and socio-economic environment.

MODULE-IV

Preparation of written documentation: Initial planning phase, detailed planning phase, writing phase, organizing relevant information, co-ordination of team writing effort.

MODULE-V

Public Participation in Environmental Decision making: Basic definitions, Regulatory requirements, Advantages & disadvantages of Public Participation, Selection of Public participation techniques, Practical considerations for implementation.

Reference Books:-

1. A. K. Srivastav, Environment Impact Assessment, APH Publishing.
2. John Glasson, Riki Therivel & S. Andrew Chadwick " Introduction to EIA" University College London Press Limited.
3. Larry W Canter, " Environment Impact Assessment", McGraw Hill Inc., New York.
4. Ministry of Environment & Forests, Govt. of India 2006 EIA Notification.
5. Rau G J and Wooten C. D, " EIA Analysis Hand Book" McGraw Hill.

Jabalpur Engineering College, Jabalpur

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

(AICTE Model Curriculum Based Scheme)

Bachelor of Technology (B.Tech.) VII Semester (Computer Science & Engg.)

w.e.f. July 2017-18 batch

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	CS701	PCC	Computer Vision	70	20	10	30	20	150	3	-	2	4
2	CS702	PCC	Compiler Design	70	20	10	30	20	150	3	-	2	4
3	CS703	PCC	Cryptography & Network Secuirty	70	20	10	30	20	150	3	-	2	4
4	CS704	PEC	Professional Elective Course-II	70	20	10	-	-	100	3	1	-	4
5	CS705	OEC	Open Elective Course-III	70	20	10	-	-	100	3	1	-	4
6	CS706	PI	Project-II (Problem Formulation & Design)	-	-	-	-	50	50	-	-	4	2
7	CS707	MC	Viva Industrial Training	-	-	-	30	20	50	-	-	2	1
8	CS708	DLC	Self-Learning Presentation (SWAYAM/NPTEL/MOOC)	-	-	-	-	-	-	-	-	-	-
Total				**350**	**100**	**50**	**120**	**130**	**750**	**15**	**2**	**12**	**23**
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 CS708 for the award of Honours (Minor Specialization) maximum 8 credit can be earned.									

Note: Departmental BOS will decide list of three elective subjects for each PEC /OEC. Industrial training viva shall take place in VII Sem. which students have already done in VI Sem.

Professional Elective Course-II		
S.No.	**Subject Code**	**Subject Name**
1	CS704A	Information Retrieval
2	CS704B	Natural Language Processing
3	CS704C	Data Centre Management

Open Elective Course-III		
S.No.	**Subject Code**	**Subject Name**
1	CS705A	Computational Intelligence
2	CS705B	Optimization Techniques
3	CS705C	Internet of Things

PEC: Professional Elective (Branch Specific), OEC: Open Elective Course (Interdisciplinary), PCC: Professional Core Course, DLC/PI: Digital Learning Courses/Project and Internship, MC: Mandatory Courses

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

MOOC/DLC Courses	MOOC subjects shall be taken with permission of HOD/Coordinator

Permitted maximum 3 MOOC courses for the award of minor specilization degree.

Jabalpur Engineering College, Jabalpur
(AICTE Model Curriculum based scheme)
B. Tech. (AICTE) VII Sem. (Computer Science & Engineering)

Subject code	Subject Name & Title	Maximum Marks Allotted						Hours/Week			Total Credits
		Theory			Practical			L	T	P	
		End Sem	Mid Sem Exam	Quiz, Assignment	End Sem	Lab Work	Total Marks				
CS701	Computer Vision	70	20	10	30	20	150	3	-	2	4

Module-I:Introduction to Computer Vision: Introduction to computer vision, Human visual system, Camera models, Image Formation and understanding, pixel and color transform, Image processing in computer vision, Application of computer vision. Image processing in computer vision: Spatial filtering operations, histogram operations, thresholding techniques, edge detection techniques, corner and interest points, 3D image processing.

Module-II: Feature Detection and Matching: Introduction to Feature Representation, Feature descriptors, GLCM, SIFT, and DWT. Image Matching, Feature distances, Accuracy Measurements (Precision, Recall, Sensitivity and Specificity) and Cross Validation Models, feature dimensionality reduction, principal component analysis.

Module-III: Shape and Region Analysis: Binary shape analysis, connectedness, object labeling and counting, size filtering, skeletons and thinning, deformable shape analysis, boundary tracking procedures, shape models and shape recognition, boundary length measures, boundary descriptors, chain codes, Fourier descriptors, region descriptors.

Module-IV: Image Classification: Introduction to Classification and learning techniques, Classification: Discriminant Function, Supervised, Un-supervised, Semi-supervised; Classifiers: Bayes, KNN, ANN models. Introduction to 3D vision and motion, camera model, camera calibration, epipolar geometry. Motion Analysis: Background Subtraction and Modeling, Optical Flow, KLT, Spatio-Temporal Analysis, Dynamic Stereo; Motion parameter estimation.

Module-V: Application and Research in Computer Vision: Object Recognition, Photo album, Face detection, Face recognition, Eigen faces, foreground-background separation, Medical image analysis, Security and Surveillance (Activity Recognition, Biometrics etc.), Document processing, image fusion, Super-resolution, Augmented Reality, Introduction to Deep learning in computer vision.

Suggested Books:

1. E. R. Davies, "Computer & Machine Vision", Fourth Edition, Academic Press.
2. R. Szeliski, "Computer Vision: Algorithms and Applications", Springer.
3. Simon J. D. Prince, "Computer Vision: Models, Learning, and Inference", Cambridge University Press.
4. Mark Nixon and Alberto S. Aquado, "Feature Extraction & Image Processing for Computer Vision", Third Edition, Academic Press.
5. D. L. Baggio et al., "Mastering OpenCV with Practical Computer Vision Projects", Packt Publishing.
6. Jan Erik Solem, "Programming Computer Vision with Python: Tools and algorithms for analyzing images", O'Reilly Media.

CS701 (Computer Vision)

Upon completion of the course, the students will be able to

CO1: Implement fundamental image processing techniques required for computer vision.
CO2: Perform shape analysis.
CO3: Implement boundary tracking techniques.
CO4: Apply chain codes and other region descriptors.
CO5 Design a content-based image retrieval system and develop applications using computer vision techniques.

Jabalpur Engineering College, Jabalpur
(AICTE Model Curriculum based scheme)
B. Tech. (AICTE) VII Sem. (Computer Science & Engineering)

Subject code	Subject Name & Title	Maximum Marks Allotted						Hours/Week			Total Credits
		Theory			Practical			L	T	P	
		End Sem	Mid Sem Exam	Quiz, Assignment	End Sem	Lab Work	Total Marks				
CS702	Compiler Design	70	20	10	30	20	150	3	-	2	4

Module-I: Introduction: Compilers and Translators; The phases of the compiler – Lexical Analysis, Syntax Analysis, Intermediate Code Generation, Optimization, Code generation, Bookkeeping, Error handling.

Module-II: Lexical Analysis: The role of the lexical analyzer, Tokens, Patterns, Lexemes, Input buffering, Specifications of a token, Recognition of a tokens, Finite automata: Regular expressions, NFA, DFA.Design of a lexical analyzer generator.

Module-III: Syntax Analysis: The role of a parser, Context free grammars, Writing a grammar, Top down Parsing: Recursive decent parser, Predictive parser, Bottom up Parsing: Handles, Viable prefixes, Operator precedence parsing, LR parsers: SLR, LALR, CLR. Parser generator (YACC).Error Recovery techniques for different parsers. **Syntax directed translation:** Syntax directed definitions, Synthesized and inherited attributes, Construction of syntax trees.

Module-IV: Run time environments: Source language issues (Activation trees, Control stack, scope of declaration, binding of names), Storage organization (Subdivision of run-time memory, Activation records), Storage allocation strategies, Symbol tables: storage, data structures used.

Module-V: Intermediate code generation: Intermediate languages, Graphical representation, Three-address code, Implementation of three address statements (Quadruples, Triples, Indirect triples). **Code optimization and code generation:** Introduction, Basic blocks & flow graphs, DAG, principle sources of optimization: loop optimization, eliminating induction variable, eliminating common sub-expression, loop unrolling, loop jamming etc. Peephole optimization, Issues in the design of code generator, a simple code generator, Register allocation & assignment.

Suggested Book:

1. Michael T. Simpson, Kent Backman, James E. "Corley, Hands-On Ethical Hacking and Network Defense", Second Edition, CENGAGE Learning.
2. 1. Alfred V. Aho, Monica S. Lam, Ravi Sethi, Jeffrey D. Ullman, Compilers: Principles, Techniques and Toolsl, Second Edition, Pearson Education
3. Randy Allen, Ken Kennedy, Optimizing Compilers for Modern Architectures: A Dependence based Approach, Morgan Kaufmann Publishers.
4. Steven S. Muchnick, Advanced Compiler Design and Implementationl, Morgan Kaufmann Publishers Elsevier Science, India, Indian Reprint.
5. Keith D Cooper and Linda Torczon, Engineering aCompiler, Morgan Kaufmann Publishers Elsevier Science, 2004.
6. V. Raghavan, Principles of Compiler Design, TataMcGraw Hill Education Publishers.

CS702 (Compiler Design)

Upon completion of the course, the students will be able to

CO1: Understand fundamentals of the compiler and identify the relationships among different phases of the compiler.

CO2: Understand the application of finite state machines, recursive descent, production rules, parsing, and language semantics.

CO3: Analyze& implement required optimizations modules and apply for various optimization techniques for dataflow analysis.

CO4: Use modern tools and technologies for designing new compilers.

Jabalpur Engineering College, Jabalpur
(AICTE Model Curriculum based scheme)
B. Tech. (AICTE) VII Sem. (Computer Science & Engineering)

Subject code	Subject Name & Title	Maximum Marks Allotted						Hours/Week			Total Credits
		Theory			Practical			L	T	P	
		End Sem	Mid Sem Exam	Quiz, Assignment	End Sem	Lab Work	Total Marks				
CS703	Cryptography & Network Security	70	20	10	30	20	150	3	-	2	4

Module-I: Overview: Services, Mechanisms and attacks, OSI security architecture, Model for network security. Classical Encryption Techniques: Symmetric cipher model, Substitution techniques, Transposition techniques, Steganography, Problems. Block Ciphers and DES (Data Encryption Standards): Simplified DES, Block cipher principles, DES, Strength of DES, Block cipher design principles, Block cipher modes of operation, Problems.

Module-II: Public Key Cryptography and RSA: Principles of public key crypto systems, RSA algorithm, Problems. Other Public Key Crypto Systems and Key Management: Key management, Diffie-Hellman key exchange, Elliptic curve arithmetic, Elliptic curve cryptography, Problems. Message Authentication and Hash Functions: Authentication requirements, Authentication functions, Message authentication codes, Hash functions, Security of hash functions and MAC, Problems.

Module-III: Digital Signature and Authentication Protocol: Digital signature, Authentication protocols, Digital signature standard. Authentication Applications: Kerberos, X.509 authentication service, Kerberos encryption technique, Problems.

Module-IV: Electronic Mail Security: Pretty good privacy, S/MIME, Data compression using ZIP, Radix-64 conversion, PGP random number generator. IP Security: Overview, IP security architecture, Authentication header, ESP (encapsulating security pay load), Security associations, Key management, Problems.). Firewalls: Firewall design principles; Trusted systems, Problems.

Module-V: Intruders and Viruses: Intruders, Viruses, Worms, Trojan horses, Distributed Denial-Of-Service (DDoS), Firewalls, IDS, Honey nets, Honey pots.

Suggested Books:

1. William Stallings, Cryptography and Network Security, 6th Edition, Pearson Education.
2. B. Forouzan, "Cryptography & Network Security", Tata McGraw-Hill.
3. AtulKahate, "Cryptography and Network Security," Tata McGraw-Hill.
4. Charlie Kaufman, Radia Perlman and Mike Speciner, "Network Security", Prentice Hall of India.
5. Eric Maiwald, "Fundamentals of Network Security," McGraw-Hill.

CS703 (Cryptography & Network Security)

Upon completion of the course, the students will be able to

CO1: Understanding of the basics of network security and cryptographic techniques.
CO2: Illustrate various Public key cryptographic techniques.
CO3: Evaluate the authentication and hash algorithms.
CO4: Discuss Digital Signature & authentication protocols.
CO5: Summarize the intrusion detection and its solutions to overcome the attacks.

Jabalpur Engineering College, Jabalpur
(AICTE Model Curriculum based scheme)
B. Tech. (AICTE) VII Sem. (Computer Science & Engineering)

Subject code	Subject Name & Title	Maximum Marks Allotted						Hours/Week			Total Credits
		Theory			Practical			L	T	P	
		End Sem	Mid Sem Exam	Quiz, Assignment	End Sem	Lab Work	Total Marks				
CS704A	Information Retrieval	70	20	10	-	-	100	3	1	-	4

Module-I:INTRODUCTION: Introduction, History of IR, Components of IR, Issues, Open source Search engine Frameworks, The impact of the web on IR, The role of artificial intelligence (AI) in IR, IR Versus Web Search, Components of a Search engine, Characterizing the web.

Module-II:INFORMATION RETRIEVAL: Boolean and vector space retrieval models, Term weighting, TF-IDF, weighting- cosine similarity, Preprocessing, Inverted indices, efficient processing with sparse vectors, Language Model based IR, Probabilistic IR, Latent Semantic Indexing - Relevance feedback and query expansion.

Module-III:WEB SEARCH ENGINE – INTRODUCTION AND CRAWLING:
Web search overview, web structure, paid placement, search engine optimization/ spam. Web size measurement, search engine optimization/spam, Web Search Architectures, crawling, meta-crawlers, Focused Crawling, web indexes, Near-duplicate detection, Index Compression, XML retrieval.

Module-IV:WEB SEARCH – LINK ANALYSIS AND SPECIALIZED SEARCH: Link Analysis, hubs and authorities, Page Rank and HITS algorithms, Searching and Ranking, Relevance Scoring and ranking for Web, Similarity, Hadoop & Map Reduce Evaluation, Personalized search, Collaborative filtering and content-based recommendation of documents and products, handling "invisible" Web, Snippet generation, Summarization, Question Answering, Cross-Lingual Retrieval.

Module-V: DOCUMENT TEXT MINING: Information filtering; organization and relevance feedback, Text Mining, Text classification and clustering, Categorization algorithms: naive Bayes; decision trees; and nearest neighbour, Clustering algorithms: agglomerative clustering; k-means; expectation maximization (EM).

Suggested Books:

1. C. Manning, P. Raghavan, and H. Schütze, Introduction to Information Retrieval , Cambridge University Press.
2. Ricardo Baeza -Yates and Berthier Ribeiro - Neto, Modern Information Retrieval: The Concepts and Technology behind Search 2nd Edition, ACM Press Books.
3. Bruce Croft, Donald Metzler and Trevor Strohman, Search Engines: Information Retrieval in Practice, 1st Edition Addison Wesley.
4. Mark Levene, An Introduction to Search Engines and Web Navigation, 2nd Edition Wiley.

CS704A (Information Retrieval)

Upon completion of the course, students will be able to

CO1: Apply information retrieval models.
CO2: Design Web Search Engine.
CO3: Use Link Analysis.
CO4: Use Hadoop and Map Reduce.
CO5: Apply document text mining techniques.

Jabalpur Engineering College, Jabalpur
(AICTE Model Curriculum based scheme)
B. Tech. (AICTE) VII Sem. (Computer Science & Engineering)

Subject code	Subject Name & Title	Maximum Marks Allotted						Hours/Week			Total Credits
		Theory			Practical			L	T	P	
		End Sem	Mid Sem Exam	Quiz, Assignment	End Sem	Lab Work	Total Marks				
CS704B	Natural Language Processing	70	20	10	-	-	100	3	1	-	4

Module-1:Introduction: Origins and challenges of NLP, Language Modelling: Grammar-based LM, Statistical LM, Regular Expressions, Finite-State Automata – English Morphology, Transducers for lexicon and rules, Tokenization, Detecting and Correcting Spelling Errors, Minimum Edit Distance

Module-II:Word Level Analysis: Unsmoothed N-grams, Evaluating N-grams, Smoothing, Interpolation and Backoff, Words and Vectors Cosine for measuring similarity TF-IDF: Weighing terms in the vector, Applications of the tf-idf vector model – Word Classes, Part-of-Speech (POS) Tagging, The Penn Treebank POS Tagset, Rule-based, Stochastic and Transformation-based tagging, Issues in POS tagging – Hidden Markov and Maximum Entropy models.

Module-III: Syntactic Analysis: Context-Free Grammars, Grammar rules for English, Treebanks, Syntactic Parsing, Ambiguity, Dynamic Programming parsing – Shallow parsing – Probabilistic CFG, Probabilistic CYK, Dependency Parsing – Dependency Relation, Transition-based dependency parsing, Graph-based dependency parsing.

Module-IV: Semantics and Pragmatics: Logical representation of sentence meaning - First-Order Logic, Event State Representation, Description Logics; Word Sense Disambiguation; Semantic Role Labelling; Co-reference Resolution.

Module-V: Application of NLP: Sentiment Analysis, Information Retrieval, Question Answering System, Dialog System and Chatbots, Machine translation, Document or Text Summarization.

Suggested Books:

1. Daniel Jurafsky, James H. Martin—Speech and Language Processing: An Introduction to Natural Language Processing, Computational Linguistics and Speech, Pearson Publication.
2. Steven Bird, Ewan Klein and Edward Loper, —Natural Language Processing with Python, First Edition, OReilly Media.
3. Breck Baldwin, —Language Processing with Java and LingPipe Cookbook, Atlantic Publisher.
4. Richard M Reese, —Natural Language Processing with Java, OReilly Media.
5. Nitin Indurkhya and Fred J. Damerau, —Handbook of Natural Language Processing, Second Edition, Chapman and Hall/CRC Press.
6. Tanveer Siddiqui, U.S. Tiwary, —Natural Language Processing and Information Retrieval, Oxford University Press.

CS704B (Natural Language Processing)

Upon completion of the course, the students will be able to

CO1: Tag a given text with basic Language features.

CO2: Design an innovative application using NLP components.

CO3: Implement a rule based system to tackle morphology/syntax of a language.

CO4: Design a tag set to be used for statistical processing for real-time applications.

CO5: Compare and contrast the use of different statistical approaches for different types of NLP applications.

Jabalpur Engineering College, Jabalpur
(AICTE Model Curriculum based scheme)
B. Tech. (AICTE) VII Sem. (Computer Science & Engineering)

Subject code	Subject Name & Title	Maximum Marks Allotted						Hours/Week			Total Credits
		Theory			Practical			L	T	P	
		End Sem	Mid Sem Exam	Quiz, Assignment	End Sem	Lab Work	Total Marks				
CS704C	Data Center Management	70	20	10	-	-	100	3	1	-	4

Module-I: Introduction to Data Center: History of data centre, Role of data center in digitalization, Carbon footprints of data center, Energy Optimization in data center, Policies resulting into need of localization (Data centers to be hosted in the Country), Design for: flexibility, scalability, environmental control, network infrastructure, modern data centers, high availability and service oriented Infrastructure(SOI).

Module-II: Data Center Architectures: Network connectivity optimization evolution: Top of rack (ToR), end of row (EOR), solutions that reduce power and cabling. Data Centre standards; TIA/EIA-42, Structured cabling standards, fiber and. and copper cabling characteristics, cable management, bandwidth requirements, I/o connectivity.

Module-III: Server Architectures: Stand-alone, blades. Stateless. Clustering. Scaling. Optimization. Virtualization. Limitation of traditional server deployments; modern solutions. Applications; database. Finance etc. Redundant Layer 2 and Layer 3 designs. Case studies

Module-IV: Enterprise-Level Virtualization: Provision, monitoring and management of a virtual data center and virtual machines through software management interfaces; Networking and Storage in enterprise Virtualized Environments - Connectivity to storage area and Ip networks from within virtualized environments using industry standard protocols. Virtual machine deployment, modification, management; monitoring and migration methodologies.

Module-V: Resource Management and Monitoring: Physical and virtual machine memory, CPU management and abstraction techniques using a Hypervisor, DNS, LDAP, Load balancing, Terminology, Advantages, Types of load balancing, Implementing a Network with Load-Balancing Switches. Case Studies: Linux (Kali/Fedora), Network Simulators. VM Ware Workstation.

Suggested Books:

1. Administering Data centers: servers, Storage and voice over IP, Kailas Jayaswal.
2. IT Virtualization Best Practices: A Lean, Green Virtualized Data Center Approach by Mickey Iqbal (Author), Mithkal Smadi (Author), Chris Molloy (Author), Jim Rymarczyk MC Press [ISBN: 978-15 8347-3542).
3. VMware vSphere 4 Administration Instant Reference by Jason W' McCarty, Scott Lowe. Matthew K. Johnson, sybex I edition [ISBN-13: 978-0470520727].
4. VCP VMware Certified Professional on vSphere 4 Study Guide by Brian Perry, Chris Huss, Jeantet Fietds Sybex; I edition, ISBN-13: 978-0470569610.
5. Microsoft Virtualization with Hyper-v by Jason Kappel, Anthony Velte, Toby velte (Network Professional's Library), McGraw-Hill Education; 1 edition [ISBN-13: 978-0071614030].
6. Data Center Handbook by Hwaiyu Geng, Wiley; 1 edition, [ISBN-13: 978-1118436639].

CS704C (Data Center Management)

Upon completion of the course, the students will be able to

CO1: Explain data Centre, carbon footprint of data center, energy optimization and understand Virtual data Centre, enterprise virtual environment and virtual machine deployments.

CO2: Evaluate load balancing, virtual memory management and resource monitoring.

CO3: Examine various server architecture, blade, stand-alone, stateless architectures, data Centre standards.

CO4: Create a basic plan for establishing virtual data Centre and virtual machines.

Jabalpur Engineering College, Jabalpur
(AICTE Model Curriculum based scheme)
B. Tech. (AICTE) VII Sem. (Computer Science & Engineering)

Subject code	Subject Name & Title	Maximum Marks Allotted						Hours/Week			Total Credits
		Theory			Practical			L	T	P	
		End Sem	Mid Sem Exam	Quiz, Assignment	End Sem	Lab Work	Total Marks				
CS705A	Computational Intelligence	70	20	10	-	-	100	3	1	-	4

Module-I: Introduction to Computational Intelligence; types of Computational Intelligence, components of Computational Intelligence. Concept of Learning/Training model. Parametric Models, Nonparametric Models. Multilayer Networks: Feed Forward network, Feedback network.

Module-II: Fuzzy Systems: Fuzzy set theory: Fuzzy sets and operations, Membership Functions, Concept of Fuzzy relations and their composition, Concept of Fuzzy Measures; Fuzzy Logic: Fuzzy Rules, Inferencing; Fuzzy Control - Selection of Membership Functions, Fuzzyfication, Rule Based Design & Inferencing, Defuzzyfication.

Module-III: Genetic Algorithms: Basic Genetics, Concepts, Working Principle, Creation of Offsprings, Encoding, Fitness Function, Selection Functions, Genetic Operators-Reproduction, Crossover, Mutation; Genetic Modeling, Benefits.

Module-IV: Rough Set Theory - Introduction, Fundamental Concepts, Set approximation, Rough membership, Attributes, Optimization. Hidden Markov Models, Decision tree model.

Module-V: Introduction to Swarm Intelligence, Swarm Intelligence Techniques: Ant Colony Optimization, Particle Swarm Optimization, Bee Colony Optimization etc. Applications of Computational Intelligence.

Suggested Books:

1. Russell C. Eberhart and Yuhui Shi, Computational Intelligence: Concepts to Implementations, Morgan Kaufmann Publishers.
2. Andries P. Engelbrecht, Computational Intelligence: An Introduction, Wiley Publishing.
3. Simon Haykin, Neural Networks: A Comprehensive Foundation, Prentice Hall.
4. David E. Goldberg, Genetic Algorithm in Search Optimization and Machine Learning, Pearson Education.
5. Jagdish Chand Bansal, Pramod Kumar Singh, Nikhil R. Pal, Evolutionary and Swarm Intelligence Algorithms, Springer Publishing, 2019.
6. S. Rajeskaran, G.A. VijaylakshmiPai, "Neural Networks, Fuzzy Logic, GeneticAlgorithms Synthesis and Applications".
7. J.S. Roger Jang, C.T.Sun, E. Mizutani, "Neuro-Fuzzy and Soft Computing: A Computational Approach to Learning & Machine Intelligence", PHI, 2002.

CS705A (Computational Intelligence)

After completing the course student should be able to:

CO1: Describe in-depth about theories, methods, and algorithms in computation Intelligence.

CO2: Compare and contrast traditional algorithms with nature inspired algorithms.

CO3: Examine the nature of a problem at hand and determine whether a computation intelligent technique/algorithm can solve it efficiently enough.

CO4: Design and implement Computation Intelligence algorithms and approaches for solving real-life problems.

Jabalpur Engineering College, Jabalpur
(AICTE Model Curriculum based scheme)
B. Tech. (AICTE) VII Sem. (Computer Science & Engineering)

Subject code	Subject Name & Title	Maximum Marks Allotted						Hours/Week			Total Credits
		Theory			Practical			L	T	P	
		End Sem	Mid Sem Exam	Quiz, Assignment	End Sem	Lab Work	Total Marks				
CS705B	Optimization Techniques	70	20	10	-	-	100	3	1	-	4

Module-I:Introduction to Optimization: Engineering application of Optimization,Statement of an Optimization problem, Optimal Problem formulation, Classification of Optimization problem. Optimum design concepts: Definition of Global and Local optima – Optimality criteria - Review of basic calculus concepts – Global optimality

Module-II: Linear Programming (LP): Introduction to LP and formulation of Linear Programming problems, Graphical solution method, alternative or multiple optimal solutions, Unbounded solutions, Infeasible solutions, Maximization – Simplex Algorithm, Minimization – Simplex Algorithm using BigM method, Two phase method, Duality in linear programming, Integer linear programming.

Module-III: Unconstrained optimization problems: Optimization algorithms for solving unconstrained optimization problems – Gradient based method: Cauchy's steepest descent method, Newton's method, Conjugate gradient method.

Module-IV: Constrained optimization problems: Optimization algorithms for solving constrained optimization problems – direct methods – Necessary and sufficient condition – equality constraints, inequality constraints -kuhu – tucker conditions – penalty function methods – steepest descent method - Engineering applications of constrained and unconstrained algorithms.

Module-V: Modern methods of Optimization: Genetic Algorithms - Simulated Annealing - Ant colony optimization - Tabu search – Neural-Network based Optimization – Fuzzy optimization techniques – Applications.

Suggested Books:

1. Rao S.S,"Optimization – Theory and applications", Wiley Easter Ltd.
2. David G.Luerbeggan, "Introduction to Linear and NonLinear Programming", Addison Wesley Publishing Co.
3. E. K. P. Chong and S. Zak, An introduction to optimization, John Wiley and Sons (Asia) Pvt. Ltd., Singapore
4. R. Fletcher, Practical methods of optimization, 2nd Edition, Wiley, New York
5. D. Luenberger, Linear and nonlinear programming, Kluwer Academic Publisher, New YorkN D Vohra, Quantitative Techniques in management, Tata McGraw Hill.

CS705B (Optimization Techniques)

Upon completion of the course, the students will be able to

CO1: Understand importance of optimization of industrial process management.

CO2: Apply basic concepts of mathematics to formulate an optimization problem.

CO3: Analyse and appreciate variety of performance measures for various optimization problems.

Jabalpur Engineering College, Jabalpur
(AICTE Model Curriculum based scheme)
B. Tech. (AICTE) VII Sem. (Computer Science & Engineering)

Subject code	Subject Name & Title	Maximum Marks Allotted						Hours/Week			Total Credits
		Theory			Practical			L	T	P	
		End Sem	Mid Sem Exam	Quiz, Assignment	End Sem	Lab Work	Total Marks				
CS705C	Internet of Things	70	20	10	-	-	100	3	1	-	4

Module-I: IoT definition, Characteristics, IoT conceptual and architectural framework, Physical and logical design of IoT, IoT enablers, Modern day IoT applications, M2M communications, IoT vs M2M, IoT vs WoT, IoT reference architecture, IoT Network configurations, IoT LAN, IoT WAN, IoT Node, IoT Gateway, IoT Proxy, IPv4 vs IPV6

Module-II: Sensor, Basic components and challenges of a sensor node, Sensor features, Sensor resolution; Sensor classes: Analog, Digital, Scalar, Vector Sensors; Sensor Types, bias, drift, Hysteresis error, quantization error; Actuator; Actuator types: Hydraulic, Pneumatic, electrical, thermal/magnetic, mechanical actuators, soft actuators

Module-III: Basics of IoT Networking, IoT Components, Functional components of IoT, IoT service oriented architecture, IoT challenges, 6LowPAN, IEEE 802.15.4, ZigBee and its types, RFID Features, RFID working principle and applications, NFC (Near Field communication), Bluetooth, Wireless Sensor Networks and its Applications

Module-IV: MQTT, MQTT methods and components, MQTT communication, topics and applications, SMQTT, CoAP, CoAP message types, CoAP Request-Response model, XMPP, AMQP features and components, AMQP frame types

Module-V: IoT Platforms, Arduino, Raspberry Pi Board, Other IoT Platforms; Data Analytics for IoT, Cloud for IoT, Cloud storage models & communication APIs, IoT case studies

Suggested Books:

1. Vijay Madisetti, Arshdeep Bahga, "Ïnternet of Things, A Hands on Approach", University Press
2. Dr. SRN Reddy, Rachit Thukral and Manasi Mishra, "Introduction to Internet of Things: A practical Approach", ETI Labs
3. Pethuru Raj and Anupama C. Raman, "The Internet of Things: Enabling Technologies, Platforms, and Use Cases", CRC Press
4. Jeeva Jose, "Internet of Things", Khanna Publishing House, Delhi
5. Adrian McEwen, "Designing the Internet of Things", Wiley
6. Raj Kamal, "Internet of Things: Architecture and Design", McGraw Hill
7. Cuno Pfister, "Getting Started with the Internet of Things", O Reilly Media

CS705C (Internet of Things)

Upon completion of the course, the students will be able to

CO1: Understand the definition and significance of the Internet of Things.
CO2: Discuss the architecture, operation, and business benefits of an IoT solution.
CO3: Examine the potential business opportunities that IoT can uncover.
CO4: Explore the relationship between IoT, cloud computing, and big data.
CO5: Identify how IoT differs from traditional data collection systems.

Jabalpur Engineering College, Jabalpur

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

(AICTE Model Curriculum Based Scheme)

Bachelor of Technology (B.Tech.) VII Semester (Electronics & Telecommunication Engg.)

w.e.f. July 2017-18 batch

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	EC701	PCC	T.V. and Digital Display	70	20	10	30	20	150	3	-	2	4
2	EC702	PCC	CMOS VLSI Design	70	20	10	30	20	150	3	-	2	4
3	EC703	PCC	Antenna Wave Propagation	70	20	10	30	20	150	3	-	2	4
4	EC704	PEC	Professional Elective Course-II	70	20	10	-	-	100	3	1	-	4
5	EC705	OEC	Open Elective Course-III	70	20	10	-	-	100	3	1	-	4
6	EC706	PI	Project-II (Problem Formulation & Design)	-	-	-	-	50	50	-	-	4	2
7	EC707	MC	Viva Industrial Training	-	-	-	30	20	50	-	-	2	1
8	EC708	DLC	Self-Learning Presentation (SWAYAM/NPTEL/MOOC)	-	-	-	-	-	-	-	-	-	-
Total				**350**	**100**	**50**	**120**	**130**	**750**	**15**	**2**	**12**	**23**
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 EC708 for the award of Honours (Minor Specialization) maximum 8 credit can be earned.									

Note: Departmental BOS will decide list of three elective subjects for each PEC /OEC. Industrial training viva shall take place in VII Sem. which students have already done in VI Sem.

Professional Elective Course-II		
S.No.	**Subject Code**	**Subject Name**
1	EC704A	Wireless Communication
2	EC704B	Information Theory & Coding
3	EC704C	RFID

Open Elective Course-III		
S.No.	**Subject Code**	**Subject Name**
1	EC705A	Digital Image Processing
2	EC705B	Artificial Intellegence
3	EC705C	Robotics

PEC: Professional Elective (Branch Specific), OEC: Open Elective Course (Interdisciplinary), PCC: Professional Core Course, DLC/PI: Digital Learning Courses/Project and Internship, MC: Mandatory Courses

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

MOOC/DLC Courses	MOOC subjects shall be taken with permission of HOD/Coordinator

Permitted maximum 3 MOOC courses for the award of minor specilization degree.

JABALPUR ENGINEERING COLLEGE, JABALPUR (MP)
Established in 1947 as Government Engineering College, Jabalpur
(Declared autonomous by Govt. of M.P. in 1998)
COURSE CONTENTS **w.e.f. July 2017-18 batch**

Category of Course	Course Title	Course Code	Credits-4			Theory Papers
			L	T	P	
B. Tech. VII SEM EC	TV and Digital Display Devices	EC701	3	-	2	Max. Marks-70 Min. Marks - 22 Duration-3 hours

Module-I
Fundamentals of television Engineering, Scanning mechanism frequency interleaving aspect ratio kell factor plumbicon, vidicon Image acquisition by CCD, CMOS Camera devices, B/W Picture Tube, Color picture tube principle, Various T. V. Standard.(NTSC CCIRB PAL)

Module-II
Composite Video Signal, Horizontal and Vertical blanking pulses, Calculation of BW in T. V., Vestigial side band transmission, Sound signal transmission, B/W T. V. Transmitter block diagram ad its working ,Color T.V. transmission.

Module-III
B/W T. V. Receiver block diagram and its working. Color T.V. Receivers block Diagram and its working. RF section, IF section in receivers, Video detector, FM sound section. PAL-D system

Module-IV
Basics of color formations in color TV. Luminance signal, Chrominance signal, Negative modulation, Quadrature amplitude modulation. Various kinds of antennas used in T.V. transmission and reception satellite T.V. principle.

Module-V
Digital display method, TFT monitor, LCD, LED, PLASMA display system, High definition TV Flat panel T. V. OLED display, quantum dot display, Holography and 3D TV

Books
1. TV Engineering by R R Gulati
2. A.M. Dhake Television & Video Engineering.
3. For LCD, LED PLASMA "Service manuals of various companies"

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

CO1	Understanding of basics of T.V. and scanning.
CO2	Knowledge of design aspect of video signal BW calculation
CO3	Understand of TV receiver and transmitter
CO4	Comprehensive knowledge of basics of T.V. modulation and Antenna
CO5	Comprehensive study of model Display devices.

LIST OF EXPERIMENTS

1. To Study Picture Tube.
2. To Study RF Section.
3. To Study VIF Section.
4. To Study Vertical Deflection Section.
5. To. Study Horizontal Deflection Section and EHT Section.
6. To study chroma Section.
7. To Study Video Amplifier.
8. To Study Control System.
9. To Study Sound Section.
10. To Study Switch Mode Power Supply.
11. (a)To study the Transmission characteristics of the different Diode limiter configuration.
    (b) To observe limiting action of sine wave on the C.R.O.
    (c) To study the Diode capacitance at higher frequency.
12. (a) To study R-C differentiating Ckt Response at 1 KHz & 10 KHz for various combination of R & C.
    (b) To study R-C Integrating Ckt Response at 1 KHz & 10 KHz for various combination of R & C
13. To Study TV pattern Generator.
14. To Study of flat panel TV receiver.

JABALPUR ENGINEERING COLLEGE, JABALPUR (MP)
Established in 1947 as Government Engineering College, Jabalpur
(Declared autonomous by Govt. of M.P. in 1998)
COURSE CONTENTS **w.e.f. July 2017-18 batch**

Category of Course	Course Title	Course Code	Credits-4			Theory Papers
			L	T	P	
B. Tech. VII SEM EC	CMOS VLSI DESIGN	EC702	3	-	2	Max. Marks-70 Min. Marks - 22 Duration-3 hours

Module - I

Introduction to cmos circuits, circuits & system representation Behavioral representation, structural representation. Physical representation MOS transistor theory. NMOS and PMOS enhancement transistor. Threshold voltage body effect. MOS device design equation. Basic DC equation. Second order effect, MOS models.

CMOS inverter – DC character, Static load MOS inverters. The differential inverter Tristate inverter. Bipolar devices, diodes, transistors, BICMOS inverters.

Module - II

Review of silicon semiconductor technology and basic CMOS technology-n- well and p-well process. Interconnect and circuit Twin-tub process layout design rules and latch-up, latch-up triggering and prevention.

Circuit characterization and performance estimation resistance and capacitance estimation, Switching characteristics, CMOS gate transistor sizing, power dissipation. Basic physical design of simple logic gates. CMOS logic structure.

Module – III

CMOS design methods. Design strategies. Programmable logic, programmable logic structure, reprogrammable gate arrays. Xylinx programmable gate array. Algotonix, concurrent logic, sea of gate and gate array design VHDL as a tool.

Module – IV

Single-Stage Amplifier: Basic Concepts, Common Source Stage, Source Follower, Common-Gate Stage, Cascode Stage.

Frequency Response of Amplifiers: General Consideration, Common-Source Stage, Source Followers, Common-Gate Stage, Cascode Stage, Differential Pair.

Module – V

Differential Amplifier: Single-Ended and Differential Operation, Basic Differential Pair, Common-Mode Response, Differential Pair with MOS Loads, Gilbert Cell.

Feedback Amplifier: General Consideration, Feedback Topologies, Effect of Loading, Effect of Feedback on Noise.

Switched-Capacitor Circuits: General Consideration, Sampling Switches, Switched-Capacitor Amplifier, Switched-Capacitor Integrator, Switched-Capacitor Common-Mode Feedback.

Reference Books:

1. Neil, H.E. Wesdte, Kamran Eshraghian, Principles of CMOS VLSI design, Pearson Education.
2. Wyne wolf, Modern VLSI design-system on silicon, Prentics Hall of india
3. Phillip E. Allen and Douglas R holding, CMOS analog Circuit Design, 2nd edition, Oxford University press.
4. B. Razavi: Design of Analog CMOS Integrated Circuits, TMH Publication.
5. Weste, Harris and Banerjee: CMOS VLSI Design, Pearson Education
6. J. M. Rabaey, Digital Integrated Circuits, PHI Learning

Course Outcomes:

Upon successful completion of course students will be able to:

CO1	Understand the working of CMOS and Characterize CMOS Inverter
CO2	Knowledge of CMOS Technology, Estimation of circuit characteristics of CMOS
CO3	Understand various CMOS design methods
CO4	Understand concept of single stage amplifier and its frequency response
CO5	Designing of Differential and feedback amplifier and Switched Capacitor Circuits

CMOS VLSI LAB
(Suggested Exercise)

List of Experiments

1. Study of Lambda based and Micron Based Design Rules
2. To design a CMOS Inverter and verify its DC and Transient Characteristics using EDA Tools (Cadence/Mentor Graphics/Tanner/Microwind)
3. To design Logic Gates (AND, NAND,OR, NOR) using EDA Tools
4. Design of Half Adder Full Adder using EDA Tool
5. To design Combinational Circuit implementing logic expressions
6. To design and Simulate following single stage Amplifiers and verify its Frequency response characteristics
    a) CS Amplifier
    b) CG Amplifier
    c) CD Amplifier
7. To Design and Simulate Basic Differential amplifier

JABALPUR ENGINEERING COLLEGE, JABALPUR (MP)
Established in 1947 as Government Engineering College, Jabalpur
(Declared autonomous by Govt. of M.P. in 1998)
COURSE CONTENTS **w.e.f. July 2017-18 batch**

Category of Course	Course Title	Course Code	Credits-4			Theory Papers
			L	T	P	
B. Tech. VII SEM EC	ANTENNA AND WAVE PROPAGATION	EC703	3	-	2	Max. Marks-70 Min. Marks - 22 Duration-3 hours

Module - I : Introduction to antenna: antenna terminology, radiation, retarded potential, radiation field from current element, radiation resistance of short dipole and half wave dipole antenna, network theorems applied to antenna, self and mutual impedance of antenna, effect of earth on vertical pattern and image antenna.

Module - II : Antenna arrays: of point sources, two element array, end fire and broad side arrays, uniform linear arrays of n-elements, linear arrays with non-uniform amplitude distribution (binomial distribution and Chebyshev optimum distribution), arrays of two-driven half wavelength elements (broad side and end fire case), principle of pattern multiplication.

Module - III :Types of antennas: Babinet's principles and complementary antenna, horn antenna, parabolic reflector antenna, slot antenna, log periodic antenna, loop antenna, helical antenna, biconical antenna, folded dipole antenna, Yagi-Uda antenna, lens antenna, turnstile antenna. Long wire antenna: resonant and travelling wave antennas for different wave lengths, V-antenna, rhombic antenna, beverage antenna, microstrip antenna.

Module - IV : Antenna array synthesis: introduction, continuous sources, methods-Schelknoff polynomial method, Fourier transform method, Woodward- Lawson method, Taylor's method, Laplace transform method, Dolph- Chebychev method, triangular, cosine and cosine squared amplitude distribution, line source, phase distribution, continuous aperture sources. Beam forming.

Module - V : Propagation of radio wave: structure of troposphere, stratosphere and ionosphere, modes of propagation, ground wave propagation, duct propagation. Sky wave propagation: Mechanism of Radio Wave Bending by Ionosphere, critical angle and critical frequency, virtual height, skip distance and LUF, MUF. Single hop and multiple hop transmission, influence of earths magnetic field on radio wave propagation, Fading Space Wave Propagation: LOS, effective earth's radius, field strength of space or tropospheric propagation.

References:

1. J. D. Krauss: Antennas;for all applications, TMH.
2. R. E. Collin, Antennas and Wave Propagation, Wiley India Pvt. Ltd.
3. C. A. Balanis: Antenna Theory Analysis and Design, Wiley India Pvt. Ltd.
4. Jordan and Balmain: Electromagnetic Fields and Radiating System, PHI.
5. A. R. Harish and M. Sachidananda: Antennas and wave propagation, Oxford University Press.
6. K. D. Prasad: Antennas and Wave Propagation, SatyaPrakashan.
7. B. L. Smith: MordernAnteenas, 2nd Edition, Springer, Macmillan India Ltd.

Course Outcomes:

Upon successful completion of course students will be able to:

CO1	Understand various antenna terminologies
CO2	Designing of antenna arrays
CO3	Knowledge of working of various types of antenna
CO4	Synthesize various antenna arrays
CO5	Differentiate between various mechanism of propagation of radio waves

RADAR & ADVANCED ANTENNA LAB

LIST OF EXPERIMENTS

1. To study the variation of field strength of radiated wave, with distance from transmitting antenna.
2. To plot radiation pattern of an omni directional antenna.
3. To plot the radiation pattern of a directional antenna. (Yagi-Uda 3- elements)
4. To study the phenomenon of linear & circular polarization of antennas.
5. To demonstrate that the transmitting and receiving pattern of an antenna are equal & hence conform the reciprocity of the antennas
6. Study of dipole antenna/ folded dipole antenna & its radiation pattern.
7. Study of Yagi (3ele/4ele) antenna & its radiation pattern
8. Study of Log-periodic antenna & its radiation pattern.
9. Study of Parabolic reflector & its construction & its radiation pattern.
10. Study of Loop antennas, (Quad & Square loop) construction & its radiation pattern.
11. Study of Biconical antenna, construction & its radiation pattern
12 Study of Horn antenna
13. Study of Rhombic antenna

JABALPUR ENGINEERING COLLEGE, JABALPUR (MP)
Established in 1947 as Government Engineering College, Jabalpur
(Declared autonomous by Govt. of M.P. in 1998)
COURSE CONTENTS **w.e.f. July 2017-18 batch**

Category of Course	Course Title	Course Code	Credits-4			Theory Papers
			L	T	P	
B. Tech. VII SEM EC	WIRELESS COMMUNICATION	EC704A	3	1	-	Maximum Marks – 70 Minimum Marks – 22 Duration – 3 Hours

Module-I : Mobile Radio Propagation I: Path Loss and Shadowing

Radio Wave Propagation, Transmit and Receive Signal Models, Free-Space Path Loss, Ray Tracing, Two-Ray Model, Ten-Ray Model (Dielectric Canyon), General Ray Tracing, Local Mean Received Power, Empirical Path Loss Models, The Okumura Model, Hata Model, COST 231ExtensiontoHataModel, Piecewise Linear (Multi-Slope) Model, Indoor Attenuation Factors, Simplified Path Loss Model, Shadow Fading, Combined Path Loss and Shadowing, Outage Probability under Path Loss and Shadowing, Cell Coverage Area.

Module-II: Mobile Radio Propagation II: Statistical Multipath Channel Models

Time-Varying Channel Impulse Response, Narrow band Fading Models, Autocorrelation, Cross Correlation, and Power Spectral Density, Envelope and Power Distributions, Level Crossing Rate and Average Fade Duration, Finite State Markov Channels, Wideband Fading Models, Power Delay Profile, Coherence Bandwidth, Doppler Power Spectrum and Channel Coherence Time, Transforms for Autocorrelation and Scattering Functions, Discrete-Time Model ,Space-Time Channel Models.

Module-III : Capacity of Wireless Channels

Capacity in AWGN , Capacity of Flat-Fading Channels ,Channel and System Model ,Channel Distribution Information(CDI)Known ,Channel Side Information at Receiver Channel Side Information at Transmitter and Receiver, Capacity with Receiver Diversity Capacity Comparisons, Capacity of Frequency-Selective Fading Channels , Time-Invariant Channels, Time-Varying Channels.

Module-IV: Diversity

Realization of Independent Fading Paths, Receiver Diversity, System Model, Selection Combining, Threshold Combining, Maximal Ratio Combining, Equal-Gain Combining, Channel Known at Transmitter Channel Unknown at Transmitter-The Alamouti Scheme, Moment Generating Functions in Diversity Analysis, Diversity Analysis for MRC, Diversity Analysis for EGC and SC, Diversity Analysis for Noncoherent and Differentially Coherent Modulation

Module-V: Wireless system and standards

Global Systems for mobile (GSM), GSM Services and features, GSM system architecture, GSM radio Subsystem, GSM Channel types, Example of GSM call, Frame structure for GSM, Signal

processing in GSM, CDMA Digital Cellular Standards (IS-95), Frequency and Channel Specification, Forward CDMA Channel, Reverse CDMA Channel, Third generation systems, OFDM and 4G communication.

Reference Books:

1. Fundamentals of Wireless Communication: David Tse and Pramod Viswanath
2. Principles of Mobile Communication : Gordon L. Stüber
3. WIRELESSCOMMUNICATIONS : AndreaGoldsmith
4. Wireless Communication Principles and Practice : T. S. Rappaport

Course Outcomes:

Upon successful completion of course students will be able to:

CO1	Understand path loss and shadowing in mobile radio propagation
CO2	Describe statistical multipath channel modes
CO3	Knowledge of capacity of various wireless channels
CO4	Analyze the diversity in wireless channels
CO5	Elaborate various wireless systems and standards

JABALPUR ENGINEERING COLLEGE, JABALPUR (MP)
Established in 1947 as Government Engineering College, Jabalpur
(Declared autonomous by Govt. of M.P. in 1998)
COURSE CONTENTS **w.e.f. July 2017-18**
batch

Category of Course	Course Title	Course Code	Credits-4			Theory Papers
			L	T	P	
B. Tech. VII SEM EC	INFORMATION THEORY AND CODING	EC704B	3	1	-	Maximum Marks – 70 Minimum Marks – 22 Duration – 3 Hours

Module -I
Source Coding: A logarithmic measure of information, Average mutual information and entropy, Information measures for continuous random variables, Noiseless coding theorem, Coding for discrete memoryless sources, Discrete stationary sources, The Lampel-Ziv algorithm, Coding for analog sources, rate distortion function.

Module -II
Channel Capacity and Coding: The converse to the coding theorem, Channel models, Channel capacity, Achieving channel capacity with orthogonal Signals, Channel reliability functions, Random coding based on M-ary Binary-coded signals, Practical Communication systems in light of Shannon's equation.

Module -III
The Noisy-channel coding theorem: Linear Block codes, The generator matrix and the parity check matrix, Some specific linear block codes, Cyclic codes, Decoding of linear block codes, bounds on minimum distance of the linear block codes.

Module -IV
Convolutional Codes: Basic properties of the convolutional codes, The transfer function of a convolutional code, Optimum decoding of convolutional codes- The Viterbi algorithm, Distance properties of binary convolutional codes, Other decoding algorithms for convolutional codes, Practical considerations in the application of convolutional codes.

Module –V
Complex codes based on combination of simple codes: Product codes, Concatenated codes, Turbo codes, The BCJR algorithm.
Coding for Bandwidth-constraint channels: Combined coding and modulation, Trellis coded modulation.

References:

1. Simon Haykins: Communication Systems, 4th Edition, John Wiley.
2. J. G. Proakis: Digital Communications, McGraw Hills
3. B.P. Lathi: Modern Analog and Digital Communication System, Oxford University Press
4. R. G. Gallager: Information Theory and Reliable Communication, John Wiley and Sons
5. A. J. Viterbi and J. K. Omura: Principles of Digital Communications and Coding, McGraw Hill Series.

6. U. Madhow: Fundamentals of Digital Communication, Cambridge University Press.

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

CO1	Understand various source coding algorithms
CO2	Describe channel capacity
CO3	Translate the noisy channel coding theorems
CO4	Describe various convolution codes
CO5	Execute complex codes based on combination of simple codes

JABALPUR ENGINEERING COLLEGE, JABALPUR (MP)
Established in 1947 as Government Engineering College, Jabalpur
(Declared autonomous by Govt. of M.P. in 1998)
COURSE CONTENTS **w.e.f. July 2017-18 batch**

Category of Course	Course Title	Course Code	Credits-4			Theory Papers
			L	T	P	
B. Tech. VII SEM EC	RFID	EC704C	3	1	-	Maximum Marks – 70 Minimum Marks – 22 Duration – 3 Hours

Module - I. : Introduction: Automatic Identification Systems, a Comparison of Different ID Systems, Components of an RFID System.
Differentiation Features of RFID Systems: Fundamental Differentiation Features, Transponder Construction Formats, Frequency, Range and Coupling, Information Processing in the Transponder, Selection Criteria for RFID Systems.

Module - II: Fundamental Operating Principles: 1-Bit Transponder, Full and Half Duplex Procedure,Sequential Procedures.
Physical Principles of RFID Systems: Magnetic Field, Electromagnetic Waves, Surface Waves.

Module - III: Frequency Ranges and Radio Licensing Regulations: Frequency Ranges Used, European Licensing Regulations, National Licensing Regulations in Europe, National Licensing Regulations.
Standardization: Animal Identification, Contactless Smart Cards, ISO 69873 — Data Carriers for Tools and Clamping Devices, ISO 10374 — Container Identification, VDI 4470 — Anti-theft Systems forGoods, Item Management.

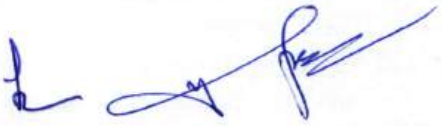
Module - IV : Coding and Modulation: Coding in the Baseband, Digital Modulation Procedures. **Data Integrity:** The Checksum Procedure, Multi-Access Procedures Anticollision.
Data Security : Mutual Symmetrical Authentication, Authentication Using Derived Keys, Encrypted Data Transfer.

Module - V : Sensors & sensing technology and interfacing Techniques, Transponder with Memory Function, HF interface, Example circuit — load modulation with subcarrier, Example circuit — HF interface for ISO 14443 transponder, Address and security logic, Read-only transponder, Writable transponder, Transponder with cryptological function, Segmented memory, MIFARE_ application directory, MIFARE_ plus, Modern concepts for the dual interface card, Measuring Physical Variables, Transponder with sensor functions, Measurements using microwave transponders, Sensor effect in surface wave transponders.
Readers: Data Flow in an Application, Components of a Reader, Low Cost Configuration — Reader IC U2270B, Connection of Antennas for Inductive Systems, Reader Designs.
Applications: Contactless Smart Cards, Public Transport, Ticketing, Access Control, Transport Systems, Animal Identification, Electronic Immobilization, Container Identification, Sporting Events, Industrial Automation, Medical Applications. Interfacing technology, Zigbee
Textbooks:
1. Klaus Finkenzeller "RFID Handbook" Second Edition John Wiley & Sons Ltd.

2. STEPHEN B. MILES, SANJAY E. SARMA, JOHN R. WILLIAMS"RFID Technology and Applications" Cambridge
University Press 2008.
3. Yan Zhang and Paris Kistos "Security in RFID and sensor networks" CRC press 2009.

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

CO1	Understand RFID system and its features
CO2	Describe the fundamental operating principle of RFID system
CO3	Elaborate the used frequency range and the regulations and standardization
CO4	Knowledge of data integrity and data security
CO5	Illustrate the sensors and its interfacing techniques



JABALPUR ENGINEERING COLLEGE, JABALPUR (MP)
Established in 1947 as Government Engineering College, Jabalpur
(Declared autonomous by Govt. of M.P. in 1998)
COURSE CONTENTS **w.e.f. July 2017-18 batch**

Category of Course	Course Title	Course Code	Credits-4			Theory Papers
			L	T	P	
B. Tech. VII SEM EC	DIGITAL IMAGE PROCESSING	EC705A	3	1	-	Max. Marks-70 Min. Marks - 22 Duration-3 hours

Module-I : DIGITAL IMAGE PROCESSING :
Elements of a Digital Image Processing system, Structure of the Human eye, Image formation and contrast sensitivity, Sampling and Quantization, Neighbors of a pixel, Distance measures, Image acquisition Systems, CMOS display demises

Module - II : IMAGE ENHANCEMENT :
Definition, Spatial domain methods, Frequency domain methods, Histogram modify technique, Neighborhood averaging, Media filtering, Low pass filtering, Averaging of multiple images, Image sharpening by differentiation and high pass filtering.

Module-III : IMAGE TRANSFORMS:
Introduction to Fourier transform-DFT, Properties of two dimensional FT, Separability, Translation, Periodicity, Rotation, Average value, FFT algorithm, Walsh transforms, Hadamard transform, Discrete Cosine transform, Wavelet transform and comparison of all the transforms.

Module – IV : IMAGE RESTORATION :
Definition, Degradation model, Discrete formulation, Circulant matrices, Block circulant matrices, Effect of diagnolization of circulant and block circulant matrices, Unconstrained and constrained restorations , Inverse filtering, Wiener filter, Restoration in spatial domain.

Module - V : IMAGE ENCODING :
Objective and subjective fidelity criteria, Basic encoding process, Variable length coding, LZW, Bit-plane coding-Bit-plane coding, Lossless predictive coding - Lossy compression: Lossy predictive coding, transform coding, wavelet coding. Image compression. Introduction to all the Image compression techniques and standards, CCITT, JPEG, JPEG 2000, Video compression standards . Basics of Pattern Recognition, image segmentation

References :
1. "Digital Image Processing" by Rafael, C. Gonzlez., and Paul, Wintz, Addison-Wesley Publishing
Company.
2. "Fundamentals of Digital Image Processing" by Jain Anil K. Prentice Hall.
3. "Digital Image Processing" by Sosenfeld, and Kak, A.C., Academic Press.
4. The Image Processing Handbook, (5/e), CRC, 2006 by J.C. Russ,
5. Digital Image Processing with MATLAB by .R.C.Gonzalez& R.E. Woods; Prentice Hall, 2003

Course Outcomes:

Upon successful completion of course students will be able to:

CO1	Knowledge of elements of digital image processing system
CO2	Describe about Image enhancement techniques
CO3	Illustrate the Image transforming techniques
CO4	Understand ways for Image restoration
CO5	Elaborate Image encoding techniques

JABALPUR ENGINEERING COLLEGE, JABALPUR (MP)
Established in 1947 as Government Engineering College, Jabalpur
(Declared autonomous by Govt. of M.P. in 1998)
COURSE CONTENTS **w.e.f. July 2017-18 batch**

Category of Course	Course Title	Course Code	Credits-4			Theory Papers
			L	T	P	
B. Tech. VII SEM EC	Artificial Intelligence and Neural Network	EC705B	3	1	-	Max. Marks-70 Min. Marks - 22 Duration-3 hours

Module - I: Meaning and definition of artificial intelligence, various types of production systems, Characteristics of production systems.

Module - II: 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 non-monotonic reasoning.

Module - III: Probabilistic reasoning, Baye's theorem, semantic networks, scripts, schemas, frames, conceptual dependency, fuzzy logic, forward and backward reasoning.

Module - IV: Game playing techniques like mini-max procedure, alpha-beta cut-offs etc, planning, Study of the block world problem in robotics, Introduction to understanding and natural languages processing.

Module - V: Introduction to learning, Various techniques used in learning, introduction to neural networks, applications of neural networks, common sense, reasoning, some example of expert systems, Free software.

References:-

- Rich E and Knight K, Artificial Intelligence, TMH New Delhi.
- Nelsson N.J., Principles of Artificial Intelligence, Springer Verlag, Berlin.

Barr A, Fergenbaub E.A. and Cohen PR. Artificial Intelligence, Addison

- Wesley, Reading Waterman D.A., A guide to Expertsystem, Adision -
- Wesley, Reading

Artificial Intelligence Hand book, Vol. 1-2, ISA, Research

- Triangle Park. Kos Ko B, Neural Networks and Fuzzy
- system –PHI.

Haykin S, Artificial Neural Networks-Comprehensive Foundation, Asea,Pearson.

Course Outcomes:

Upon successful completion of course students will be able to:

CO1	Characterize Artificial intelligence system
CO2	Describe knowledge representation in AI systems
CO3	Illustrate reasoning using fuzzy
CO4	Elaborate natural language processing
CO5	Knowledge of neural networks

JABALPUR ENGINEERING COLLEGE, JABALPUR (MP)
Established in 1947 as Government Engineering College, Jabalpur
(Declared autonomous by Govt. of M.P. in 1998)
COURSE CONTENTS **w.e.f. July 2017-18 batch**

Category of Course	Course Title	Course Code	Credits-4			Theory Papers
			L	T	P	
B. Tech. VII SEM EC	Robotics	EC705C	3	1	-	Max. Marks-70 Min. Marks - 22 Duration-3 hours

Module I
Introduction: Historical development of robots; basic terminology and structure; robots in automated manufacturing, robot configuration space and its topology, degrees of freedom

Module II
Rigid Motions and Homogeneous Transformation: Rotations and their composition; Exponential coordinates; Screw theory; Twists; Euler angles; homogeneous transformations

Module III
Forward Kinematics: Common robot configurations; Product of Exponentials formula; Denavit-Hartenberg convention
Velocity kinematics: Angular velocity and acceleration; The Jacobian
Inverse kinematics: Planar mechanisms; geometric approaches; pseudo inverse; spherical wrist; numerical approaches and Newton-Raphson method

Module IV
Statics of open chains: The use of the Jacobian; singular configurations; manipulability
Kinematics of closed-chains
Robot dynamics: Lagrangian dynamics; Euler-Newton equations for open kinematic chains. Forward and inverse dynamics.

Module V
Trajectory generation: trajectories in space of homogeneous transformations; minimum time trajectories
Feedback control: Actuators and sensors; velocity and torque control; PID control; linearization; feedback linearization
Vision-based control: The geometry of image formation; feature extraction; feature tracking (lab)

Text Books:

1. Lynch and Park, Modern Robotics: Mechanics, Planning, and Control, Cambridge University Press, 2017
2. Robotics, Vision, and Control, Peter Corke, Springer, 2011.
3. Introduction to Robotics, John J. Craig, Addison-Wesley Publishing, Inc., 1989
4. Introduction to Robotics, P. J. McKerrow, ISBN: 0201182408

Course Outcomes:

Upon successful completion of course students will be able to:

CO1	Understand the basics of Robotics technology
CO2	Describe various kind of rigid motions and transformations
CO3	Differentiate between various kinds of Kinematics
CO4	Illustrate Robot dynamics
CO5	Elaborate trajectory generations and controls

Jabalpur Engineering College, Jabalpur

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

(AICTE Model Curriculum Based Scheme)

Bachelor of Technology (B.Tech.) VII Semester (Electrical Engg.)

w.e.f. July 2017-18 batch

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	EE701	PCC	High Voltage Engineering	70	20	10	30	20	150	3	-	2	4
2	EE702	PCC	Electrical Drives	70	20	10	30	20	150	3	-	2	4
3	EE703	PCC	Power System Control	70	20	10	30	20	150	3	-	2	4
4	EE704	PEC	Professional Elective Course-II	70	20	10	-	-	100	3	1	-	4
5	EE705	OEC	Open Elective Course-III	70	20	10	-	-	100	3	1	-	4
6	EE706	PI	Project-II (Problem Formulation & Design)	-	-	-	-	50	50	-	-	4	2
7	EE707	MC	Viva Industrial Training	-	-	-	30	20	50	-	-	2	1
8	EE708	DLC	Self-Learning Presentation (SWAYAM/NPTEL/MOOC)	-	-	-	-	-	-	-	-	-	-
Total				**350**	**100**	**50**	**120**	**130**	**750**	**15**	**2**	**12**	**23**
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 EE708 for the award of Honours (Minor Specialization) maximum 8 credit can be earned.									

Note: Departmental BOS will decide list of three elective subjects for each PEC /OEC. Industrial training viva shall take place in VII Sem. which students have already done in VI Sem.

Professional Elective Course-II		
S.No.	**Subject Code**	**Subject Name**
1	EE704A	Power System Planning & Reliability
2	EE704B	Soft Computing Techniques
3	EE704C	Advanced Digital Communication

Open Elective Course-III		
S.No.	**Subject Code**	**Subject Name**
1	EE705A	Generalized Theory of Electrical Machine
2	EE705B	Digital Control System
3	EE705C	Advanced Industrial Electronics

PEC: Professional Elective (Branch Specific), OEC: Open Elective Course (Interdisciplinary), PCC: Professional Core Course, DLC/PI: Digital Learning Courses/Project and Internship, MC: Mandatory Courses

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

MOOC/DLC Courses	MOOC subjects shall be taken with permission of HOD/Coordinator

Permitted maximum 3 MOOC courses for the award of minor specilization degree.

Jabalpur Engineering College, Jabalpur

(AICTE Model Curriculum based scheme)

Bachelor of Technology (Electrical Engineering) Semester: VII

w.e.f. July 2017-18 batch

Subject Code	Subject Name & Title	Maximum Marks allotted					Total Marks	Hours / Week			Total Credits
		Theory			Practical			L	T	P	
		End Sem	Mid Sem	Quiz, Assignments	End Sem	Lab Work					
EE701	High Voltage Engineering	70	20	10	30	20	150	3	-	2	4

Course Outcomes

CO1 – Understanding of breakdown phenomenon in different mediums.
CO2 – Understanding of generation and measurement of high voltage.
CO3 – Implementation of insulation coordination, testing and protection schemes for high voltages.

HIGH VOLTAGE ENGINEERING

Module –I Breakdown in gases

Breakdown mechanism in gases : ionization, ionization processes, Townsend's mechanism, time lag for breakdown, Streamer theory, Paschen's law, effect of temperature on B.D. Voltage, Desirable properties of a gaseous insulation, SF6 as an insulator, vacuum as a dielectric.

Breakdown of gases in uniform and non uniform fields : factors affecting time lag for BD, BD in a uniform AC field, BD under impulse voltage, volt time characteristics, B.D. in non uniform field, degree of non uniformity, effect of polarity of electrodes on B.D. voltage, Carona: carona loss on conductor at DC voltage, carona loss on conductor at AC voltage.

Module-II Breakdown in liquids, solids, composite insulation and applications of insulating materials

Breakdown in liquid and solids : Break down in liquids, classification of liquids, B.D. in pure liquids, B.D. in commercial liquids, different theories of B.D. in liquids

Different theories of B.D. in solids, intrinsic B.D. electromechanical B.D. thermal B.D. mechanism of B.D. occurring after prolonged operation

B.D. of composite dielectrics

Partial discharge

Applications of insulating materials

Module-III Generation for HV testing

Generation of High Voltage : Impulse voltage, impulse voltage generation, single stage IG circuits- their analysis, multistage IG, constructional details of IG.

Generation of High AC voltage : Cascaded transformer, series resonant transformer, tesla coil

Generation of high DC voltage- half and full wave rectifier, voltage double circuit

Module -IV HV Measurements
Measurement of impulse voltage by sphere gap. Measurement of AC, DC high voltage, sphere gap, voltage dividers. Measurement of dielectric constant and loss factor, Partial discharge measurements, impulse analyzer system.

Module -V Over voltage and insulation coordination
Charge formation in clouds, lightning surges, switching surges, protection against over-voltages, surge diverters, surge modifiers.

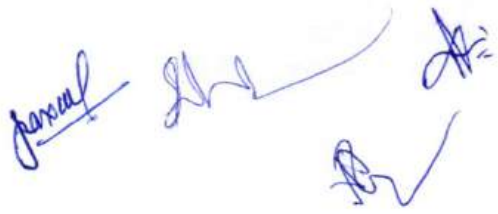
High voltage testing of power apparatus
Impulse testing of power transformer, testing of cables and some HV apparatus, testing of insulators, bushings, isolators and circuit breakers.

References :

1. M.S. Naidu and V.Kamaraju "High Voltage Engineering" Tata Mc Graw Hill Education 2013
2. D.V. Razevig "High Voltage Engineering" translated by Dr. M.P. Chourasia Khanna Pub.
3. E. Kuffel, W. S. Zingal & J. Kuffel "High Voltage Engineering fundamentals" Newres publication 2000
4. C.L. Wadhana " High Voltage Engineering" New age international publishers 2007
5. R.Arora "High voltage and electrical insulation engineering" wiely
6. Various 1.5 and IEC standards for HV lab techniques and testing

List of Experiments:

1. Various standards for high voltage testing of electrical apparatus
2. IE, IEC Standards
3. High voltage laboratories layout
4. Indoor and outdoor laboratory
5. Testing facilities
6. Safety precautions



Jabalpur Engineering College, Jabalpur

(AICTE Model Curriculum based scheme)

Bachelor of Technology (Electrical Engineering) Semester: VII

w.e.f. July 2017-18 batch

Subject Code	Subject Name & Title	Maximum Marks allotted					Total Marks	Hours / Week			Total Credits
		Theory			Practical						
		End Sem	Mid Sem	Quiz, Assign ments	End Sem	Lab Work					
EE702	Electrical Drives	70	20	10	30	20	150	3	-	2	4

Course Outcomes

CO1 – Relation between Power Electronic switches and Machines to form a drive.
CO2 – Application of various converter topology in association with machines.
CO3 – Discussion of special drives and case studies.

ELECTRICAL DRIVES

Module I :

Basic Concepts of Electric Drives : Elements of drive systems, Requirement of electric drives, Rating & Selection of drives, groups and individual drives, Constant power and Constant torque drives.

Motor Mechanism dynamics : Review of Characteristics of AC & DC motors, load characteristic, load-drive speed torque characteristics, quadrant speed torque characteristics. Mechanical Systems Stability of Electric drives, referred moment of inertia and torque of motor load combination, load equalization.

Module II :

DC Drives : Starting & Braking of conventional, Phase controlled and chopper controlled drives, Transient & Steady state analysis, Energy recovery systems.

Module III :

Induction Motor Drives : Conventional method of Starting braking and speed control, PWM, (VSI) Voltage source Inverter and Current Sources (CSI) fed IM drives, cyclo converter fed drive, Vector control drives.

Slip Controlled IM Drives : Review of Conventional methods & converter controlled-Crammers & Scherbius drives; rotor impedance control.

Module IV :

Synchronous Motors Drives : VSI and CSI fed; self-controlled-Brush less &. commutatorless dc & ac motor drives.

Module V :

Special Drives : Fundamentals of Switched reluctance motors, Stepper Motors, Permanent Magnet Motor Introduction to vector control; Digital control of drives.

Case Studies Electric traction, steel & cements plants, textile & paper mills, machine tool drive and CNC, electric cars.

References:

- Pillai S. K. "A first course on Electrical Drives", Second edition, Wiley Eastern.
- Dubey G. K., "Power Semiconductor Controlled Drives", Prentice-Hall, Englewood Cliffs .
- Dubey G. K. , "Fundamentals of Electrical Drives". Narosa Publishing House.
- Bose B. K., "Power Electronics and AC Drives", Prentice-Hall.
- Murphy M. D., and Tumbuli F., "Power Electronic Control of AC Motors", Pergamon Press, Oxford University Press.
- P.V. Rao, "Power semiconductor Drives", BS Publications

List of Experiments:

1. To perform Speed-Torque characteristics of a separately excited DC motor using open and close loop armature voltage control.
2. To perform Speed-Torque characteristics of a separately excited DC motor using open and close loop field control.
3. To perform four-quadrant speed-torque characteristics of a separately excited DC motor using close loop control.
4. To perform Speed-Torque characteristics of Single Phase Induction Motor using open loop controlled V/f method.
5. To perform Speed-Torque characteristics of Single Phase Induction Motor using close loop controlled V/f method.
6. To perform Speed-Torque characteristics of Three Phase Induction Motor using open loop controlled V/f method.
7. To perform Speed-Torque characteristics of Three Phase Induction Motor using close loop controlled V/f method.
8. To perform the speed control on 3-phase Induction motor using Sensor-less vector control.
9. To perform Speed-Torque characteristic of Permanent Magnet synchronous motor (PMSM) using open loop control.
10. To perform Speed-Torque characteristic of Permanent Magnet synchronous motor (PMSM) using close loop control.
11. To perform Speed-Torque characteristic of Permanent Magnet Brush Less DC motor (PMBLDC) using open loop control.
12. To perform Speed-Torque characteristic of Permanent Magnet Brush Less DC motor (PMBLDC) using close loop control.
13. To perform Speed-Torque characteristic of Switched Reluctance Motor (SRM) using open loop control.
14. To perform Speed-Torque characteristic of Switched Reluctance Motor (SRM) using close loop control.

Jabalpur Engineering College, Jabalpur

(AICTE Model Curriculum based scheme)

Bachelor of Technology (Electrical Engineering) Semester: VII

w.e.f. July 2017-18 batch

Subject Code	Subject Name & Title	Maximum Marks allotted					Total Marks	Hours / Week			Total Credits
		Theory			Practical						
		End Sem	Mid Sem	Quiz, Assignments	End Sem	Lab Work					
EE703	Power System Control	70	20	10	30	20	150	3	-	2	4

Course Outcomes

CO1 – Explain power system restructuring and deregulation.
CO2 – Determine voltage control methods in an interconnected system.
CO3 – Analyze frequency control in an interconnected system.

POWER SYSTEM CONTROL

Module – I : General problems associated with modern interconnected power systems, deregulation of electric utilities , Competitive market for generation, power system restructuring, congestion, available transfer capacities, pricing of energy.

Module – II : Distribution in deregulated market, the development in competition, demand side management, Maintaining distribution planning, transmission expansion in new environment, Transmission in open access, Unbundling Generation, Transmission and distribution, BOT, ISO power exchange (PX). Energy market and terms related to energy market.

Module – III : Introduction to SCADA, Introduction to Flexible AC Transmission System (FACTS), Voltage quality in power systems, Distributed generation. Phasor measurements unit-concept, working and applications in wide area, online monitoring of power system.

Module – IV : MW Frequency control – Coherency, Control area, modeling of speed control mechanism, load damping, block diagrammatic representation of single and two area interconnected system, static and dynamic response , optimum parameter adjustment.

Module – V : MVAR Voltage Control – Difference in control strategy over MW-f-control characteristics of an exciting system, DC AC and static excitation system, general block diagram representation of voltage regulators.

Reference Books :

1. P.S. Kundur, Prabha Kundur, "Power System Stability and Control" ,McGraw HillEducation,2005
2. D.P.Kothari and I.J.Nagrath, "Modern Power System Analysis",Tata Mc-Graw Hill Publishing Company, Third Edition, 2008.
3. C.L.Wadhwa, "Electrical Power Systems", New-Age International Publishers", Sixth edition, 2009.
4. PSR Murthy," Power System Operation and Control",McGraw Hill Publishing

Jabalpur Engineering College, Jabalpur

(AICTE Model Curriculum based scheme)

Bachelor of Technology (Electrical Engineering) Semester: VII

w.e.f. July 2017-18 batch

Subject Code	Subject Name & Title	Maximum Marks allotted					Total Marks	Hours / Week			Total Credits
		Theory			Practical						
		End Sem	Mid Sem	Quiz, Assignments	End Sem	Lab Work					
EE704A	Power System Planning & Reliability	70	20	10	-	-	100	3	1	-	4

Course Outcomes

CO1 – Illustrate the basic concepts and techniques of modern reliability theory.

CO2 – Apply the approaches and techniques to assess reliability of Power systems..

CO3 – Introduce the principles and techniques of Quality Control and their practical uses in design and monitoring of Power systems.

POWER SYSTEM PLANNING & RELIABILITY

Module-I : Review of Probability Theory: Element of probability theory, Probability Distribution, Random variable, Density and distribution functions. Reliability function, MTTF, Hazard rate function, Bathtub curve, Conditional probability, Binominal distribution, Poisson distributions, Normal distribution, Exponential distribution, Weibull distribution.

Module-II : Reliability of Engineering Systems: Component reliability, Reliability of systems with non-repairable components, Series configuration, Parallel configuration, Combined series-parallel systems, System structure function, Minimal tie-set, Minimal cut-set and Decomposition methods. Repairable systems, MARKOV analysis, Load sharing system, Standby systems, Degraded systems.

Module-III : Reliability of Engineering Systems : Reliability model of a generating unit, State space methods, Combing states, sequential addition method, Load modelling, Cumulative load model, Merging of generation and load models, Loss of load probability, Percentage energy loss, Probability and frequency of failure, Operating reserve calculations.

Module-IV : Power Network Reliability : Weather effect on transmission lines, Common mode failures, Switching after faults, three state components, Normally open paths, Distribution system reliability.

Module-V : Composite System Reliability : Bulk Power supply systems, Effect of varying load, Inter connected systems, correlated and uncorrelated load models, Cost and worth of reliability.

Reliability Improvement & Testing: Reliability growth process, Growth curve, Growth model, Reliability life testing, Test time calculations, Length of test, Burn in testing, Acceptance testing, Accelerated life testing, Environmental test, Reliability estimations.

References:

- J. Endreny, Reliability Modelling in Electric Power Systems, John Wiley & Sons.
- Roy Billinton & Ronald, Nallan, Reliability Evaluation of Power Systems, Plenum Press, New York.
- Charles E Ebeling, An Introduction to Reliability and Maintainability Engineering, McGraw Hill Education.

Jabalpur Engineering College, Jabalpur

(AICTE Model Curriculum based scheme)

Bachelor of Technology (Electrical Engineering) Semester: VII

w.e.f. July 2017-18 batch

Subject Code	Subject Name & Title	Maximum Marks allotted					Total Marks	Hours / Week			Total Credits
		Theory			Practical						
		End Sem	Mid Sem	Quiz, Assignments	End Sem	Lab Work					
EE704B	Soft Computing Techniques	70	20	10	-	-	100	3	1	-	4

Course Outcomes

CO1 – Understand concepts, technologies, principle of soft computing with its usage in various applications.

CO2 - Develop application on different soft computing techniques like Fuzzy, GA, Neural network and Multi-objective Evolutionary optimization algorithm.

CO3 - Implement Neuro-Fuzzy, Neuro-Fuzzy-GA and Multi-objective Evolutionary expert system.

SOFT COMPUTING TECHNIQUES

Module-I: Introduction to Soft Computing

Concept of computing systems, "Soft" computing versus "Hard" computing, Characteristics of Soft computing, Requirement of Soft computing, Major areas of Soft Computing, Applications of Soft Computing techniques

Module-II: Artificial Neural Networks

Biological neurons and its working, Simulation of biological neurons to problem solving, Different ANNs architectures, Learning rules and various activation functions,Training techniques for ANNs, Functional link network, Back propagation algorithm network and Radial basis function network, Applications of ANNs to solve some real life problems.

Module-III: Genetic Algorithms

Concept of "Genetics" and "Evolution" and its application to probabilistic search techniques, Basic GA framework and different GA architectures, GA operators: Encoding, Crossover, Selection, Mutation, etc, Solving single-objective, optimization problems using GAs.

Module-IV: Fuzzy logic

Introduction to Fuzzy logic, Fuzzy sets and membership functions, Operations on Fuzzy sets, Fuzzy relations, rules, propositions, implications and inferences, Defuzzification techniques, Fuzzy logic controller design, Some applications of Fuzzy logic.

Module-V: Multi-objective Optimization Problem Solving

Concept of multi-objective optimization problems (MOOPs) and issues of solving them, Multi-Objective Evolutionary Algorithm (MOEA), Non-Pareto approaches to solve MOOPs, Pareto-based approaches to solve MOOPs, Some applications with MOEAs.

References:

1. Foundations of Neural Networks, Fuzzy Systems, and Knowldge Engineering, Nikola K. Kasabov, MIT Press, 1998.
2. Rajasekaran and pai- Neural Network, Fuzzy logic & Genetic Algorithms. PHI Learing
3. LiMin. Fu, Neural Networks in Computer Intelligence, 9th Reprint TMH 3. Fuzzy Logic with Engineering Applications (3rd Edn.), Timothy J. Ross, Willey, 2010.
4. Fuzzy Logic for Embedded Systems Applications, Ahmed M. Ibrahim, Elesvier Press, 2004.
5. Principles of soft computing- S N Shivanandan, S N Deepa Wiley India (P) Ltd, I edition 2007.
6. An Introduction to Genetic Algorithms, Melanie Mitchell, MIT Press, 2000.
7. Genetic Algorithms In Search, Optimization And Machine Learning, David E. Goldberg, Pearson Education, 2002.
8. Neural Networks, Fuzzy Logis and Genetic Algorithms : Synthesis, and Applications, S. Rajasekaran, and G. A. Vijayalakshmi Pai, Prentice Hall of India, 2007.
9. Soft Computing, D. K. Pratihar, Narosa, 2008.
10. Neuro-Fuzzy and soft Computing, J.-S. R. Jang, C.-T. Sun, and E. Mizutani, PHI Learning, 2009.
11. Neural Networks and Learning Machines, (3rd Edn.), Simon Haykin, PHI Learning, 2011.

Jabalpur Engineering College, Jabalpur

(AICTE Model Curriculum based scheme)

Bachelor of Technology (Electrical Engineering) Semester: VII

w.e.f. July 2017-18 batch

Subject Code	Subject Name & Title	Maximum Marks allotted					Total Marks	Hours / Week			Total Credits
		Theory			Practical						
		End Sem	Mid Sem	Quiz, Assignments	End Sem	Lab Work					
EE704C	Advance Digital Communication	70	20	10	-	-	100	3	1	-	4

Course Outcomes

CO1 – Understand and appreciate the need of various modulation and spread spectrum techniques.

CO2 – Analyze the properties of basic Modulation techniques and apply them to Digital Communication

CO3 – Design and develop the different types of modulation techniques, equalizer to improve the performance under fading channels for various applications.

ADVANCE DIGITAL COMMUNICATION

Module – I : Digital PAM, binary PAM formats, line coding, band limited digital PAM systems Nyquist pulse shaping, equalization, synchronization techniques, bit and frame synchronization. Coded pulse modulation, voice digitization rate (VDR) of PCM, DPCM, DM, ADM, CVSD, log PCM, their performance comparison, VDR reduction by speech coding, VOCODERS, noise performance of PCM and DM, Digital multiplexes. AT & T and CCITT hierarchies, quasi-synchronous multiplexes.

Module – II : Digital CW modulation, BPSK, DPSK, DEPSK, QPSK, MPSK, QASK, BFSK, Doubinary encoding, QPR coherent and non-coherent systems, error probabilities in PSK, DPSK, FSK, QPSK, 16QAM, MSK, QPR and bit.

Module – III : Matched correlation and optimum filters and symbol error rate.

Module – IV : Spread Spectrum techniques : DS, CAMA, FH, PN sequence, power requirement PN- sequence code, and Walsh code.

Module – V : ISDN & Value added communication system simulation & Analysis using MATLAB & Simulink Application using communication toolboxes.

Reference Books :

1. Digital Communication by Haykins Mc Graw Hill Int Edition
2. Modern Digital & Analog Communication by B.P. Lathi, Willey Eatern Ltd 2000
3. Communication Systems by A B Carlson, Tata Mc Graw Hill 2000

Jabalpur Engineering College, Jabalpur

(AICTE Model Curriculum based scheme)

Bachelor of Technology (Electrical Engineering) Semester: VII

w.e.f. July 2017-18 batch

Subject Code	Subject Name & Title	Maximum Marks allotted					Total Marks	Hours / Week			Total Credits
		Theory			Practical						
		End Sem	Mid Sem	Quiz, Assignments	End Sem	Lab Work					
EE705A	Generalised Theory of Electrical Machines	70	20	10	-	-	100	3	1	-	4

Course Outcomes

CO1 – Analyze and apply the concept of steady state analysis and electrical transients in polyphase machines

CO2 – The generator and motor operation in steady state and transient conditions

CO3 – Evaluate the basic operation and performance of special machines and can select special machines for different purpose.

GENERALISED THEORY OF ELECTRICAL MACHINES

Module - I : Generalised Theory : Conversions – Basic two pole machines – Transformer with movable secondary – Transformer voltage and speed voltage Kron's primitive machine Analysis of electrical machines.

Module – II : Linear Transformation : Invariance of Power – Transformations from displaced brush axis, three phases to two phase, Rotating axes to stationary axes Transformed impedance matrix Torque calculations.

Module – III : DC Machines : Generalized Representation – Generator and motor operation – Operation with displaced brushes – Steady state and transient analysis – sudden short circuit – Sudden application on inertia load – Electric braking of DC motors.

Module – IV : AC Machines : Synchronous Machines : Generalized Representation – Steady state analysis Transient analysis – Electro-mechanical transients. Induction Machines : Generalized representation performance equation – steady state analysis – Transient analysis Double case machine – Harmonics – Electric braking.

Module - V : Special Machines : Generalized Representation and steady state analysis of Reluctance motor Brushless DC Motor – Variable Reluctance Motor Single phase series motor.

Reference Books :

1. Gupta J.B. Theory & Performance of Electrical Machines, S.K.Kataria & Sons, New Delhi 2010
2. Bimbhra P.S. Generalized Circuit Theory of Electrical Machines, Khanna Pub Ltd. 5th Edition.

Jabalpur Engineering College, Jabalpur

(AICTE Model Curriculum based scheme)

Bachelor of Technology (Electrical Engineering) Semester: VII

w.e.f. July 2017-18 batch

Subject Code	Subject Name & Title	Maximum Marks allotted					Total Marks	Hours / Week			Total Credits
		Theory			Practical						
		End Sem	Mid Sem	Quiz, Assignments	End Sem	Lab Work					
EE705B	Digital Control System	70	20	10	-	-	100	3	1	-	4

Course Outcomes

CO1 – Acquire the knowledge of digital control system concepts.

CO2 – Analyze the considered digital control systems using state space and z domain technique.

CO3 – Design a digital controller to meet given performance specifications using conventional and recent methods .

CO4 - Examines the stability of the considered digital control systems using various techniques.

DIGITAL CONTROL SYSTEM

Module - I :

Introduction: Digital Control Systems, quantization and quantization error, Z-transform, Z-transforms of elementary functions, properties of Z-transform, Inverse Z-transform, Z-transform method for solving difference equations

Module – II :

Z-plane Analysis of Discrete time Control Systems: Introduction, Impulse sampling and data hold, pulse transfer function, realization of digital controllers and digital filters

Module – III :

Design of Digital control systems by Conventional methods: Introduction, Mapping between s-plane and z-plane, transient and steady-state response analysis, Design based on frequency response methods, Analytical Design method.

Module –IV :

State Space Analysis: State space representation of digital systems, solving discrete state space equations, pulse transfer function matrix, discretization of continuous time state space equations, Liapunov stability analysis.

Module - V :

Pole placement and State Observers design: Controllability, Observability, useful transformations of state space analysis and design, Design through pole placement, state observer

Reference Books :

1. Katsuhiko Ogatta, " Discrete time Control Systems" Second Edition, Prentice Hall of India (2005)

2. I H Nagrath, " State Space methods and digital control systems" , New Age International (2004).

3.M.Gopal,:Digital Control and state variable Methods", Tata McGraw Hill,Fourth edition 2009

Jabalpur Engineering College, Jabalpur
(AICTE Model Curriculum based scheme)
Bachelor of Technology (Electrical Engineering) Semester: VII

w.e.f. July 2017-18 batch

Subject Code	Subject Name & Title	Maximum Marks allotted					Total Marks	Hours / Week			Total Credits
		Theory			Practical						
		End Sem	Mid Sem	Quiz, Assignments	End Sem	Lab Work					
EE705C	Advanced Industrial Electronics	70	20	10	-	-	100	3	1	-	4

Course Outcomes

CO1 – Theoretical and practical knowledge on modern day semiconductor devices, their characteristics and control.

CO2 – Knowledge of power conditioners and their application.

CO3 – Working knowledge of static applications of advanced power electronics like UPS, DC to DC converters etc.

ADVANCED INDUSTRIAL ELECTRONICS

Module -I

Introduction to modern power conductor devices: Gate turn off thyristor (GTO), Insulated Gate Bipolar Junction Transistor (IGBT), Power BJT, Power MOSFET, MOS controlled thyristor (MCT), Reverse conducting thyristor (RCT), Smart Power Devices (Power ICs) Rating, Static and dynamic characteristics, Safe operating areas, Protections of devices, Devices selection.

Module -II

DC to DC conversion, Buck Boost and Buck Boost converters (Circuit Configuration and analysis with different types of loads) Power factor, Harmonics and effect of source inductance in converter circuits. Resonant DC, DC convert ers. Switched mode power supply (SMPS).

Module -III

Concept of PWM in converters, Unity power factor converters, Voltage source invert ers (VSI), Current source inverters (CSI). Application of VSI and CSI in induction motor control.

Module -IV

Non Drive applications of power electronics inverters, Uninterrupted power supply (UPS), Induction heating, Metal cutting, Active power line conditioning.

Module -V

Vector controlled and slip power controlled induction motor drives, Application of microprocessor, Micro controllers and DSP in Machine drives.

Reference Books:

1. Power Electronics, M.H. Rashid, Tata McGraw Hill Pub.
2. Principle of Power Electronics, J.G. Kassakian, MF Schlecht and G.C. Verghese
3. Power Semiconductor Controlled Drives, Dubey G.K., Engle Wood Cliffe NJ, Prentice Hall
4. Uninterruptible power supply by DC Griffith, Marcell Dekker, NY.

Jabalpur Engineering College, Jabalpur

(AICTE Model Curriculum based scheme)

Bachelor of Technology (Electrical Engineering) Semester: VII

w.e.f. July 2017-18 batch

Subject Code	Subject Name & Title	Maximum Marks allotted					Total Marks	Hours / Week			Total Credits
		Theory			Practical						
		End Sem	Mid Sem	Quiz, Assignments	End Sem	Lab Work					
EE706	Project – II (Problem Formulation & Design)	-	-	-	-	50	50	-	-	4	2

COURSE GUIDELINES

The project formulation and design work provides students an opportunity to do something on their own and under the supervision of a guide. Each student shall work on an approved project, which may involve fabrication, design or investigation of a technical problem that may take design, experimental or analytical character or combine element of these areas. The project work involves sufficient work so that students get acquainted with different aspects of manufacture, design or analysis. The students also have to keep in mind that in final semester they would be required to implement whatever has been planned in the major project in this semester. It is possible that a work, which involves greater efforts and time may be taken up at this stage and finally completed in final semester and also evaluated by an external examiner. At the end of semester, all students are required to submit a synopsis.

Jabalpur Engineering College, Jabalpur
(AICTE Model Curriculum based scheme)
Bachelor of Technology (Electrical Engineering) Semester: VII

w.e.f. July 2017-18 batch

Subject Code	Subject Name & Title	Maximum Marks allotted					Total Marks	Hours / Week			Total Credits
		Theory			Practical						
		End Sem	Mid Sem	Quiz, Assignments	End Sem	Lab Work					
EE707	Viva Industrial Training	-	-	-	30	20	50	-	-	2	1

Industrial Training Evaluation

Student shall go to an Industry at the end of Sixth Semester during summer and shall prepare a report on the Practical Training undergone there. Student has to present the report in seventh semester and assessment will be done by committee (headed by HOD with faculty members of the department). Student has to submit a report of 30-40 pages (max) including certificate and cover pages.

1 OBJECTIVE OF INDUSTRIAL TRAINING

The objective of undertaking industrial training is to provide work experience so that student's engineering knowledge is enhanced and employment prospects are improved. The student should take this course as a window to the real World of Work and should try to learn as much as possible from real life experiences by involving and interacting with industry staff. Industrial training also provides an opportunity to students to select an engineering problem and possibly an industry guide for their Major Project in final semester.
Industrial training of the students is essential to bridge the wide gap between the classroom and industrial environment. This will enrich their practical learning and they will be better equipped to integrate the practical experiences with the classroom learning process.

2 LEARNING THROUGH INDUSTRIAL TRAINING

During industrial training students must observe following to enrich their learning: - Industrial environment and work culture. - Organizational structure and inter personal communication. - Machines/ equipment/ instruments - their working and specifications. - Product development procedures and phases. Project planning, monitoring and control. - Quality control and assurance. - Maintenance system. - Costing system. - Stores and purchase systems. - Layout of Computer/ EDP/MIS centers. - Roles and responsibilities of different categories of personnel. - Customer services. - Problems related to various areas of Work etc. Faculty and TPO are supposed to plan industrial training in such a manner that students get exposure on most of the above arena in the field (world of work). Students are supposed to acquire the knowledge on above by -

1. Observation,
2. Interaction with officials at the workplace
3. Study of Literature at the workplace (e.g. User Manual, standards, maintenance schedules, etc.)
4. "Hand's on" experience
5. Undertaking / assisting project work.
6. Solving problems at the work place.

7. Presenting a seminar.
8. Participating in-group meeting/ discussion.
9. Gathering primary and secondary data/ information through various sources, Storage, retrieval and analysis of the gathered data.
10. Assisting officials and managers in their working.
11. Undertaking a short action research work.
12. Consulting current technical journals and periodicals in the library.
13. Discussions with peers.

Jabalpur Engineering College, Jabalpur

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

(AICTE Model Curriculum Based Scheme)

Bachelor of Technology (B.Tech.) VII Semester (Industrial & Production Engg.)

w.e.f. July 2017-18 batch

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	IP701	PCC	Industrial Robotics & Mechatronics	70	20	10	30	20	150	3	-	2	4
2	IP702	PCC	Industrial Engineering	70	20	10	30	20	150	3	-	2	4
3	IP703	PCC	Vibration & Maintenance Engineering	70	20	10	30	20	150	3	-	2	4
4	IP704	PEC	Professional Elective Course-II	70	20	10	-	-	100	3	1	-	4
5	IP705	OEC	Open Elective Course-III	70	20	10	-	-	100	3	1	-	4
6	IP706	PI	Project-II (Problem Formulation & Design)	-	-	-	-	50	50	-	-	4	2
7	IP707	MC	Viva Industrial Training	-	-	-	30	20	50	-	-	2	1
8	IP708	DLC	Self-Learning Presentation (SWAYAM/NPTEL/MOOC)	-	-	-	-	-	-	-	-	-	-
Total				**350**	**100**	**50**	**120**	**130**	**750**	**15**	**2**	**12**	**23**
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 IP708 for the award of Honours (Minor Specialization) maximum 8 credit can be earned.									

Note: Departmental BOS will decide list of three elective subjects for each PEC /OEC. Industrial training viva shall take place in VII Sem. which students have already done in VI Sem.

Professional Elective Course-II		
S.No.	**Subject Code**	**Subject Name**
1	IP704A	Material Management & Product Design
2	IP704B	Manufacturing System Design
3	IP704C	Product Life Cycle Management

Open Elective Course-III		
S.No.	**Subject Code**	**Subject Name**
1	IP705A	Advance Manufacturing Process
2	IP705B	Rapid Prototyping
3	IP705C	Research Methodology and Optimization Techniques

PEC: Professional Elective (Branch Specific), OEC: Open Elective Course (Interdisciplinary), PCC: Professional Core Course, DLC/PI: Digital Learning Courses/Project and Internship, MC: Mandatory Courses

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

MOOC/DLC Courses	MOOC subjects shall be taken with permission of HOD/Coordinator

Permitted maximum 3 MOOC courses for the award of minor specilization degree.

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

Credits: 4	IP701	Industrial Robotics and Mechatronics	L: 3, T:0, P:2

Course Objective:

- To acquaint students with the basic concepts of robotics and robot programming.
- To Know Fundamentals of robot sensors and vision.
- To impart a fundamental knowledge of mechatronics.

Course content:

Module I

Introduction to Robotics: Introduction, Definition, Automation and Robotics, Need and importance, basic concepts, Anatomy of Robots, Structure and classification of Robots, Robot configurations, Comparative advantages of different configurations, Resolution, Accuracy, Repeatability.

Module II

Structure of Robotic System : Robot links, Joints in Robots, Robot Specification, Performance Parameters, Robot Drive Systems, Hydraulic Actuators, Pneumatic Actuators, Electric Drives, Steeper Motors, Comparison of Characteristics of robot Drive Systems, Wrist and Motions, Designs of Gripper Fingers, Gripper Mechanisms, Force Analysis of Gripper Mechanism, Selection Consideration of Gripper.

Module III

Robot Sensors and Vision: Introduction, Classification of Sensors and their functions, Touch Sensors, Binary Sensors, Analog Sensors, Tactile Sensors, Desirable Features for Sensors and Transducers, Proximity Sensors, Range Sensors, Force and Torque Sensors, Robot Vision, Block Diagram of Vision System, Constructional Features of Vidicon Camera, Analog to Digital Conversion, Image Storage, Image Processing and Analysis, Feature Extraction, Object Recognition.

Module IV

Robot Programming: Introduction, Lead through Programming, Manual, Walk through, off line Programming Concepts, Requirement of Good Programming Language, VAL Commands with description, Definition and Statements of AL AND AML, Programming Languages features and applications, Program for Pick and Place Activity.

Module V

Mechatronics: Transducers, Applications and Selection, Application of Proximity Switch, Application of Photoelectric Sensor, Sensor Array, Wrist Sensors, Compliance Sensing, Range Sensing, Guidelines for Selection, Active and Passive Sensors, Basic Requirements of a Sensor/Transducer.

Text Books

1. Groover M.P. Weiss M. Industrial Robotics, Tata McGraw Hill Publication.
2. Groover M.P.Cam and Automation, PHI Learning Publicing Ltd.
3. Ganesh S.Hegde. A Text Book on Industrial Robotics. Laxmi Publication.

References

1. Ghosal Ashitava. Robotics Fundamental Concepts and Analysis, Oxford Publication.
2. Shimon K. Handbook of Industrial Robots, John Willey& Sons.
3. Fu, Gonzalez, Lee, Robots Control, Sensing, Tata McGraw Hill Publication.

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

CO1	Understand the design of robotics.
CO2	Demonstrate robot structure and designing.
CO3	Classify robot sensors.
CO4	Robot programming
CO5	Understand Applications and Selection of mechatronics

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

Course Outcome	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	1	1	2	1	3	1	1	0	0	0	0	1
CO2	1	0	1	2	3	1	0	0	0	0	0	0
CO3	0	0	1	2	2	0	1	1	0	0	0	0
CO4	0	2	2	1	3	1	0	1	1	0	0	1
CO5	1	1	2	2	2	2	1	0	2	1	1	1

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

Credits: 4	IP702	Industrial Engineering	L: 3, T:0, P:2

Course Objective:

- To acquaint students with the basic concepts of Reliability engineering
- To impart a fundamental knowledge of capacity planning and Re-engineering
- Selection and application of different Sequencing Models.
- To Know Fundamentals of Marketing Management
- To impart a fundamental knowledge of Human resource management.

Course Content :

Module-I : Reliability Engineering: Introduction and objectives of Reliability Engineering, System Reliability, Achieving Reliability, Failure Rate, Hazard Rate, Failure Modes and the 'Bath-tub' curve, Series Structure, Parallel Structure, Combination Structure, Design , Important Aspect of Reliability, Maintainability, Availability, Improving Reliability.

Module-II : Capacity Planning: Measurement of Capacity, Estimating Future capacity, Factors influencing effective capacity, Factors Favoring over capacity and under capacity, Business Process Reengineering, Definition, Characteristics of BPR, Need for Re-engineering, Steps in Re-engineering, Process of Re-engineering, Industrial Engineering and Re-engineering, Success factors in reengineering, Advantages of Re-engineering.

Module-III : Sequencing Models: Introduction, Assumptions, Gantt chart for Solving Sequencing Problems, Processing n jobs through 2 machines, Johnsons Algorithm, Loading, Sequencing and Scheduling, Visual load Profile, Priority Sequencing, Assignment Problems, Principles of scheduling, Inputs to scheduling, Scheduling strategies, Forward scheduling and backward scheduling, Finite Loading, Critical ratio loading, Index method.

Module-IV : Marketing Management: Marketing Function, Marketing Management Process and Marketing Planning, Market Research, Consumer Behavior, Product Life Cycle, Product, Product Lines and Brands, Physical Distribution Channels, Sales Promotion & advertising programs.

Module-V : Human Resource Management: Definition, Objective of Human Resource Management, Characteristics, Functions/Scope, Principles of Human Resource Management, and Manpower Planning –factors Affecting Manpower Planning, Steps in Manpower Planning, recruitment and Selection procedure of Manpower. Training and Development of Manpower: Need of Training, Benefits of Training, Method of Training Workers, Foreman or Supervisory Training, Executive/Managers Training and Development, learning curves and classifications.

Text Books

1. Khanna O. P., "Industrial Engineering and Management", Dhanpat Rai and sons, 2007.
2. Banga T. R. and Sharma S. C., "Industrial Organization & Engineering economics", 23ed., Khanna Publishers, 2001, ISBN 81-7409-078-9.
3. Mahajan M., "Industrial Engineering and Production Management" Dhanpat rai and Sons Publishers, 2005, ISBN-81-7700-047-0

4. Chabra T. N., "Principles & Practices of Management", Dhanpat lal & company.
5. Srinath N., "Reliability Engineering", East West Publication Ltd.

Reference Books
1. Koontz Harold and Weihrich Heinz, "Essentials of management", 7ed, Tata McGraw - Hill publishing, 2008, ISBN 0-07-0623030-x.
2. Luthans f., "Organizational Behaviour", McGraw-Hill Company, 2008, ISBN 81-317- 05021.
3. Kotler Philip & Keller K.L., "Marketing Management. Dorling Kindersley pvt.Ltd.,2008, ISBN-978-81-317-1683-0
4. Cynthia L.Greene , "Entrepreneurship: Ideas In Action", Thomson, ISBN-981-243-257-1.
5. Mamoria C.B. and Gankar S.V., "Personnel Management", Himalaya Publishing House, 20

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

CO1	understand about What is Reliability and how to allocate Reliability to each component.
CO2	apply core concepts of Capacity Planning
CO3	Solve sequencing problem
CO4	Understand Marketing Function, market dynamics, demands, and environment. Marketing Management Process
CO5	Understand Principles of Human Resource Management

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

Course Outcome	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	1	1	2	1	3	1	1	0	0	0	0	1
CO2	1	0	1	2	3	1	0	0	0	0	0	0
CO3	0	0	1	2	2	0	1	1	0	0	0	0
CO4	0	2	2	1	3	1	0	1	1	0	0	1
CO5	1	1	2	2	2	2	1	0	2	1	1	1

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

Credits: 4	IP703	Vibration and Maintenance Engineering	L: 3, T:0, P:2

Module–I : Fundamental Aspects of Vibrations : Vibration, main causes, advantages and disadvantages; engineering applications of vibration; vector method of representing harmonic motion; characteristics of vibration, harmonic analysis and beats phenomenon, work done by harmonic forces on harmonic motion;; elements of vibratory system; lumped and distributed parameter systems, degreed of freedom.

Undamped Free Vibrations: Derivation of differential equation of motion: the energy method, the method based on Newton's second law of motion, and Rayleigh's method. Solution of differential equation of motion: Natural frequency of vibration. Equivelent spring stiffness, Systems involving angular oscillations: the compound pendulum.

Module-II : Damped Free Vibrations: Viscous damping: coefficient of damping; damping ratio; under damped, over damped and critically damped systems; logarithmic decrement; frequency of damped free vibration; frequency, decay rate, systems with two degrees of freedom.

Whirling Motion and Critical Speed : Whirling motion and Critical speed : Definitions and significance, Critical – speed of a vertical, light –flexible shaft with single rotor : with and without damping, Free Transverse Vibration due to a Point Load on a Simply Supported Shaft, Free Torsional Vibration of a Single Rotor System

Module–III : Maintenance Concepts and Strategies: Introduction, maintenance functions and objectives, maintenance planning and scheduling, maintenance organization.

General Introduction to Maintenance Types: Breakdown, emergency, corrective, predictive, and preventive; maintenance prevention; design-out maintenance, productive maintenance, shutdown maintenance and scheduled maintenance.

Module IV : Condition Based Maintenance: Principles of CBM, pillars of condition monitoring, CBM implementation and benefits; condition monitoring techniques- visual monitoring, vibration monitoring, wear debris monitoring, corrosion monitoring, performance monitoring

Module-V :Reliability Centered Maintenance (RCM):– Concept, methodology, benefits;

Total Productive Maintenance: Evolution of TPM, TPM objectives, concept, pillars of TPM.

Failure Modes and Effects Analysis **(FMEA)/ Failure Modes, Effects and Criticality Analysis, (FMECA)**: Overview, elements of FMECA, applications and benefits, risk evaluation, risk priority numbers, criticality analysis, process FMEA, qualitative and quantitative approach to FMECA; design FMEA and steps for carrying out design FMEA

References:

1- Ambekar A.G., Mechanical Vibrations and Noise Engineering; PHI
2- Meirovitch Leonard; Element of Vibration Analysis; TMH
3- Dukikipati RV Srinivas J Text book of Mechanical Vibrations; PHI
4- Kelly SG and kudari SK; Mechanical Vibrations; Schaum Series;TMH
5- Thomson , W.T., Theory of Vibration with Applications , C.B.S Pub & distributors .
6- Singiresu Rao, Mechanical Vibrations ' , Pearson Education .

7- G.K. Grover, Mechanical Vibration , Nem chand and Bross , Roorkee
8- V. P. Singh, Mechanical vibrations, Dhanpat rai and Co.
9- Sadhu Singh, Mechanical Vibrations, Khanna Publishers.
10- Ebeling CE; An Introduction To Reliability & Maintainability Engg; John Wiley and Sons
11- Mishra R.C; Reliability and Maintenance Engineering; New age International publisher.
12- Kelly Anthony; Maintenance Planning and Control
13- R.C. Mishra and Pathak; Maintenance Engineering and Management;PHI

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

CO1	Analyze undamped free vibration system.
CO2	Analyze damped free vibration system.
CO3	Understand whirling motion and critical speed in harmonically excited vibration.
CO4	Analyze condition based maintenance.
CO5	Analyze Reliability Centered Maintenance

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

Course Outcome	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	1	1	2	1	3	1	1	0	0	0	0	0
CO2	1	0	1	2	3	1	0	0	0	0	0	0
CO3	0	0	1	2	2	0	1	1	0	0	0	0
CO4	0	2	2	1	3	1	0	1	1	0	0	0
CO5	1	1	2	2	2	2	0	0	2	1	0	1

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

Credits: 4	IP704A	Material Management & Product Design	L: 3, T:1, P: 0

Course Objective:

- To acquaint students with the basic concepts of Reliability engineering
- To impart a fundamental knowledge of capacity planning and Re-engineering
- Selection and application of different Sequencing Models.
- To Know Fundamentals of Marketing Management
- To impart a fundamental knowledge of Human resource management.

Module-I : Material Management: Introduction to Material Management Functions, objectives, Integration concept Material classification and coding system importance of writing specifications and variety reduction techniques, Material Planning-importance & techniques, Master & material budget, Quality control in material management, Theory of sampling inspection.

Module-II : Purchasing: Make or buy decision, Factors, Purchasing objectives, organization of purchase department, responsibilities, Principles of purchasing, purchasing process, Tender system, Negotiation, Vendor rating, Legal aspects of purchasing, International purchasing.

Module-III : Stores management & Material Handling : Introduction, objective of store keeping, stores functions, stores organization, stores systems and procedures, stores accounting and verification systems, stores location and layout, factor affecting location, centralized and decentralized storing, automated/retrieval storage.Planning and operating principles material handling equipments and classification; belt conveyer, chain conveyers, fork lifts, over head cranes, automated material handling in modern industries.

Module–IV : Product Design: Design by evolution & innovation, factors of product design, morphology of design, Primary design phases & flow charting, design for safety and reliability, value engineering, role of computer in design process

Module-V : Product design Practice: Product strategies, analysis of the product , basic design considerations, procedure adopted by industrial designers, role of aesthetics, functional design practice, creativity- process, techniques, group technology, concurrent engineering & reverse engineering.

References:

1. Product design & Manufacturing-A.K. Chitale, R. C. Gupta-third edition
2. Purchasing and materials management-Gopalkrishnan P, TMH
3. Materials Management-Chitale AK and Gupta RC, PHI

Course Outcomes:

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

CO1	understand objectives and integration concept of material management
CO2	Understand purchasing process,purchasing objectives and purchasing principles.
CO3	Understand store management ,store function ,store organization ,store system and procedure.
CO4	Understand product design and morphology og design.

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

Course Outcome	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	1	1	2	1	3	1	1	0	0	0	0	1
CO2	1	0	1	2	3	1	0	0	0	0	0	0
CO3	0	0	1	2	2	0	1	1	0	0	0	0
CO4	0	2	2	1	3	1	0	1	1	0	0	1
CO5	1	1	2	2	2	2	1	0	0	1	0	0

IP704B Manufacturing Systems Design

Module -I

Fundamentals: System concept, Hierarchical structure, System design, Decision making procedure, System types in manufacturing environments; Manufacturing Systems: Structural aspects, transformational aspects, procedural aspects, integrated manufacturing systems; Modes of Production- Jobbing / Intermittent /Continuous; Mass Production- Economies of Scale, Optimum production scale, Mass Customization; Multi-Product Small Batch Production- Economies of Scope with Diversification; Logistic Systems- Material flow: conversion /transportation / storage.

Module-II

Product / Process Planning and Design: Product Life Cycle, Planning of a new product, Product Design Aspects, Design cost considerations, Concurrent Engineering; Process and Operation Design- Computer Aided Process Planning, Optimum routing analysis using Dynamic Programming.

Module-III

Manufacturing Optimization: Criteria for Evaluation, Optimization of single Stage manufacturing- Unit production time and cost; Optimization of multistage manufacturing system- Scope, basic mathematical models; Cost Estimating- Classical metal cutting cost analysis, Industrial cost estimation practices, Estimating material, setup and cycle times.

Module-IV

Computer Simulation in Manufacturing System Analysis: Characteristics, Simulation Models, applications of probability and statistics; Design and evaluation methodology of manufacturing systems, General design framework, Analysis of situation, Setting objectives, Conceptual modeling, Detailed design, Evaluation and Decision.

Module-V

Modern approaches in Manufacturing: Cellular Manufacturing- Group Technology, Composite part, Rank Order Clustering Technique, Hollier method for GT cell layouts; Flexible Manufacturing- Concept, components, architecture; Lean Production- concept, principles, Agile Manufacturing- concept, principles and considerations for achieving agility.

Reference Books:

1. KatsudoHitomi, (1998), "Manufacturing Systems Engineering", Viva Low Priced Student Edition, ISBN 81-85617-88-0
2. B. Wu, "Manufacturing Systems Design & Analysis: Context and Techniques" (2/e), Chapman & Hall, UK, ISBN 041258140X
3. Mikell P. Groover, (2002), "Automation, Production Systems and Computer Integrated Manufacturing", (2/e), Pearson Education, ISBN 81-7808-511-9
4. Radhakrishan P., Subramaniyan S. and Raju V., "CAD / CAM / CIM", (3/E), New Age International Publication
5. Luca G. Sartori,(1998), " Manufacturing Information Systems", Addison Wesley Publishing Co.
6. N. Viswanadhan& Y, Narhari, (1998), "Performance Modeling of Automated Manufacturing Systems", Prentice Hall of India

7. Phillip F. Ostwald, JairoMunez, (2002), " Manufacturing Processes and Systems", John Wiley & Sons (Students' Edition), ISBN 9971-512-34-3
8. Sanjay B. Joshi, Jeffrey S. Smith ,(1994), "Computer Control of Flexible Manufacturing Systems: Research and Development", Springer, ISBN 0412562006, 9780412562006

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

CO1	understand System design, Decision making procedure
CO2	Understand Process Planning and Design
CO3	Understand Manufacturing Optimization
CO4	Understand Computer Simulation in Manufacturing System Analysis
CO5	Understand Modern approaches in Manufacturing

IP704C Product Life Cycle Management

Module-I

Introduction: Background, Overview, Need, Benefits, Concept of Product Life Cycle. Components / Elements of PLM, Emergence of PLM, Significance of PLM, Customer Involvement. Product Life Cycle Environment: Product Data and Product Workflow, Company's PLM vision, The PLM Strategy, Principles for PLM strategy, Preparing for the PLM strategy, Developing a PLM strategy, Strategy identification and selection, Change Management for PLM.

Module-II

Product development process & Methodologies: Integrated Product development process - Conceive – Specification, Concept design, Design - Detailed design, Validation and analysis (simulation), Tool design, Realize – Plan manufacturing , Manufacture, Build/Assemble , Test (quality check) , Service - Sell and Deliver , Use , Maintain and Support, Dispose. Bottom-up design, Top-down design, Front loading design workflow, Design in context, Modular design. Concurrent engineering - work structuring and team Deployment - Product and process systemization - problem, identification and solving methodologies. Product Reliability, Mortality Curve. Design for Manufacturing, Design for Assembly. Design for Six Sigma.

Module-III

Product development process & Methodologies - Definition of concepts - Fundamental issues - Role of Process chains and product models -Types of product models - model standardization efforts-types of process chains - Industrial demands.

Module-IV

Types of Analysis Tools : Design for manufacturing - machining - casting and metal forming - optimum design - Design for assembly and disassembly - probabilistic design concepts - FMEA - QFD - Taguchi Method for design of experiments -Design for product life cycle. Estimation of Manufacturing costs, Reducing the component costs and assembly costs, Minimize system complexity.

Module-V

Product Data Management –(PDM Technology: An Introduction to Concepts, Benefits and Terminology, CIM Data. PDM functions, definition and architectures of PDM systems, product data interchange, portal integration, PDM acquisition and implementation.

Reference Books :

1. Grieves, Michael. Product Life cycle Management, McGraw-Hill, 2006. ISBN 0071452303
2. Product Life Cycle Management - by AnttiSaaksvuori, AnselmiImmonen,Springer, 1st Edition (Nov.5, 2003)
3. Stark, John. Product Lifecycle Management: Paradigm for 21st Century Product Realisation, Springer-Verlag, 2004. ISBN 1852338105
1. Product Design & Process Engineering, McGraw Hill – Kogalkusha Ltd., Tokyo, 1974

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

CO1	understand Elements of product life cycle
CO2	Understand Product development process & Methodologies
CO3	Understand Integrated Product development process
CO4	Understand Types of Analysis Tools
CO5	Understand Product Data Management

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

Credits: 4	IP705A	Advance Manufacturing Process	L: 3, T:1,P:0

Course Objective:

- Provide knowledge about Basic Features and Kinematics of Machine Tools.
- Explain design of metal working tools.
- Explain principle and Design of jigs and fixtures.
- Explain Gear generation process Gear finishing process.
- Mould Design and Acceptance Tests.

Course content :

Module-I

Abrasive Jet Machining (AJM): Principles of Abrasive jet machining, Process parameters, Metal removal rate, Effect of parameters on Abrasive jet machining, Application & limitation.
Water Met Machining: Procedure of Water jet machining, Jet cutting equipments, process detail, Practical applications.

Module-II

Ultrasonic Machining: Principle, Process parameters, Cutting tool design, tool feed mechanism, transducer, design of velocity transformers, Mechanics of cutting , Effect of parameters, Economic consideration, Applications & limitations.
Plasma Arc Machining: Non-thermal generation of plasma, Mechanics of metal removal, Parameters, Accuracy & surface finish, Applications.

Module-III

Electrochemical Machining: Principle, Elements of process, Metal removal rate, Electro-chemistry of process, tool design, Applications, choice of electrolyte. Electrochemical grinding, Electrochemical deburring and Electrochemical honing.
Chemical Machining: Elements of process, Applications and advantages.

Module-IV

Electro Discharge Machining: Process, Mechanism of metal removal, Electrode feed control , Metal removal rate, Machining accuracy, tool material, dielectric fluid, flushing, application & limitation. Wire cut EDM, Electro discharge grinding.

Module-V

Laser Beam Machining: Features, Metal removal rate, Thermal analysis, Cutting speed and accuracy.
Electron Beam Machining Procedure, Forces in machining, Process capability.
High Energy Rate Forming: High energy rate forming process, High Velocity Forming process, Explosive Forming, Electro Hydraulic Forming. Electromagnetic forming, High speed forming machines.

References:

1. Modern Machining Process, P.C.Pandey &H.S. Shan, Tata McGraw hill.
2. New Technology, Dr. Amitabh Bhattacharya, The Institution of Engineers.
3. Unconventional Manufacturing Process, Dr. V.K. Jain, Allied Publishers
4. Principles of Engineering Production, A.S. Lissaman & S.J. Martin
5. Production Engineering, P.C. Sharma, S Chand company Ltd.

Course Outcomes:

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

CO1	Explain about Basic Features and Kinematics of Machine Tools.
CO2	Design metal working tools.
CO3	Design jigs and fixtures.
CO4	Explain Gear generation process Gear finishing process.
CO5	To do Mould Design and Acceptance Tests

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

Course Outcome	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	1	1	1	1	1	0	0	1	0	1	1
CO2	2	2	3	0	3	1	0	1	0	1	0	1
CO3	1	1	3	1	3	0	1	0	0	0	0	1
CO4	1	1	0	0	3	0	0	0	0	0	0	1
CO5	1	0	3	1	3	0	0	0	0	0	0	1

IP705B Rapid Prototyping

Module-I

Introduction to RP, Technology Description and Definition to RP, Overview of RP, Benefits and Application. RP Processes: Process overviews, STL file Generation, File Verification and Repair, Build File Creation, Part Construction, Part Cleaning and finishing, Process Strength and its limitations.

Module–II

Classes of RP systems: 3D Printers, Enterprise Prototyping centers, Direct digital tooling, Direct digital manufacturing, system classification, Stereo lithography, SL with photo polymerization, SL with liquid thermal polymerization, Selective Laser Sintering, Fused deposition modeling, Laminated object manufacturing, Laser powder forming.

Module–III

Prototype properties: Material properties, color, dimensional accuracy, stability, surface finish, machinability, environmental resistance, operational properties.

Module-IV

RP Applications: Design, Concept Models, Form & fit checking, Ergonomic Studies, Functional testing, Requesting Price quotes, CAD data verification, Rapid Tooling, Rapid manufacturing, Science & Medicine, Archeology, Paleontology & forensic Science, miniaturization.

Module-V

Fundamental Process: Background, The line spread function of scanned Gaussian Laser Beam. The Parabolic Cylinder, The working curved equation, The curved line width function, Mechanical properties, Bilateral exposure of a Thin Sample, The Photo modulus Model, Experimental Method, Experimental Results.

REFERENCES

1. T. A. Grimm & Associates, Users Guide to Rapid Prototyping, Society of Manufacturing Engineers (SME) ISBN 0872636976
2. Frank W. Liou, Rapid Prototyping & engineering applications, CRC Press, ISBN 978-0-8493-3409-2
3. Rapid Prototyping theory & practice, Manufacturing System Engineering Series, Ali K. Kamarani, Springer Verlag
4. Rapid Prototyping- case book, J. A. McDonalds, C. J. Ryall, Wiley Eastern
5. Rapid & Virtual Prototyping & applications, C. E. Bocking, AEW Rennie, Wiley Eastern
6. Paul F. Jacobs, Rapid Prototyping and Manufacturing, First Edition Published by Society of Manufacturing Engineers. ISBN: 0-87263-425-6

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

CO1	Understand Technology Description of rapid prototyping.
CO2	Understand Classes of RP systems
CO3	Understand Prototype properties
CO4	Understand RP Applications: Design,

IP705C RESEARCH METHODOLOGY AND OPTIMIZATION TECHNIQUES

Module-I

Introduction to Research Methodology , Various Types of Techniques, Alternative approaches to the study of the research problem and problem formulation. Formulation of hypotheses, Feasibility, Preparation and presentation of research proposal.

Introduction to Experimental Design, Taguchi Method, Concept of Orthogonal Array, Primary and Secondary data collection, S/N ratio, Validation, Regression and correlation analysis. Tests of significance based on normal. t and chi square distributions, Analysis of variance.

Module-II

Edition, tabulation & testing of hypotheses, interpolation of results, presentation, styles for figures, tables, text, quoting of reference and bibliography. Use of software for statistical analysis like SPSS, Mini Tab or MAT Lab, Report writing, preparation of thesis, use of software like MS Office. The course will include extensive use of software, reporting writing and seminars in tutorial class.

Module-III

Integer linear programming methods and applications, Introduction to integer non-linear Programming, Basics of geometric programming.

Module-IV

Multi-objective optimization methods and applications, Formulation of problems – Separable programming and stochastic programming.

Module-V

Introduction to Genetic algorithms, neural network based optimization and optimization of fuzzy systems, Evolutionary Algorithm and Ant Colony Optimisation techniques.

Note: - Some of the algorithm is used to be exercised using MAT LAB

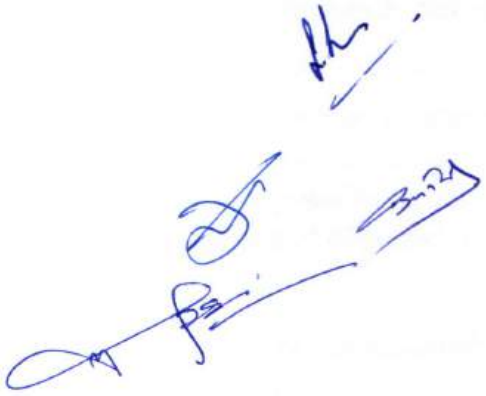
RECOMMENDED BOOKS :

1. C.R Kothari, Research Methodology, Wishwa Prakashan
2. P.G Triphati, Research Methodology, Sultan Chand & Sons, N.Delhi
3. Fisher, Design of Experiments, Hafner
4. Sadhu Singh, Research Methodology in Social Sciences, Himalya Publishers
5. Kalyanmoy Deb, Optimization for Engineering design – algorithms and examples. PHI, NewDelhi 1995
6. Singiresu S.Rao, "Engineering optimization – Theory and practices", John Wiley and Sons, 1998.
7. Garfinkel, R.S. and Nemhauser, G.L., Integer programming, John Wiley & Sons, 1972

Course Outcomes:

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

CO1	understand Research Methodology
CO2	Understand Edition, tabulation & testing of hypotheses
CO3	Understand Integer linear programming methods and applications
CO4	Understand Multi-objective optimization methods and applications
CO5	Understand Genetic algorithms



INDUSTRIAL ENGINEERING LAB
(IP702)

Laboratory Assignments:

1. To Study Failure rate and Hazard rate of Component (Industry supported case study).
2. To Construct Gantt Chart for the given Scheduling Problems.
3. Estimate Future capacity of the given plant (Industry supported case study).
4. To find the Training needs of the given plant (Industry supported case study).
5. To study Physical Distribution Channels, Sales Promotion & advertising programs of the given product(Industry supported case study).

Vibrations & Maintenance Engineering Lab

(IP703)

List Of Experiments (Please Expand it):

1. To verify the relation $T=2\pi\sqrt{L/g}$.
2. To determine the radius of gyration 'K' of given compound pendulum and to verify the relation , $T=2\pi\sqrt{)}$
   (where 0G is distance of g.g of rod from support.)
3. To study the longitudinal vibration of helical spring and to determine the frequency of period of vibration (oscillation)theoretically and actually by experiment.
4. To study undamped free vibration of equivalent spring mass system.
5. To study the forced vibration of equivalent spring mass system.
6. To study the torsional vibration undamped of single rotor shaft system.
7. To study the free vibration of twe rotor system and to determine the natural frequency of vibration theoretically anrd experimentally.
8. To study various condition monitoring techniques
   1) Study of TPM methodology
   2) Study of near debris monitoring techniques.

PROJECT-I
(IP706)

The Major Project Work provides students an opportunity to do something on their own and under the supervision of a guide. Each student shall work on an approved project, which should be selected from some real life problem as far as possible, which may involve fabrication, design or investigation of a technical problem. The project work involves sufficient work so that students get acquainted with different aspects of manufacturing, design or analysis. The students also have to keep in mind that in final semester they would be required to implement whatever has been planned in the major project in this semester. It is possible that a work, which involves greater efforts and time, may be taken up at this stage and finally completed in final semester, but partial completion report should be submitted in this semester and also evaluated internally. At the end of semester, all students are required to submit a synopsis.

INDUSTRIAL TRAINING (TWO WEEKS)
(IP707)

SCHEME OF STUDIES

Duration: 2 weeks after the VI semester in the summer break, Assessment in VII semester.

1.1 OBJECTIVE OF INDUSTRIAL TRAINING

The objective of undertaking industrial training is to provide work experience so that student's engineering knowledge is enhanced and employment prospects are improved. The student should take this course as a window to the real World of Work and should try to learn as much as possible from real life experiences by involving and interacting with industry staff. Industrial training also provides an opportunity to students to select an engineering problem and possibly an industry guide for their Major Project in final semester. Industrial training of the students is essential to bridge the wide gap between the classroom and industrial environment. This will enrich their practical learning and they will be better equipped to integrate the practical experiences with the classroom learning process.

1.2 LEARNING THROUGH INDUSTRIAL TRAINING

During industrial training students must observe following to enrich their learning: - Industrial environment and work culture. - Organizational structure and inter personal communication. - Machines/ equipment/ instruments - their working and specifications. - Product development procedures and phases. - Project planning, monitoring and control. - Quality control and assurance. - Maintenance system. - Costing system. - Stores and purchase systems. - Layout of Computer/ EDP/MIS centers. - Roles and responsibilities of different categories of personnel. - Customer services. - Problems related to various areas of Work etc. Faculty and TPO are supposed to plan industrial training in such a manner that students get exposure on most of the above arena in the field (world of work). Students are supposed to acquire the knowledge on above by -

1. Observation
2. Interaction with officials at the workplace
3. Study of Literature at the workplace (e.g. User Manual, standards, maintenance schedules, etc.)
4. "Hand's on" experience
5. Undertaking / assisting project work.
6. Solving problems at the work place.
7. Presenting a seminar.
8. Participating in-group meeting/ discussion.
9. Gathering primary and secondary data/ information through various sources, Storage, retrieval and analysis of the gathered data.
10. Assisting officials and managers in their working.
11. Undertaking a short action research work.
12. Consulting current technical journals and periodicals in the library.
13. Discussions with peers.

Jabalpur Engineering College, Jabalpur

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

(AICTE Model Curriculum Based Scheme)

Bachelor of Technology (B.Tech.) VII Semester (Information Technology)

w.e.f. July 2017-18 batch

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	IT701	PCC	Cloud Computing	70	20	10	30	20	150	3	-	2	4
2	IT702	PCC	Information Retrival	70	20	10	30	20	150	3	-	2	4
3	IT703	PCC	Machine Learning	70	20	10	30	20	150	3	-	2	4
4	IT704	PEC	Professional Elective Course-II	70	20	10	-	-	100	3	1	-	4
5	IT705	OEC	Open Elective Course-III	70	20	10	-	-	100	3	1	-	4
6	IT706	PI	Project-II (Problem Formulation & Design)	-	-	-	-	50	50	-	-	4	2
7	IT707	MC	Viva Industrial Training	-	-	-	30	20	50	-	-	2	1
8	IT708	DLC	Self-Learning Presentation (SWAYAM/NPTEL/MOOC)	-	-	-	-	-	-	-	-	-	-
			Total	**350**	**100**	**50**	**120**	**130**	**750**	**15**	**2**	**12**	**23**
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 IT708 for the award of Honours (Minor Specialization) maximum 8 credit can be earned.									

Note: Departmental BOS will decide list of three elective subjects for each PEC /OEC. Industrial training viva shall take place in VII Sem. which students have already done in VI Sem.

Professional Elective Course-II		
S.No.	Subject Code	Subject Name
1	IT704A	Simulation and Modeling
2	IT704B	Advanced Computer Architecture
3	IT704C	Real Time Systems

Open Elective Course-III		
S.No.	Subject Code	Subject Name
1	IT705A	Wireless and Mobile Communication
2	IT705B	Embedded Systems
3	IT705C	Distributed Systems

PEC: Professional Elective (Branch Specific), OEC: Open Elective Course (Interdisciplinary), PCC: Professional Core Course, DLC/PI: Digital Learning Courses/Project and Internship, MC: Mandatory Courses

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

MOOC/DLC Courses	MOOC subjects shall be taken with permission of HOD/Coordinator

Permitted maximum 3 MOOC courses for the award of minor specilization degree.

Jabalpur Engineering College, Jabalpur, M.P.

PROGRAMME: B.Tech. (VII-Semester) AICTE

Information Technology

(w.e.f. July 2017-18 batch)

Subject Code	Subject Title	Maximum Marks allotted						Hours/week			Total Credits
		Theory			Practical		Total Marks	L	T	P	
		End Sem	Mid Sem MST	Quiz Assign ment	End Sem	Lab Work					
IT701	Cloud Computing	70	20	10	30	20	150	3	-	2	4

COURSE CONTENTS

Module I- Cloud Introduction

Cloud Computing Fundamentals . Cloud Computing definition, Types of Cloud, Cloud services: Benefits and challenges of cloud computing, usage scenarios and Appliucations, Business models around Cloud – Major players in Cloud Computing-Issues in Cloud- Eucalyptus Nimbus-Open Nebula, Cloudsim. Challenges in Cloud Computing: Migration, Integration, Proprietary VS Open Sources.

Module II- Cloud Services And File System

BIGDATA : Introduction; Types of Cloud services: Software as a Service- Platform as a Service- Infrastructure as a Service- Database as a Service – Monitoring as a Service – Communication as services, Service providers –Google App Engine, Amazon EC2.Introuduction to MapReduce, HDFS, Hadoop Framework.

Module III- Virtualization For Cloud

Need for Virtualization –pros and cons of Virtualization –Types of Virtualization – System Vm, Process VM, Virtual Machine monitor- Virtual machine properties – Interpretation and binary translation, HLL VM-Hypervisors –Xen, KVM, VMW are Virtual Box, Hyper-V

Module IV - Collaborating with Cloud

Collaborating on Calendars, Schedules and Task Management- Collaborating on Event Management, Contact Management , project Management – Collaborating on word processing, Databases- Storing and Sharing Files- Collaborating via Web- Based Communication Tools- Evaluating Web Mail Services- Collaborating via Social Networks- Collaborating via Blogs and Wikis.

Module V - Security, Standards, And Applications

Security in Clouds: Cloud security challenges- Software as a Service Security, Common Standards: The Open Cloud Consortium- The Distributed management Task Force- Standards for application Developers – Standards for Messaging – Standards for Security, End user access to cloud computing, Mobile Internet devices and the cloud

Course Outcomes:

CO1: To understand the benefits and the challenges of cloud computing.

CO2: To understand the types of cloud services.

CO3: To outline about the need and types of virtualization.

CO4: To discuss collaborating with the cloud.

CO5: To analyze the security challenges and standards for security and application.

COs/POs	1	2	3	4	5	6
1	*					
2	*	*				
3		*		*		
4				*		*
5				*		*

Jabalpur Engineering College, Jabalpur, M.P.

PROGRAMME: B.Tech. (VII-Semester) AICTE

Information Technology

(w.e.f. July 2017-18 batch)

Subject Code	Subject Title	Maximum Marks allotted						Hours/week			Total Credits
		Theory			Practical		Total Marks	L	T	P	
		End Sem	Mid Sem MST	Quiz Assign ment	End Sem	Lab Work					
IT702	Information Retrieval	70	20	10	30	20	150	3	-	2	4

COURSE CONTENTS

Module I

Introduction to Information retrieval - Information retrieval process, Indexing, Information retrieval model, Boolean retrieval model

Dictionary and Postings - Tokenization, Stop words, Stemming, Inverted index, Skip pointers, Phrase queries

Module II

Tolerant Retrieval - Wild card queries, Permuterm index, Bigram index, Spelling correction, Edit distance, Jaccard coefficient, Soundex

Term Weighting and Vector Space Model - Wild card queries, Permuterm index, Bigram index, Spelling correction, Edit distance, Jaccard coefficient, Soundex

Module III

Evaluation - Precision, Recall, F-measure, E-measure, Normalized recall, Evaluation problems

Latent Semantic Indexing - Eigen Vectors, Singular value decomposition, Low rank approximation, Problems with Lexical Semantics

Module IV

Query Expansion - Relevance feedback, Rocchio algorithm, Probabilistic relevance feedback, Query Expansion and its types, Query drift

Probabilistic Information Retrieval - Probabilistic relevance feedback, Probability ranking principle, Binary Independence Model, Bayesian network for text retrieval

Module V

XML Indexing and Search - Data vs. Text-centric XML, Text-Centric XML retrieval, Structural terms

Content Based Image Retrieval - Introduction to content Based Image retrieval, Challenges in Image retrieval, Image representation, Indexing and retrieving images, Relevance feedback

Course Outcomes:

CO1: To familiarize with Information Retrieval and dictionary and postings.

CO2: To understand Tolerant Retrieval Term Weighting and various models.

CO3: To perform various evaluation measures and semantic indexing.

CO4: To get exposure to query processing in IR and probabilistic IR introduction.

CO5: To understand XML and content based IR.

COs/POs	1	2	3	4	5	6
1	*					
2		*				
3		*	*			
4				*		*
5					*	*

Jabalpur Engineering College, Jabalpur, M.P.

PROGRAMME: B.Tech. (VII-Semester) AICTE

Information Technology

(w.e.f. July 2017-18 batch)

Subject Code	Subject Title	Maximum Marks allotted						Hours/week			Total Credits
		Theory			Practical		Total Marks	L	T	P	
		End Sem	Mid Sem MST	Quiz Assign ment	End Sem	Lab Work					
IT703	Machine Learning	70	20	10	30	20	150	3	-	2	4

Module I- Mathematical foundations of machine learning, random variables and probabilities, probability distributions, high-dimensional spaces, overview of machine learning, supervised, semi-supervised, unsupervised learning, inductive and transductive frameworks

Module II- Classification:-Introduction, Decision Tree, The Tree Induction Algorithm, Split Algorithms Based on Information Theory, Split Algorithm Based on the Gini Index, Overfitting and Pruning, Decision Trees Rules..**Cluster Analysis:-** Introduction, Desired Features of Cluster Analysis, Types of Cluster Analysis Methods:- Partitional Methods, Hierarchical Methods, Density-Based Methods,. Quality and Validity of Cluster Analysis Methods. Classification algorithms: linear and non-linear algorithms, perceptrons, logistic regression, naive Bayes, decision trees, neural networks, support vector machines, regression algorithms, least squares linear regression, neural networks, relevance vector machines

Module III- kernel methods, dual representations, RBF networks, graphical models, Bayesian networks, Markov random fields, inference, ensemble methods, bagging, boosting, random forests

Module IV- practical aspects in machine learning, data preprocessing, overfitting, accuracy estimation, parameter and model selection.

Module V- special topics, PAC learning, sample selection bias, learning from graph data, learning from sequential data

Reference Books:

- *Machine Learning*: A Multistrategy Approach by **Ryszard Spencer Michalski, Ryszard Stanislaw Michalski, George Tecuci.**
- Introduction to *Machine Learning by* Ethem Alpaydin.

Course Outcomes:

CO1: To introduce with the mathematical foundation of machine learning.

CO2: To understand and outline various machine learning algorithms and their classification.

CO3: To give insights of the practical aspects in machine learning, data processing and accuracy establishment.

CO4: To discuss about some special topics PAC objects.

COs/POs	1	2	3	4	5	6
1	*					
2		*	*			*
3				*		*
4				*		

Jabalpur Engineering College, Jabalpur, M.P.

PROGRAMME: B.Tech. (VII-Semester) AICTE

Information Technology

(w.e.f. July 2017-18 batch)

Subject Code	Subject Title	Maximum Marks allotted						Hours/week			Total Credits
		Theory			Practical		Total Marks	L	T	P	
		End Sem	Mid Sem MST	Quiz Assign ment	End Sem	Lab Work					
IT704A	Simulation and Modeling	70	20	10	-	-	100	3	1	-	4

COURSE CONTENTS

Module I

Introduction to Modeling and Simulation: Nature of Simulation, Systems , Models and Simulation, Continuous and Discrete Systems, system modeling, Principles used in modeling, Static and Dynamic physical models, Static and Dynamic Mathematical models, concept of simulation, Components of a simulation study. Introduction to Static and Dynamic System simulation, continuous and discrete time simulation. Advantages, Disadvantages and pitfalls of Simulation.

Module II

PROBABILITY CONCEPTS IN SIMULATION: Stochastic variables, discrete and continuous probability functions, Distributed Random numbers, generation of random numbers-Uniform and Non Uniform Random numbers, variance reduction techniques-Introduction, Common Random numbers- Rationale, Applicability and Synchronization.

Module III

Introduction to Queuing Theory: Characteristics of queuing system, Poisson's formula, berth-death system, equilibrium of queuing system, Queuing Disciplines, Simulation of single and two server queue. Analysis of M/M/1 queues. Application of queuing theory in computer system like operating systems, computer networks etc.

Module IV

Discrete-Event Simulation: Components and Organization of a Discrete-Event Simulation Model, Determining the Events and Variables, approaches for time advance. Generation of arrival patterns, Simulation programming tasks, Gathering statistics, Measuring occupancy and Utilization , Recording Distributions and Transit times.

Module V

Introduction to Simulation languages: GPSS: Action times, Succession of events, Choice of paths, Conditional transfers, program control statements. SIMSCRIPT: Organization of SIMSCRIPT Program, Names & Labels, SIMSCRIPT statements.

References:

- Gorden G., System simulation, Printice Hall.
- Law .,Simulation Modeling And Analysis, McGraw Hill
- Payer T., Introduction to system simulation, McGraw Hill.
- Spriet, Computer Aided Modeling and Simulation, W.I.A.
- Sushil, System Dynamics, Wiley Eastern Ltd.
- Shannon R.E., System simulation, Prentice Hall.

Course Outcomes:

CO1: To understand the principles used in modeling.

CO2: To understand the probability concepts used in simulation.

CO3: To give overview of discrete event simulation.

CO4: To introduce simulation languages GPSS, SIMSCRIPT.

CO5: To discuss queuing theory and its applications in computer system.

COs/POs	1	2	3	4	5	6
1	*					
2	*					
3	*		*			
4				*		
5			*			*

Jabalpur Engineering College, Jabalpur, M.P.

PROGRAMME: B.Tech. (VII-Semester) AICTE

Information Technology

(w.e.f. July 2017-18 batch)

Subject Code	Subject 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					
IT704B	Advance Computer Architecture	70	20	10	-	-	100	3	1	-	4

COURSE CONTENTS

Module I

Evolution of Computer Architecture, System Attributes to performance, Multiprocessor and Multi computers, Data and resource dependencies, Hardware & Software Parallelism, Program Partitioning and scheduling, Grain sizes and latency, Grain packing & Scheduling, Static Multiprocessor scheduling, Program flow Mechanisms, Control flow and Data flow, Demand-driven mechanism, Back plane Bus systems, Bus specification, Arbitration, Transaction and interrupt, IEEE future bus + Standards.

Module II

Cache Memory organization, Cache performance issues, Interleaved Memory organizations, Bandwidth and fault tolerance, Memory allocation Schemes. Linear pipeline processors, asynchronous and synchronous Nudels, Speedup, Efficiency and through put. Non-linear pipeline processors, Reservation and latency analysis, Collision free scheduling. Braches handling and Hazard avoidance, Dynamic instruction scheduling, Arithmetic pipeline design, super scalar and super pipeline design.

Module III

Vector computers, Vector instruction types, Vector access Memory schemes, Multi vector Multi processors, Compound vector processing, Static and dynamic Interconnection networks. Cache coherence, Snoopy bus protocols, Directory protocols, Hardware synchronization mechanisms, Message passing mechanisms, Message routing schemes, Deadlock and Virtual channels, Flow control strategies, Multicast reacting algorithms.

Module IV

Principles of scalable performance, Performance metrics and measures, Parallelism profile in programs, Harmonic mean performance, Efficiency, Utilization and quality, Standard performance measures, Application models of parallel computers. Speedup performance laws, Amdahls law for fixed workload, Memory bounded speedup model, Scalability analysis and approaches, Scalability matrix and goals.

Module V

Introduction to parallel programming and parallel programming models, Parallel languages and compilers, dependence analysis of data arrays, Code optimization and scheduling, Loop parallization and pipelining, Parallel program development and environments, Synchronization, Shared variable program structures.

References:

- Kai Hwang, Advance Computer Architecture, McGraw Hill.

Books & References

1. *Computer Architecture - A Quantitative Approach*, 5th edition, John L. Hennessy, David A. Patterson.
2. *Computer Systems Design and Architecture*, 2nd Edition, Vincent P. Heuring
3. *Computer Organization and Architecture*, 6th Edition, William Stallings
4. *Advanced Computer Architectures - A Design Space Approach*, Dezsosima, Terence Fountain, Peter Kacsuk.

Course Outcomes:

CO1: To familiarize with Evolution of Computer Architecture and Program Partitioning.
CO2: To understand Cache Memory organization and Linear pipeline processors.
CO3: To understand Vector computers.
CO4: To get exposure to Principles of scalable performance, metrics and measures.
CO5: To Introduce parallel programming and parallel programming models.

COs/POs	1	2	3	4	5	6
1	*					
2		*				
3		*	*			
4				*		*
5					*	*

Jabalpur Engineering College, Jabalpur, M.P.

PROGRAMME: B.Tech. (VII-Semester) AICTE

Information Technology

(w.e.f. July 2017-18 batch)

Subject Code	Subject Title	Maximum Marks allotted						Hours/week			Total Credits
		Theory			Practical		Total Marks	L	T	P	
		End Sem	Mid Sem MST	Quiz Assign ment	End Sem	Lab Work					
IT704C	Real Time System	70	20	10	-	-	100	3	1	-	4

COURSE CONTENTS

Module I - Introduction

Introduction to UNIX/LINUX, Overview of Commands, File I/O, (open, create, close, lseek, read, write), Process Control (fork, vfork, exit, wait, waitpid, exec).

Module II - Real Time Operating Systems

Brief History of OS, Defining RTOS, The Scheduler, Objects, Services, Characteristics of RTOS, Defining a Task, asks States and Scheduling, Task Operations, Structure, Synchronization, Communication and Concurrency. Defining Semaphores, Operations and Use, Defining Message Queue, States, Content, Storage, Operations and Use.

Module III - Objects, Services and I/O

Pipes, Event Registers, Signals, Other Building Blocks, Component Configuration, Basic I/O Concepts, I/O Subsystem.

Module IV - Exceptions, Interrupts and Timers

Exceptions, Interrupts, Applications, Processing of Exceptions and Spurious Interrupts, Real Time Clocks, Programmable Timers, Timer Interrupt Service Routines (ISR), Soft Timers, Operations.

Module V - Case Studies of RTOS

RT Linux, MicroC/OS-II, VxWorks, Embedded Linux, and Tiny OS.

Textbook

Real Time Concepts for Embedded Systems – Qing Li, Elsevier, 2011

Books & References

1. *Embedded Systems- Architecture, Programming and Design* by Rajkamal, 2007, TMH.
2. *Advanced UNIX Programming,* Richard Stevens
3. *Embedded Linux: Hardware, Software and Interfacing,* Dr. Craig Hollabaugh

Course Outcomes:

CO1: To Introduce UNIX/LINUX.

CO2: To understand Real Time Operating Systems.

CO3: To understand Objects, Services and I/O in RTS.

CO4: To understand exceptions, Interrupts and Timers in RTS.

CO5: To analyze Case Studies of RTOS

COs/POs	1	2	3	4	5	6
1	*					
2		*				
3		*	*			
4				*		*
5					*	*

Jabalpur Engineering College, Jabalpur, M.P.

PROGRAMME: B.Tech. (VII-Semester) AICTE

Information Technology

(w.e.f. July 2017-18 batch

Subject Code	Subject Title	Maximum Marks allotted						Hours/week			Total Credits
		Theory			Practical		Total Marks	L	T	P	
		End Sem	Mid Sem MST	Quiz Assign ment	End Sem	Lab Work					
IT705A	Wireless and Mobile communica tion	70	20	10	-	-	100	3	1	-	4

COURSE CONTENTS

Module I

Introduction of Wireless Networks, Different Generations of Wireless Networks.
Characteristics of the Wireless Medium: Radio Propagation Mechanisms, Path Loss Modelling and Signal Coverage, Effect of Multipath and Doppler, Channel Measurement and Modelling Techniques.

Module II

Introduction to cellular mobile system A basic cellular system, performance criteria, Uniquences of Mobile Radio Environment, Operation of cellular systems, Planning and cellular system, Analog and digital cellular systems. **Elements of cellular radio system design:** General description of the problem, Concept of frequency channels, Co channel interface reduction factor, Cell splitting, Consideration of the components of cellular systems.

Module III

Cell coverage for signal and traffic: General introduction, obtaining the mobile point-to-point mode propagation over water or flat open area, foliage loss, propagation near in distance, long distance propagation, point-to-point prediction model-characteristics, cell site, antenna heights and signal coverage cells, mobile-to-mobile propagation.

Module IV

Introduction to Wireless LAN, Evolution of WLAN, Wireless Home Networking, Technologies for Home Area Network (HAN), Overview of IEEE 802.11, Reference Architecture, PHY and MAC Layer, Wireless ATM, HIPERLAN.

Module V

IEEE 802.15 WPAN, HomeRF, Bluetooth, Interference between Bluetooth and 802.11, Adhoc Networks, Introduction to 2.5 G and 3 G Networks.

References:

1. Kaveh Pahlavan, Prashant Krishnamurthy "principles of Wireless Networks", PHI.
2. Qing- An Zeng, Dharma Prakash Agrawal "Introduction to Wireless and Mobile Systems" CENGAGE Learning.
3. Sumit Kasera, Nishit Narang, A P Priyanka "2.5 G Mobile Networks: GPRS and EDGE", TMH
4. Dr. KAMILO FEHER "Wireless Digital Communications" , PHI
5. Jochen Schiller " Mobile Communications", PEARSON
6.Cellular and Mobile Communication by Lee (McGraw Hill)
7.Wireless Digital Communication by Dr. Kamilo Faher (PHI)

Course Outcomes:

CO1: To compare various wireless systems.

CO2: To understand the cellular mobile system and its problems and its solution.

CO3: To outline the cell coverage for various control modules.

CO4: To give overview of IEEE reference architecture.

CO5: To discuss various generations of mobile wireless technology.

COs/POs	1	2	3	4	5	6
1	*					*
2	*					*
3			*			*
4	*					*
5				*		*

Jabalpur Engineering College, Jabalpur, M.P.

PROGRAMME: B.Tech. (VII-Semester) AICTE

Information Technology

(w.e.f. July 2017-18 batch)

Subject Code	Subject Title	Maximum Marks allotted						Hours/week			Total Credits
		Theory			Practical		Total Marks	L	T	P	
		End Sem	Mid Sem MST	Quiz Assign ment	End Sem	Lab Work					
IT705B	Embedded System	70	20	10	-	-	100	3	1	-	4

COURSE CONTENTS

Module I: Introduction to Embedded System, Categories, Requirements, Applications, Challenges and Issues. Core of Embedded system, Memory, Sensors and Actuators, communication interface, embedded firmware, system components.

Module II: Architecture of 8051 microcontroller, memory organization, registers, interrupts, addressing modes, instruction sets. Interfacing methods parallel I/O interface, Parallel Port interfaces, Memory Interfacing, High Speed I/o Interfacing, Interrupts, interrupt service routing, features of interrupts, Interrupt vector and Priority, timing generation and measurements,

Module III: Fundamental issues of hardware software co-design, computational models in embedded design. **Embedded firmware design approaches**- Embedded firmware development languages- Assembly language based, high level language based, mixed. Programming in embedded C.

Module IV: Embedded System Development Environment: KEIL Integrated Development Environment (IDE), Types of files Generated on Cross-Compilation, Disassembler/Decompiler, Simulators, Emulators and Debugging

Module V: Real Time Operating Systems: Task and Task States, tasks and data, semaphores and shared Data Operating system Services, Message queues, Timer Function, Events, Memory Management, Interrupt Routines in an RTOS environment, Basic design using RTOS.

References:-

- Shibu K V, "Introduction to Embedded System", TMH.
- David E Simon, "An Embedded Software Primer", Pearson education Asia, 2001.
- Steven F. Barett, Daniel J. Pack, "Embedded Systems" Pearson education, First Impression 2008.
- Vahid Frank, Tony Givargis, "Embedded System Design", John Wiley and Sons, Inc.
- Dream Tech Software Team, "Programming for Embedded Systems" Wiley Publishing house Inc.

Course Outcomes:

CO1: To familiarize with Embedded System, Categories, Requirements, Applications

CO2: To understand Architecture of 8051 microcontroller

CO3: To understand Embedded firmware design approaches.

CO4: To get exposure to Embedded System Development Environment

CO5: To study Real Time Operating Systems.

COs/POs	1	2	3	4	5	6
1	*					
2		*				
3		*	*			
4				*		*
5					*	*

Jabalpur Engineering College, Jabalpur, M.P.

PROGRAMME: B.Tech. (VII-Semester) AICTE

Information Technology

(w.e.f. July 2017-18 batch)

Subject Code	Subject Title	Maximum Marks allotted						Hours/week			Total Credits
		Theory			Practical		Total Marks	L	T	P	
		End Sem	Mid Sem MST	Quiz Assign ment	End Sem	Lab Work					
IT705C	Distributed Systems	70	20	10	-	-	100	3	1	-	4

COURSE CONTENTS

Module I

Characterization of Distributed Systems: Introduction, Examples of distributed Systems, Resource sharing and the Web Challenges. **System Models:** Architectural models, Fundamental Models **Theoretical Foundation for Distributed System**: Limitation of Distributed system, absence of global clock, shared memory, Logical clocks, Lamport's & vectors logical clocks, Causal ordering of messages, global state, termination detection.
Distributed Mutual Exclusion: Classification of distributed mutual exclusion, requirement of mutual exclusion theorem, Token based and non token based algorithms, performance metric for distributed mutual exclusion algorithms.

Module II

Distributed Deadlock Detection: system model, resource Vs communication deadlocks, deadlock prevention, avoidance, detection & resolution, centralized dead lock detection, distributed dead lock detection, path pushing algorithms, edge chasing algorithms. **Agreement Protocols**: Introduction, System models, classification of Agreement Problem, Byzantine agreement problem, Consensus problem, Interactive consistency Problem, Solution to Byzantine Agreement problem, Application of Agreement problem, Atomic Commit in Distributed Database system.

Module III

Distributed Objects and Remote Invocation: Communication between distributed objects, Remote procedure call, Events and notifications, Java RMI case study. **Security**: Overview of security techniques, Cryptographic algorithms, Digital signatures Cryptography pragmatics, Case studies: Needham Schroeder, Kerberos, SSL & Millicent. **Distributed File Systems**: File service architecture, Sun Network File System, The Andrew File System, Recent advances.

Module IV

Transactions and Concurrency Control: Transactions, Nested transactions, Locks, Optimistic Concurrency control, Timestamp ordering, Comparison of methods for concurrency control. **Distributed Transactions**: Flat and nested distributed transactions, Atomic Commit protocols, Concurrency control in distributed transactions, Distributed deadlocks, Transaction recovery. Replication: System model and group communication, Fault tolerant services, highly available services, Transactions with replicated data.

Module V

Distributed Algorithms: Introduction to communication protocols, Balanced sliding window protocol, Routing algorithms, Destination based routing, APP problem, Deadlock free Packet switching, Introduction to Wave & traversal algorithms, Election algorithm.**CORBA Case Study**: CORBA RMI, CORBA services

Books:

1. Singhal & Shivaratri, "Advanced Concept in Operating Systems", McGraw Hill
2. Coulouris, Dollimore, Kindberg, "Distributed System: Concepts and Design", Pearson Ed.
3. Ramakrishna,Gehrke," Database Management Systems", Mc Grawhill
6. Tenanuanbaum, Steen," Distributed Systems", PHI
7. Gerald Tel, "Distributed Algorithms", Cambridge University Pres
Gerald Tel, "Distributed Algorithms", Cambridge University Press

Course Outcomes:

CO1: To familiarize with Characterization of Distributed Systems, System Models and Theoretical Foundation for Distributed System.

CO2: To understand Distributed Deadlock Detection, Distributed Mutual Exclusion and Agreement Protocols.

CO3: To understand Distributed Objects and Remote Invocation, Security and Distributed File Systems.

CO4: To get exposure to Transactions and Concurrency Control in Distributed Transactions.

CO5: To understand Distributed Algorithms and CORBA.

COs/POs	1	2	3	4	5	6
1	*					
2		*				
3		*	*			
4				*		*
5					*	*

Jabalpur Engineering College, Jabalpur

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

(AICTE Model Curriculum Based Scheme)

Bachelor of Technology (B.Tech.) VII Semester (Mechanical Engg.)

w.e.f. July 2017-18 batch

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	ME701	PCC	Refrigeration & Air Conditioning	70	20	10	30	20	150	3	-	2	4
2	ME702	PCC	Vibration & Noise Control	70	20	10	30	20	150	3	-	2	4
3	ME703	PCC	Operation Research & Supply Chain	70	20	10	30	20	150	3	-	2	4
4	ME704	PEC	Professional Elective Course-II	70	20	10	-	-	100	3	1	-	4
5	ME705	OEC	Open Elective Course-III	70	20	10	-	-	100	3	1	-	4
6	ME706	PI	Project-II (Problem Formulation & Design)	-	-	-	-	50	50	-	-	4	2
7	ME707	MC	Viva Industrial Training	-	-	-	30	20	50	-	-	2	1
8	ME708	DLC	Self-Learning Presentation (SWAYAM/NPTEL/MOOC)	-	-	-	-	-	-	-	-	-	-
			Total	**350**	**100**	**50**	**120**	**130**	**750**	**15**	**2**	**12**	**23**
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 ME708 for the award of Honours (Minor Specialization) maximum 8 credit can be earned.									

Note: Departmental BOS will decide list of three elective subjects for each PEC /OEC. Industrial training viva shall take place in VII Sem. which students have already done in VI Sem.

Professional Elective Course-II		
S.No.	**Subject Code**	**Subject Name**
1	ME704A	Industrial Robotics
2	ME704B	Product Design
3	ME704C	Gas Dynamics and Jet Propulsion

Open Elective Course-III		
S.No.	**Subject Code**	**Subject Name**
1	ME705A	Renewable Energy Systems
2	ME705B	Artificial Intelligence
3	ME705C	Internet of Things

PEC: Professional Elective (Branch Specific), OEC: Open Elective Course (Interdisciplinary), PCC: Professional Core Course, DLC/PI: Digital Learning Courses/Project and Internship, MC: Mandatory Courses

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

MOOC/DLC Courses	MOOC subjects shall be taken with permission of HOD/Coordinator

Permitted maximum 3 MOOC courses for the award of minor specilization degree.

Jabalpur Engineering College, Jabalpur (M.P)
PROGRAMME: B.Tech. Mechanical Engineering (VII-Semester) AICTE
w.e.f. July 2017-18 batch

Credits: 4	ME701	Refrigeration & Air Conditioning	L: 3, T: 0, P: 2

Course Objective

1. Learn the basic concepts and principles of refrigeration and air conditioning.
2. Learn the fundamental analysis methodology of refrigeration.
3. Learn the basic process and systems of air conditioning.
4. Will apply the course knowledge to do a design project of HVAC system.

Course Content

Module-I

Introduction: Principles and methods of refrigeration, freezing; mixture cooling by gas reversible expansion, throttling, evaporation, Joule Thomson effect and reverse Carnot cycle; unit of refrigeration, coefficient of performance, vortex tube & thermoelectric refrigeration, adiabatic demagnetization; air refrigeration cycles- Joule's cycle Boot-strap cycle, reduced ambient cycle and regenerative cooling cycles.

Module-II

Vapour compression system: Vapor compression cycle, p-h and t-s diagrams, deviations from theoretical cycle, sub-cooling and super heating, effects of condenser and evaporator pressure on cop; multi-pressure system: removal of flash gas, multiple expansion & compression with flash inter cooling; low temperature refrigeration: production of low temperatures, cascade system, dry ice, production of dry ice, air liquefaction system,.

Module-III

(a) **Vapour absorption system**: Theoretical and practical systems such as aqua-ammonia, Electrolux & other systems;
(b) **Steam jet refrigeration**: Principles and working, simple cycle ofoperation, description and working of simple system,
(c)**Refrigerants:** nomenclature & classification, desirable properties, common refrigeration, comparative study, leak detection methods, environment friendly refrigerants and refrigerant mixtures, brine and its properties

Module-IV

Psychometric: Calculation of psychrometric properties of air by table and charts;psychrometric processes: sensible heating and cooling, evaporative cooling, cooling and dehumidification, heating and humidification, mixing of air stream, sensible heat factor; principle of air conditioning, requirements of comfort air conditioning, ventilation standards, infiltrated air load, fresh air load human comfort, effective temperature & chart, heat production & regulation of human body,

Module-V

Air conditioning: Calculation of summer & winter air conditioning load, bypass factor ofcoil, calculation of supply air rate & its condition, room sensible heat factor, grand sensible heat factor, effective sensible heat factor, dehumidified air quantity. Problems on cooling load calculation. Air distribution and ventilation systems

Evaluation:

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

References:

1. Arora CP; Refrigeration and Air Conditioning; TMH
2. Sapali SN; Refrigeration and Air Conditioning; PHI
3. Ananthanarayan; Basic Refrigeration and Air conditioning; TMH
4. Manohar Prasad; Refrigeration and Air Conditioning; New Age Pub
5. Ameen; Refrigeration and Air Conditioning; PHI
6. Pita; Air conditioning Principles and systems: an energy approach; PHI
7. Stoecker W.F, Jones J; Refrigeration and Air conditioning; McGH, Singapore
8. Jordan RC and Priester GB Refrigeration and Air Conditioning, PHI USA

Course Outcomes:

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

CO1	Explain the principles and methods of refrigeration.
CO2	Evaluation of VCRS and Vapor absorption systems and applications.
CO3	Analyze psychrometric properties and processes.
CO4	Elaborate the heating and cooling load for a given AC system.

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

Course Outcomes	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12
CO1	1		2									
CO2	1	3	1									
CO3	1	2	2									
CO4	1	2	1	2								

List of Experiments:

1. General Study of vapor compression refrigeration system.
2. General Study of Ice Plant
3. General Study and working of cold storage
4. General Study Trane Air Condition (Package Type).
5. General Study of Electrolux Refrigeration
6. General Study One tone Thermax refrigeration unit.
7. General Study of Water cooler
8. General Study of Psychrometers (Absorption type)
9. General Study of Leak Detectors (Halide Torch).
10. General Study and working of Gas charging Rig.
11. General Study of window Air Conditioner.
12. General Study and working of Vapor compression Air conditioning Test rig.
13. Experimentation on Cold Storage of Calculate COP & Heat Loss.
14. Experimentation on Vapor compression Air Conditioning test rig.
15. Changing of Refrigerant by using Gas Charging Kit.

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

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

CO1	Evaluate the principles of ice plant and cold storage.
CO2	Analyze the Electrolux Refrigeration system and Psychrometric processes
CO3	Elaborate the working of Gas charging Rig.
CO4	Formulate the problem and solution of window AC.

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

Course Outcomes	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12
CO1	1		2									
CO2	1	2	1		1							
CO3	1	2	2									
CO4	1	2	1	2								

Jabalpur Engineering College, Jabalpur (M.P)
PROGRAMME: B.Tech. Mechanical Engineering (VII-Semester) AICTE
w.e.f. July 2017-18 batch

Credits: 4	**ME702**	**Vibration & Noise Control L: 3, T: 0, P: 2**

Course Objective

1. Learn the basic concepts and principles of vibration in mechanical systems.
2. Learn the fundamental damped free and undamped free vibration.
3. Learn the basic principle of noise engineering.

Course Content

Module-I:

Fundamental Aspects of Vibrations: Vibration, main causes, advantages and disadvantages; engineering applications of vibration and noise; vector method of representing harmonic motion; characteristics of vibration, harmonic analysis and beats phenomenon, work done by harmonic forces on harmonic motion; periodic, non-harmonic functions- Fourier series analysis; evaluation of coefficients of Fourier series; elements of vibratory system; lumped and distributed parameter systems. **Undamped Free Vibrations:** Derivation of differential equation of motion: the energy method, themethod based on Newton's second law of motion, and Rayleigh's method. Solution of differential equation of motion: Natural frequency of vibration. Systems involving angular oscillations: the compound pendulum.

Module-II:

Damped Free Vibrations: Viscous damping: coefficient of damping; damping ratio; underdamped, over damped and critically damped systems; logarithmic decrement; frequency of damped free vibration; Coulomb or dry friction damping; frequency, decay rate and comparison of viscous and Coulomb damping; solid and structural damping; slip or interfacial damping.

Module-III:

Harmonically excited Vibration: One degree of freedom- forced harmonic vibration; vector representation of forces; excitation due to rotating and reciprocating unbalance; vibration Isolation, force and motion transmissibility; absolute and relative motion of mass (Seismic Instruments).

Whirling Motion and Critical Speed: Whirling motion and Critical speed: Definitions and significance. Critical –speed of a vertical, light –flexible shaft with single rotor: with and without damping. Critical speed of a shaft carrying multiple discs (without damping), Secondary critical speed.

Module-IV:

Systems with Two Degrees of Freedom: Un-damped free vibration of 2 d.o.f and Principalmodes of vibration; torsion vibrations; Forced, Un-damped vibrations with harmonic excitation; Coordinate coupling; Dynamic vibration absorber; torsion Vibration Absorber; Pendulum type of dynamic vibration.

Module-V:

Noise Engineering –Subjective response of sound: Frequency and sound dependent humanresponse; the decibel scale; relationship between, sound pressure level (SPL), sound power level and sound intensity scale; relationship between addition, subtraction and averaging, sound spectra and Octave band analysis; loudness; weighting networks; equivalent sound level, auditory effects of noise; hazardous noise, exposure due to machines and equipments; hearing conservation and damage risk criteria, daily noise doze.

Noise: Sources, Isolation and Control: Major sources of noise on road and in industries, noise due toconstruction equipments and domestic appliances, industrial noise control, strategies- noise control at source (with or without sound enclosures), noise control along the path (with or without partitions and acoustic barriers); noise control at the receiver, ear defenders, earplugs, semi-insert protectors.

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

References:

1- Ambekar A.G., 'Mechanical Vibrations and Noise Engineering', PHI.
2- Meirovitch Leonard,'Element of Vibration Analysis', TMH.
3- Dukikipati RV, Srinivas J,'Text book of Mechanical Vibrations', PHI.
4- Kelly SG and kudari SK,'Mechanical Vibrations',Schaum Series, TMH.
5- Thomson , W.T., 'Theory of Vibration with Applications', C.B.S Pub & distributors .
6- Singiresu Rao, 'Mechanical Vibrations', Pearson Education.
7- G.K. Grover, 'Mechanical Vibration', Nem chand and Bross , Roorkee.

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

CO1	Analyze Undamped and Damped free vibration systems.
CO2	Evaluate the two Degrees of Freedom.
CO3	Explain whirling motion and critical speed in Harmonically excited Vibration.
CO4	Evaluate sound pressure level (SPL), sound power level and sound intensity.

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

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

List of experiments:

1. To find out effect of load on natural frequency of vibrations of a lever pin supported at one end carrying adjustable load on a vertical screwed bar and spring supported at some intermediate point (i) When the dead weight of rods is neglected and (ii) when their dead weight is taken into account .
2. To find out frequency of damped free vibration and rate of decay of vibration-amplitude in the system.
3. To find out natural frequency and damped free frequency of a torsion pendulum and, hence to find out coefficient of damping of the oil;
4. To observe the phenomenon of 'whirl' in a horizontal light shaft and to determine the critical speed of the shaft.
5. To observe the mode shapes of a spring-connected, double pendulum and hence to demonstrate the phenomenon of beats.
6. To demonstrate the principle of tuned Undamped Dynamic Vibration Absorber and to determine the effect of mass-ratio (of main and auxiliary mass) on the spread of the resulting

natural frequencies;

7. To take measurements of sound Pressure Level (SPL) and to carry out octave band analysis of a machine using Noise Level Meter.

Evaluation:

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

Course Outcomes:

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

CO1	Analyze Undamped and Damped free vibration systems.
CO2	Evaluate the two Degrees of Freedom and
CO3	Explain whirling motion and critical speed in Harmonically excited Vibration.
CO4	Evaluate sound pressure level (SPL), sound power level and sound intensity

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

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

Jabalpur Engineering College, Jabalpur (M.P)
PROGRAMME: B.Tech. Mechanical Engineering (VII-Semester) AICTE
w.e.f. July 2017-18 batch

Credits: 4 ME703 Operations Research& Supply Chain L: 3, T: 0, P: 2

Course Objective:

The student will be made to learn.

1. To be familiar with all the OR Techniques and optimization methods.
2. To understand the role of logistics in the supply chain within a focal firm as well as between organisations linked within a given supply chain network.
3. To be familiar with various inventory control techniques.
4. Students will get a clear idea of the decision making and meta-heuristic algorithm.

Course Content:

Module-I

Linear system and distribution models: Mathematical formulation of linear systems by LP, solution of LP for two variables, Simplex method, special cases of LP- transportation and assignment model and theirgraphical solution, Vogels Approximation Method (VAM) or penalty method, cell evaluation degeneracy, basics of SW Lindo, Tora, Excel.

Module-II

Supply chain (SCM): Definition, importance, expenditure and opportunities in SCM; integrationof inbound, outbound logistics and manufacturing to SCM, flow of material money and information,difficulties in SCM due to local v/s system wide (global) optimization and uncertainties in demand andtransportation; Bull-whip effect; customer value; IT, info-sharing and strategic partnerships; plant andwarehouse-network configuration; supply contracts and revenue sharing; outsourcing; transportation,cross docking and distribution, forecasting models in SCM; coordination and leadership issues; changeof purchasing role and vendor rating, variability from multiple suppliers.

Module-III

Inventory models: Necessity of inventory in process and safety stock, problem of excess inventory and cycle time, JIT/ Lean Mfg; basics of inventory models with deterministic demand, Classical EOQ Model, ABC, VED and other analysis based on shelf life, movement, size, MRP technique and calculations, lot sizing in MRP, linking MRP with JIT; evolution of MRP to ERP to SCM and e-business.

Module-IV

(a) **Waiting Line Models:** Introduction, Input process, service mechanism, Queue discipline, single server (M/M/1), average length and average time calculations, optimum service rate; basic multipleserver models (M/M/s)

(b) **Competitive strategy:** concept and terminology, assumptions, pure and mixed strategies, two-person zero sumgames, saddle point, dominance, graphical, algebraic and LP methods for solving game theory problems.

Module-V:

(a) **Network Analysis:** Project Planning, Scheduling and Controlling; Project management; Network Techniques and its role in project management, Network logics, Fulkerson's Law, Merits and Demerits of AON Diagrams; Programme Evaluation and Review Technique (PERT), Critical Path Method (CPM), Determination of critical path, Float/Slack.

(b) Meta-heuristics: Definition of heuristic and meta-heuristic algorithms; introduction to Tabu search,Simulated Annealing and Genetic algorithms and solution of traveling salesman, non-linearoptimization problems.

Evaluation:

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

References:

1. Hillier FS and Liberman GJ; Introduction to Operations Research concept and cases; TMH
2. Simchi-Levi, Keminsky; Designing and managing the supply chain; TMH.
3. Srinivasan G; Quantitative Models In Operations and SCM; PHI Learning
4. Mohanty RP and Deshmukh SG; Supply Chain Management; Wiley India
5. Taha H; Operations research; PHI
6. Sen RP; Operations Research-Algorithms and Applications; PHI Learning
7. Sharma JK; Operations Research; Macmillan
8. Ravindran, Philips and Solberg; Operations research; Wiley India
9. Vollman, Berry et al; Manufacturing planning and control for SCM; TMH.
10. Bowersox DJ, Closs DJ, Cooper MB; Supply Chain LogistiMgt; TMH
11. Burt DN, Dobler DW, StarlingSL; World Class SCM; TMH
12. Bronson R;Theory and problems of OR; Schaum Series; TMH
13. George Hadley; Linear programming; Addison Wesley

Course Out Comes:

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

CO1	Formulate linear programming problems.
CO2	Elaborate optimum solution of transportation problems and forecasting in supply chain.
CO3	Determine average queue length and waiting time of queuing models.
CO4	Estimate optimum inventory and cost in inventory models.

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

course outcome	PO 1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	2	2	1								1
CO2	1		3									
CO3	1	1		1								1
CO4	2	1	1									

LIST OF EXPERIMENTS:

1. Use computer and software as Lindo, Tora, and Excelto solve problems contained in the syllabus.
2. Case studies on SCM.
3. Problems on ABC Analysis.
4. Problems onEconomic order quantity.
5. Problems onWaiting Line Models.
6. Problems on Game Theory.

Evaluation:

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

Course Out Comes:

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

CO1	Formulate linear programming problems.
CO2	Determine average queue length and waiting time of queuing models.
CO3	Estimate optimum inventory and cost in inventory models.
CO4	Discuss different decision-making processes and apply various optimization algorithms.

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

course outcome	PO 1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	2	2	1								
CO2	1	1		1								
CO3	2	1	1									
CO4	1	1	1	3								

Jabalpur Engineering College, Jabalpur (M.P)
PROGRAMME: B.Tech. Mechanical Engineering (VII-Semester) AICTE
w.e.f. July 2017-18 batch

Credits: 4 PEC–III ME704A Industrial Robotics	**L: 3, T: 1, P:0**

Course Objective:

1. Introduction and need of industrial robots.
2. End Effectors and Drive systems industrial robots
3. Understanding the basic principle Sensors.
4. Understanding the basic principle robotics programming

Course Content:

Module-I Introduction: Need and importance, basic concepts, structure and classification of industrial robots, terminology of robot motion, motion characteristics, resolution, accuracy, repeatability, robot applications.

Module-II End Effectors and Drive systems: Drive systems for robots, salient features and comparison, different types of end effectors, design, applications.

Module-III Sensors: Sensor evaluation and selection Piezoelectric sensors linear position and displacement sensing, revolvers, encoders, velocity measurement, proximity, tactile, compliance and range sensing. Image Processing and object recognition.

Module-IV Robot Programming: Teaching of robots, manual, walk through, teach pendant, off line programming concepts and languages, applications.

Module-V Safety and Economy of Robots: Work cycle time analysis, economics and effectiveness of robots, safety systems and devices, concepts of testing methods and acceptance rule for industrial robot.

Evaluation:

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

References:

1. Nagrath IJ and Mittal RK; Robotics and Control; TMH
2. GrooverM.P,Weiss M, Nagel,OdreyNG; Industrial Robotics-The Appl; TMH
3. Groover M.P; CAM and Automation; PHI Learning
4. Spong Mark and Vidyasagar; Robot Modelling and control; Wiley India
5. Yoshikava; Foundations of Robotics- analysis and Control; PHI Learning;
6. Murphy; Introduction to AI Robotics; PHI Learning
7. FU KS, Gonzalez RC, Lee CSG; Robotics Control, sensing; TMH
8. Shimon, K; Handbook of Industrial Robots; John Wiley & Sons,
9. Bhupendra Gupta, A text book of Industrial Robotics: Dhanpat Rai Publishing company, New Delhi.
10. GhosalAshitava; Robotics Fundamental concepts and analysis; Oxford
11. Saha S; Introduction to Robotics; TMH 11. Yu Kozyhev; Industrial Robots Handbook; MI

Course Outcomes:

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

CO1	Illustrate the concept of robot and its motion characteristics.
CO2	Identify different types of end effectors and drive systems required for specific applications
CO3	Explain the working of various types of sensors and their applications.
CO4	Develop programming principles and languages for a robot control system

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

Jabalpur Engineering College, Jabalpur (M.P)
PROGRAMME: B.Tech. Mechanical Engineering (VII-Semester) AICTE
w.e.f. July 2017-18 batch

Credits: 4 PEC–III ME704B Product Design	**L: 3, T: 1, P:0**

Course objective:

- Confidence in your own abilities to create a new product.
- Awareness of the role of multiple functions in creating a new product (e.g. marketing, finance, industrial design, engineering, production).
- Ability to coordinate multiple, interdisciplinary tasks in order to achieve a common objective.

Module-I

Basic concepts of engineering products' drawings. Software's applications for preparation of drawings, designs and animations.

Module-II

Creativity, Concept generation – Intuitive / Rational and as per customers choice amongst alternatives. Needs and wants. Products' specifications and product architecture.

Module-III

A brief review of engineering materials and their properties. Concepts of tribology – Friction, Wear and Lubrication

Module-IV

Basic concepts of limits, fits and tolerances in individual components and assemblies. A brief review of process planning, Jigs, Fixtures, manufacturing methods and shop floor practices. Review of drawings and design from industrial and manufacturing aspects. A brief review of quality assessment and control

Module-V

Basic concepts of ergonomics and related proportions. Value Engineering and Value analysis, cost analysis, market impact and feedback data from market to designer. The product life cycle. Intellectual property rights/ Patent procedures and governments' support for export/import substitutions.

Books:

1. K.T.Ulrich and S.D.Eppinger," Product design and development".
2. G.E.Dieter, Engineering Design.
3. Product design – Otto, Wood,

Course Outcomes:

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

CO1	Create 2D & 3D drawing with the help of CAD software.
CO2	Elaborate a set of tools and methods for product design and development.
CO3	Discuss the role of multiple functions in creating a new product (e.g. marketing, finance, industrial design, ergonomics, and production).

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

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

Jabalpur Engineering College, Jabalpur (M.P)
PROGRAMME: B.Tech. Mechanical Engineering (VII-Semester) AICTE
w.e.f. July 2017-18 batch

Credits: 4 PEC –III ME704C Gas Dynamics and Jet Propulsions L: 3, T: 1, P:0

Course Objective:

1. Understanding the gas dynamics and components of turbo engine fundamentals.
2. Understanding the diffusers and nozzles
3. Understanding the basic principle of jet propulsion and thermodynamic cycles.

Course Content:

Module-I: Gas Dynamics of Passive Components of Turbo Engines:
Fundamentals of gas dynamics,Energy equation for a non-flow process - Energy equation for a flow process - The adiabatic energy equation - Momentum Equation - Moment of Momentum equation - Stagnation Velocity of Sound - Stagnation Pressure - Stagnation Density - Stagnation State - Velocity of sound - Critical states – Mach number - Critical Mach number - Various regions of flow.

Module-II: Analysis of Diffusers And Nozzles: Introduction - Study Of Intakes For Subsonic and supersonic engines - Comparison of isentropic and adiabatic processes – Mach number variation - Area ratio as function of Mach numbers - Impulse function - Mass flow rates - Flow through nozzles - Flow through diffusers - Effect of friction - Analysis of intakes for supersonic engines - intakes with normal shock – oblique shocks - Study of special supersonic nozzles and diffusers.

Module-III: Study of Compressors: Design and Analysis of compressors - Classification - analysis of centrifugal compressors - velocity triangles -design of impellers and diffusers - analysis of axial flow compressor - analysis of stage - characterization of stage - design of multistage axial flow compressor – Performances analysis of centrifugal and axial flow compressors.
Gas Dynamics of Combustors: Stoichiometry of combustion - calculation air-fuel ratio – gas dynamics of combustors.

Module-IV: Propulsion
Aircraft Propulsion - introduction - Early aircraft engines - Types of aircraft engines - Reciprocating internal combustion engines - Gas turbine engines - Turbo jet engine - Turbo fan engine - Turbo-prop engine.Aircraft propulsion theory: thrust, thrust power, propulsive and overall efficiencies - Problems.

Module-V: Thermodynamic Analysis of Ideal Propulsion Cycles
Thermodynamic analysis of turbojet engine - Study of subsonic and supersonic engine models - Identification and Selection of optimal operational parameters. Need for further development - Analysis of Turbojet with after burner. Thermodynamic analysis of turbofan engine - Study of subsonic and supersonic systems - Identification and selection of optimal operational parameters. Design of fuel efficient engines - Mixed flow turbo fan engine - Analysis of Turbofan with after burner. Thermodynamic analysis of turbo-prop engine – Identification and selection of optimal operational parameters.

Evaluation:
Evaluation will be continuous and integral part of the class 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. G anesan; 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	1	2	3									
CO3	1	2	3									
CO4	1	2	3									

Jabalpur Engineering College, Jabalpur (M.P)
PROGRAMME: B.Tech. Mechanical Engineering (VII-Semester) AICTE
w.e.f. July 2017-18 batch

Credits: 4 OEC –III ME705A Renewable Energy Systems	**L: 3, T: 1, P:0**

Course Objective:

1. Understanding the solar thermal conversion techniques and photovoltaic conversion of solar energy.
2. Understanding thewind energy conversion systems and wind characteristics curves.
3. Understanding the Biomass conversion systems: biochemical, chemical and thermochemical
4. Understanding the Principle of ocean, Geothermal, Hydrogen energy conversion system and Fuel Cells.

Course Content:

Module-I: SOLAR ENERGY CONVERSION SYSTEMS

Solar Radiation: Introduction to solar energy, Extra-terrestrial and terrestrial, solar constant, radiation measuring instruments.Solar collector, Types of solar collector. Working principle of flat plate solar collectorand concentrating solar collector. Modifications in solar collector.Construction and working principle of solar water heater, solar dryer, solar still, Solar cooling and solar refrigeration. Solar photovoltaic: Principle of photovoltaic conversion system, Construction of PV Cell, Module, Penal, Array,Applications of PVC system.

Module-II : WIND ENERGY CONVERSION SYSTEMS

Metrology of wind: wind and its potential, wind speed distribution, windspeed statistics. Weibull, Rayleigh and Normal distributionof wind. Measurement of wind data, Principle of wind energy conversion system; Classification of WECS, advantages and disadvantages of wind energy conversion system. Discuss thedesign parameters of wind mill. Characteristics curves of wind turbine, Application of wind energy.

Module-III :BIOMASS CONVERSION SYSTEMS

Biomass and its production, Classificationsofbiomass and its potential,Physicochemical characteristics of biomass,Biomass conversion techniques:anaerobic digestion, fermentation, chemical reduction, etc. Biogas production mechanism,Types of digesters, biogas plantparameters,manure-utilization and manure values. Thermal gasification of biomass. Biomass Gasification: working principle and its types, Construction and working principle of gasification.

Module-IV:HYDRO POWERCONVERSION SYSTEMS: Overview of micro, mini and small hydro-power system, potential of hydropower system, Site selection criteria of hydro power systems, working principle of hydro power conversion system, advantages and limitations of hydro-power system. **Ocean thermalEnergy:** Principle of ocean thermal energy conversion system,Ocean wave energyand ocean wave energy conversion system. Tidal energy and its conversion system.

Module-V GEOTHERMAL, HYDROGEN & FUEL CELLS ENERGY: Origin of geothermal resources, Type of geothermal energy deposits, advantages and disadvantages of geothermal energy system.**Hydrogen Energy**: Hydrogenproduction methods, storage, transportation& utilization. **Fuel Cells**: Principle of operation of a fuel cell, classifications, advantages and disadvantages of fuel cell.

Evaluation:

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

References:

1. Kothari, Singal&Rajan; Renewable Energy Sources and Emerging Technologies, PHI Learn
2. Khan, B H, Non Conventional Energy, TMH.
3. Sukhatme S.P. and Nayak, Solar Energy, Principles of Thermal Collection and Storage, TMH.
4. Tiwari and Ghosal, Renewable Energy Resources: basic principle & application, NarosaPubl
5. Koteswara Rao, Energy Resources, Conventional & Non-Conventional, BSP Publication.
6. Chetan Singh Solanki, Solar Photovoltaics: Fundamental, technologies and Application, PHI L
7. AbbasiTanseem and Abbasi SA; Renewable Energy Sources; PHI Learning
8. Ravindranath NH and Hall DO, Biomass, Energy and Environment, Oxford University Press.
9. Duffie and Beckman, Solar Engineering of Thermal Process, Wiley
10. Nikolai, Khartchenko; Green Power; Tech Book International
11. Tester, Sustainable Energy-Choosing Among Options, PHI Learning.
12. Godfrey Boyle, Renewable Energy: Power for a sustainable future, Oxford OUP.

Course Outcomes:

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

CO1	Able to develop the concept of energy conversion systems.
CO2	Develop the models of energy conversion systems.
CO3	Estimation of the energy potential at the site.
CO4	Modify the energy conversion systems for better performance.

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

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

Jabalpur Engineering College, Jabalpur (M.P)
PROGRAMME: B.Tech. Mechanical Engineering (VII-Semester) AICTE
w.e.f. July 2017-18 batch

Credits: 4	OEC –III	ME-705(B) Artificial Intelligence	L: 3, T: 1, P:0

Module-I - Scope of AI Games theorem, natural language processing, vision and speech processing, robotics, expert systems, AI techniques- search knowledge, abstraction.

Module-II Problem solving State space search; Production systems, search space control: depth first, breadth-first search, heuristic search - hill climbing, best-first search, branch and bound. Problem Reduction, Constraint Satisfaction End, Means-End Analysis

Module-III Knowledge Representation Predicate Logic: unification, modus pones, resolution, dependency directed backtracking. Rule based Systems: forward reasoning, conflict resolution, backward reasoning, use of no backtracks. Structured Knowledge Representation: semantic net slots, exceptions and default frames, conceptual dependency, scripts.

Module-IV Handling uncertainty and learning: Non-monotonic reasoning, probabilistic reasoning, use of certainty factors, fuzzy logic, Concept of learning, learning automation, genetic algorithm, learning by inductions, neural network.

Module-V Robotics: Robot Classification, Robot Specification, notation Direct and Inverse Kinematics: Co-ordinates Frames, Rotations, Homogeneous Coordinates

Reference Text books-

1. E. Rich and K. Knight, "Artificial intelligence", MH, 2nd ed., 1992.
2. N.J. Nilsson, "Principles of AI", Narosa Publ. House, 2000.
3. Robin R Murphy, Introduction to AI Robotics PHI Publication, 2000
4. D. W. Patterson, "Introduction to AI and Expert Systems", PHI, 1992.
5. R. J. Schalkoff, "Artificial Intelligence - an Engineering Approach", McGraw Hill Int. Ed., Singapore, 1992.

17/7/20

6. George Lugar, .Al-Structures and Strategies for and Strategies for Complex Problem solving, 4/e, 2002, Pearson Educations.

Jabalpur Engineering College, Jabalpur (M.P)
PROGRAMME: B.Tech. Mechanical Engineering (VII-Semester) AICTE
w.e.f. July 2017-18 batch

Credits: 4	OEC–III	ME-705(C) Internet of things	L: 3, T: 1, P:0

Module-I – INTRODUCTION Internet of Things Promises–Definition– Scope–Sensors for IoT Applications–Structure of IoT– IoT Map Device

Module-II - SEVEN GENERATIONS OF IOT SENSORS TO APPEAR Industrial sensors – Description & Characteristics–First Generation – Description & Characteristics–Advanced Generation – Description & Characteristics–Integrated IoT Sensors – Description & Characteristics–Polytronics Systems – Description & Characteristics–Sensors' Swarm – Description & Characteristics–Printed Electronics – Description & Characteristics–IoT Generation Roadmap

Module-III - TECHNOLOGICAL ANALYSIS Wireless Sensor Structure–Energy Storage Module–Power Management Module–RF Module–Sensing Module

Module-IV -IOT DEVELOPMENT EXAMPLES ACOEM Eagle – EnOcean Push Button – NEST Sensor – Ninja Blocks -Focus on Wearable Electronics

Module-V - PREPARING IOT PROJECTS Creating the sensor project - Preparing Raspberry Pi - Clayster libraries - HardwareInteracting with the hardware - Interfacing the hardware- Internal representation of sensor values - Persisting data - External representation of sensor values - Exporting sensor data - Creating the actuator project- Hardware - Interfacing the hardware - Creating a controller - Representing sensor values - Parsing sensor data - Calculating control states - Creating a camera - Hardware -Accessing the serial port on Raspberry Pi - Interfacing the hardware - Creating persistent default settings - Adding configurable properties - Persisting the settings - Working with the current settings - Initializing the camera

REFERENCES

1. Dr. Guillaume Girardin , Antoine Bonnabel, Dr. Eric Mounier, 'Technologies & Sensors for the Internet of Things Businesses & Market Trends 2014 - 2024',Yole Développement Copyrights ,2014
2. Peter Waher, 'Learning Internet of Things', Packt Publishing, 2015
3. Editors OvidiuVermesan Peter Friess,'Internet of Things – From Research and Innovation to Market

4. Deployment', River Publishers, 2014
5. N. Ida, Sensors, Actuators and Their Interfaces, Scitech Publishers, 2014.