Chhattisgarh Swami Vivekanand Technical University, Bhilai

SCHEME OF TEACHING AND EXAMINATION

B.E. VII SEMESTER MECHATRONICS ENGINEERING

S. No.	Board Of Study	Sub. Code	Subject	Periods Per Week			Scheme Of Exam Theory/Practical			Total Marks	Credit L+(T+P)/2
				L	T	P	ESE	CT	TA		
1.	Mech. Engg.	337713 (37)	CAD/CAM	4	1	-	80	20	20	120	5
2.	Mech. Engg.	337755(37)	Numerical Control of Machine Tools	4	1	-	80	20	20	120	5
3.	Electronics and Telecom	367711 (28)	Digital Design with HDL	4	1	-	80	20	20	120	5
4.	Mech. Engg.	337711 (37)	Automobile Engg.	4	1	-	80	20	20	120	5
5.	Refer Table 2		Professional Elective 2	4	1	-	80	20	20	120	5
6.	Electronics and Telecom	367721 (28)	Digital Design with HDL Lab	-	-	3	40	-	20	60	2
7.	Mech. Engg.	337723 (37)	CAD/CAM Lab	-	-	3	40	-	20	60	2
8.	Mech. Engg.	337721 (37)	Automobile Engg. Lab	-	-	3	40	-	20	60	2
9.	Mech. Engg.	367722 (37)	Minor Project	-	-	3	100	-	40	140	2
10.	Management	300725 (36)	Innovative and Entrepreneurial Skills	-	-	2	-	-	40	40	1
11.	Mech. Engg.	367723 (37)	**Practical Training Evaluation/Library	-	-	1	-	-	40	40	-
			Total	20	5	15	620	100	280	1000	34

L – Lecture, T – Tutorial, CT- Class Test,
P – Practical, ESE- End Semester Exam, TA – Teacher's Assessment
**To be completed after VI Sem. and before the commencement of VII Sem.

Table – II Professional Elective- II			
S.No.	Board of Studies	Code	Name of Subject
1	Mechanical	337751(37)	Quality Control & Total Quality Management
2	Mechanical	337752(37)	Reliability Based Design
3	Mechanical	337714(37)	Operations Research
4	Electronics and Telecom	328751(28)	Electronic Instrumentation and Automation
5	Electronics and Telecom	328753(28)	Consumer Electronics
6	Electronics and Telecom	328757(28)	Artificial Intelligence and Expert Systems

Note : 1/4th of total strength of students subject to minimum of twenty students is required to offer an elective in the college in a particular academic session.

Note : Choice of elective course once made for an examination cannot be changed for future

Chhattisgarh Swami Vivekanand Technical University, Bhilai (C G)

Semester: B.E. VII Sem.
Subject: Computer Aided Design and Manufacturing
Total Theory Periods: 50
Total Marks in End Semester Exam: 80
Minimum number of class tests to be conducted: 2

Branch: Mechanical Engg., Mechatronics Engg.
Code: 337713 (37)
Total Tutorial Period: 12

UNIT – I
Introduction CAD/CAM
The influence of computers on manufacturing environment, Introduction of CAD/CAM, the product cycle & CAD/CAM, automation and CAD/CAM, the common database as linkage to various computerized applications. Product engineering, Benefits of CAD/CAM, Concurrent engineering.

UNIT – II
Geometric Modeling
Data base: Design database concept, objectives, data structures, creation of data files in application programs and relational database management system.
Requirement of Geometric Modeling, Geometric models, Geometric construction Methods, other modeling methods, curve representation, desirable modeling facilities & rapid prototyping.
3D representation of surfaces and solids; Plane surface, surfaces of revolution, Bezier surfaces, spline surfaces,Solid entities, basic set theory.

UNIT – III
Numerical Control
Introduction to Numerical Control, Basic components of an NC system, the NC procedure, NC coordinate systems,
NC motion control systems, applications of Numerical Control, Introduction to Computer Control in NC, problems with conventional NC, Computer Numerical Control, Direct Numerical Control, Combined DNC/CNC system, Adaptive control machining system,
NC Part Programming
Introduction to NC Part Programming, Manual part programming, Computer assisted part programming, the APT (Automatically Programming Tool) language, MACRO statement in APT, Advantages of CAD/CAM in NC programming.

UNIT – IV
Group Technology
introduction to group technology, part families, parts classification & coding, three parts classification & coding system, group technology machine cells, benefits of group technology
Computer integrated manufacturing (CIM) system
Introduction of CAPP, Flexible manufacturing system, benefits.

UNIT V
Finite Element method
Introduction, types of analysis, general procedure of finite element analysis- stiffness matrix, solution procedure, one dimensional problem.
TEXT BOOKS
1. CAD/CAM Principles & Applications – P.N. Rao – TMH Publication
2. CAD/CAM Computer Aided Design & Manufacturing – Mikell P. Groover, Emory W. Zimmer - Pearson Education
3. Concept and application of Finite element analysis, R D Cook, John Wiley

REFERENCES BOOKS
1. CAD/CAM Theory & Practice – Ibrahim Zied – TMH Publication
2. CAD/CAM – Surendra Kumar & A.K. Jha – Dhanpat Rai & Company
3. Finite element analysis

Semester: B.E. VII Sem.
Subject : Numerical Control of Machine Tools
Total Theory Periods: 50
Total Marks in End Semester Exam: 80
Minimum number of class tests to be conducted: 2

Branch: Mechanical Engg., Mechatronics Engg.
Code: 337755 (37)
Total Tutorial Period: 12

UNIT - I
Introduction
Fundamentals of numerical control, advantages limitations of N.C systems -classification of N.C systems.
Computer Numerical Control
Nomenclature, types and features of CNC machine tools. Machine control unit. Position control and its significance. Engineering analysis of NC positioning systems. Open loop and closed loop systems. Precision in NC positioning systems: control resolution, accuracy and repeatability. Actuators: servomotors, stepper motors, transducers and feedback elements.

UNIT - II
Features of N.C. Machine tools
Design consideration of N.C machine tools - increasing productivity with N.C machines, tooling for CNC machine.
System Device
Feed back system-counting devices digital analog converters
Interpolations
DDA integrators, simple and symmetrical DD reference word CNC interpolators.

UNIT - III
Part Programming
Process planning and flow chart for part programming. systems, nomenclature and tool geometries. Tool presetting & Modular Tooling. Selection of tools based on machining capacity, accuracy and surface finish. Elements of programming for turning and milling. part programming. Preparatory codes G, Miscellaneous functions M.
Interpolation, Tool compensations, cycles for simplifying programming. Typical part programming
Control Loops for N C Systems
Introduction-control loops for point and counting systems.

UNIT - IV
Computerized Numerical Control
CNC concepts-advantage of CNC reference planes, sampled data techniques, microcomputers in CNC.
Adaptive Control Systems
Adaptive control with optimization, and constraints-variable gains AC systems.

UNIT - V
Modern CNC machines
CNC lathes. Turning centers. Machining centres. Automatic pallet changers. Automatic tool changers. Direct numerical control and applications. CNC machine design features.

TEXT BOOKS
1. Automation, Production Systems and Computer Integrated Manufacturing - Mikell P. Groover - PHI, 2001.
2. CNC Programming - S.K. Sinha - Galgotia Publications 2003.

REFERENCE BOOKS
1. HMT Mechatronics - Tata McGraw Hill
2. Numerical Control of Machine Tool by Urie and Koren

Chhattisgarh Swami Vivekanand Technical University, Bhilai (C G)

Semester: B.E. VII Sem.
Subject: Automobile Engineering
Total Theory Periods: 50
Total Marks in End Semester Exam: 80
Minimum number of class tests to be conducted: 2

Branch: Mechanical Engg., Mechatronics Engg.
Code: 337711 (37)
Total Tutorial Period : 12

UNIT-I
Chassis & Frame - Layout of chassis & its main components, types of frames, conventional frames & unitized chassis.
Suspension system & Springs -Objects & principles of suspension, system, types, rigid axle suspension & Independent suspension for front & rear ends, simple & double arm parallel & perpendicular type of suspension system. Gas filled suspension system.
Springs - Purpose, types viz. leaf, coiled, rubber, air, suspension system, torsion bar, stabilizer, Telescopic damper.

UNIT – II
Clutches
Characteristics, functions, principles of operation of clutch, friction clutch, single plate, multi plate, centrifugal clutch,positive clutch, friction plate clutch lining materials. Torque transmitted and related problems.
Fluid flywheel
Construction, principles of working & characteristics.

UNIT – III
Gear Box: Object of Gear Box, Air, rolling & gradient resistance, tractive effort variation with speed, performance curve.
Types of Gear Boxes:- Sliding mesh, constant mesh, synchromesh device, automatic transmission, overdrive, lubrication of gear box.
Torque converter: Principles of working, characteristics, Torque converter with direct drive.
Testing of automobiles.

UNIT – IV
Universal Joint-: Types, propeller shaft, slip joint.
Differential – Functions, single & double reduction differential, limited slip differential.
Front Axle: Live & dead axle, stub axle.
Back Axle: Hotch kiss drive, torque tube drive.
Tyres: Types specification, causes of tyre wear & rim.
Brakes & Braking system: Purpose, principles, layout of braking system. Classification, mechanical, hydraulic,master cylinder, Tandoma master cylinder wheel cylinder, self energizing & self adjusting brakes, disc brakes,antiskid brakes.power operated brakes:

UNIT – V
Steering system:- Gear & links, types of steering gears, reversibility of steering, center point steering, steering geometry viz castor, camber, king pin inclination toe in, toe out, cornering power, under-over steer; power steering,effect of shimmy, condition of true rolling, calculation of turning radius. Correct steering equation and related problems.
Electrical System: Battery construction, maintenance, testing and charging, cut out, lighting circuit, horn, signals etc.

TEXT BOOKS
1. Automobile Engineering – Kripal Singh – Standard Publications
2. Automobile Engineering – G.B.S. Narang – Khanna Publishers

REFERENCE BOOKS
1. Automobile Engineering - Dr. N. K. Giri – Khanna Publishers
2. Automobile Engineering – K. R. Govindan – Anuradha Agencies
3. Automotive Mechanics – Heitner
4. Motor Vehicle – Newton & Steeds – Life & Sons Limited.

Chhattisgarh Swami Vivekanand Technical University, Bhilai (C G)

Semester: B.E. VII Sem.
Engg Subject: Quality Control & Total Quality Management
Total Theory Periods: 50
Total Marks in End Semester Exam: 80
 Minimum number of class tests to be conducted: 2

Branch: Mechanical Engg., Mechatronics
Code: 337751 (37)
Total Tutorial Period: 12

UNIT-I
Basic Concept of Quality
Quality and quality control, concept of quality, quality characteristics, Quality of design and quality of conformance,History of quality control, Quality policy and objectives, Economics of quality.

Statistical Concept of Variation
Concept of variation frequency distribution, continuous and discrete, probability distributions viz. Normal, Exponential and weibull distribution, pattern of variation, significance tests, Analysis of variance, statistical aids in limits and tolerances.

UNIT-II
Quality Assurance
Concept, advantages, field complaints, quality rating, quality audit, inspection planning, quality mindness, quality budget, vendor quality rating (VQR), vendor rating (VR), manufacturing planning for quality, Quality Function Deployment (QFD).

Statistical Quality Control
Objectives, Growth and applications of S.Q.C.,S.O.C, Techniques in manufacturing planning. Process capability analysis, Control charts for variables and attributes and their analysis, process capability, concept of six sigma.

UNIT III
ACCEPTANCE SAMPLING
Fundamental concept in acceptance sampling, operating characteristics curve. Acceptance plans, single, double and introduction of multiple plans, LTPD, AOQL, AOQ.

UNIT I V
Total Quality Management
Total Quality Control (TQC), Concept of Total Quality Management (TQM), TQM philosophies, Deming approach to TQM, Juran ten steps to Quality Management, Taguchi Philosophy, Crosby fourteen steps, TQM models, Tools and techniques of TQM,

UNIT V
Quality system
Quality system, need for quality system, ISO 9000 Quality Management Standards, ISO 9000:2000 requirement,Quality Auditing, ISO 14000, Benefits of ISO 14000.

TEXT BOOKS
1. Quality Planning and Analysis by Juran J.M. and Gryana FM. – McGraw Hill, New York
2. Statistical Quality Cntrol – R.C. Gupta – Khanna Publishers, Delhi
3. Statistical quality control – E. L. Grant and R. S. Leavenworth – Mc. Graw Hill, New York

REFERENCE BOOKS
4. Engineering Statistics and quality control – I. W. Burr, Mc. Graw Hill, New York
5. Managing for Total quality from Deming to Tguchi and SPC. - Logothetis – Prentice Hall of India
6. Statistical Quality Control – M. Mahajan – Dhanpat Rai & Company – New Delhi

Chhattisgarh Swami Vivekanand Technical University, Bhilai (C G)

Semester: B.E. VII Sem. **Branch: Mechanical Engg., Mechatronics Engg.**
Subject: Reliability Based Design **Code: 337752 (37)**
Total Theory Periods: 50 **Total Tutorial Period: 12**
Total Marks in End Semester Exam: 80
Minimum number of class tests to be conducted: 2

UNIT - I
Basic concepts in probability theory:
Probability of events and random variables; discrete distributions: Poisson and Binomial, continuous distributions:Exponential, Weibull, Normal and Lognormal distributions

UNIT - II
System reliability:
Series, parallel, standby redundant and 'out-of' systems; static and dynamic reliability models

UNIT - III
Probabilistic models:
Load (stress) and capacity (strength) variables, load-capacity analysis (Stress-Strength Interference Theory)
Probabilistic design methodology:
Interference theory, calculation of reliability of with stress and strength having exponential, normal, lognormal, Gamma and Weibull distributions

UNIT - IV
Reliability and rates of failure:
Reliability characterization and failure rates, bath tub curves, constant failure rate models, conditional probability of survival of a device, increasing failures rate models

UNIT- V
Reliability testing and data analysis:
Non-parametric methods; grouped and ungrouped data, ungrouped and grouped censored data
Reliability data analysis; parametric methods, parameters estimation using linear regression of transformed data, accelerated life testing

TEXT BOOKS
1. Introduction to Reliability Engineering, 2nd Edition - Elmer E. Lewis - John Wiley & Sons, Inc.
2. Mechanical Engineering Design, 5th Edition- J. E. Shigley and C. R. Mischke - McGraw-Hill

REFERENCE BOOKS
1. Optimisation for Engineering Design - Kalyanmoi Deb- Prentice Hall India
2. Optimisation Concepts and Applications in Engineering - Ashok Belegundi, T Chandrauptala -Pearson education
3. Optimisation Theory and Applications – S.S. Rao - Wiley Eastern Ltd
4. Reliability in Design - Kapoor K.C.

Chhattisgarh Swami Vivekanand Technical University, Bhilai (C G)

Semester: B.E. VII Sem.   **Branch: Mechanical Engg., Mechatronics Engg.**
Subject: Operations Research   **Code: 337714 (37)**
Total Theory Periods: 50   **Total Tutorial Period: 12**
Total Marks in End Semester Exam: 80
Minimum number of class tests to be conducted: 2

UNIT I
Introduction
Various stages of O.R., Fields of application, optimization and its classification.
General Linear Programming Problems- Introduction, maximization and minimization of function with or without constraints, formulation of a linear programming problem, graphical method and simplex method, Big M method degeneracy, application of L.P.P. in Mechanical Engineering.

UNIT – II
The Transportation Problems
Mathematical formulation computational procedures, Stepping stone method, Modified Distribution Method, Vogels Approximation Method, Solution of balanced and unbalanced transportation problems and case of Degeneracy.
The Assignment Problems
Mathematical formulation of assignment problems, solution of assignment problems, traveling salesman problems,Air crew Assignment problems.

UNIT - III
Waiting Line Theory
Basic queuing process, basic structure of queuing models, some commonly known queuing situations Kendall's service time, solution to M/M/1: $\Box$ /FCFS models.
Network Analysis
CPM/PERT, Network Representation, Techniques for drawing network. Resource smoothing and leveling, project cost, Optimum project duration, project crashing, updating, Time estimation in PERT.

UNIT – IV
Game Theory
Introduction, two person zero sum game, methods for solving two person zero sum game: when saddle point exists,when no saddle point exists, solution of 2xn and mx2 game.
Simulation
Basic concept of simulation, applications of simulation, merits and demerits of simulation, Monte Carlo simulation,simulation of Inventory system, simulation of Queuing system.

Note: Four questions to be set, one from each unit.

TEXT BOOKS
1. Operation Research , Sasien Yaspan
2**.** Operation Research – N. D. Vohra – TMH
3. Operation Research– Hira & Gupta – S. Chand & Co.
REFERENCES
1. Operation Research – H. Gillette – TMH, New Delhi
2. Operations Research – M. Taha – TMH, New Delhi
3. Fundamentals of Operation Research – Ackof Sasieni – Dhanpat Rai & Sons
4. Quantitative Approach to Management – Lovin and Krit Patrick – TMH
5. Operation Research– S.D. Sharma – S. Chand & Com. New Delhi

Chhattisgarh Swami Vivekanand Technical University, Bhilai (C G)

Semester: B.E. VII Sem.
Subject: Electronic Instrumentation & Automation
Total Theory Periods: 40
Total Marks in End Semester Examination: 80
Minimum number of Class tests to be conducted: Two

Branch: Mechanical Engg., Mechatronics Engg.
Code: 328751 (28)
Total Tutorial Periods: 12

UNIT: I
Instrument Errors & Error Reduction : Errors and their statistical behavior, Types of errors, Statistical analysis of data, Probability of errors. Limiting errors, Error reduction using intelligent instruments.
Recorders: Single and Multivariable recorders, Servo recorders, Potentiometric Recorders, X-Y recorders, Paper-less recorders, Magnetic Tape recorders, Digital recorders and recording process.

UNIT: II
Instrument Displays: Special Oscilloscopes: Oscilloscope controls, Sampling oscilloscope. Analog & Digital Storage oscilloscope. Dual channel and dual trace oscilloscope. Displays: Digital displays: LED and LCD and displays based on them, Plasma displays, TFT Displays

UNIT: III
Voltage and Current Measurements: Digital Voltmeters: Non-Integrating type, Integrating Type, Using counting circuits, Principles of AC voltage measurement: Average and Peak responding detectors, Peak to Peak detector, Root mean square detectors, DC and AC probes, Basic Hand-held Multimeter, Bench type Digital Multimeters, Comparison of Analog and Digital Multimeters, Digital LCR meters.

UNIT: IV
Frequency & Power Measurement: Bolometer method. Calorimeter method.
Frequency Measurement: Basic Frequency Meter, Spectral analysis, Swept superheterodyne frequency analyzer, Harmonic Mixing, Multifilter Real Time Spectrum Analyzer, Digital Spectrum Analyzer, Audio Analyzer, Modulation Analyzer.

UNIT: V
Advanced Topics in Instrumentation: Telemetry: Various types of Telemetry, Principles of Telemetry, Telemetry Equipment, Basics of - Data Loggers, Data Acquisition Systems, Distributed Control Systems, Programmable Logic Controllers.

TEXT BOOKS
1. Electronic and Electrical Measurement and Instrument: Sawhney: Dhanpat Rai & sons.
2. Modern Electronic Instrumentation and Measurement Techniques: Cooper & Helfrick, Pearson Education.

REFERENCE BOOKS
1. Industrial Control & Instrumentation, W. Bolton, University Press.
2. Electronic Measurements and Instrumentation: Oliver and Cage: TMH.
3. Electronic Instrumentation, H.S. Kalsi, 2nd Ed., TMH.

Chhattisgarh Swami Vivekanand Technical University, Bhilai (C G)

Semester: B.E. VII Sem.
Subject: Consumer Electronics
Total Theory Periods: 40
Total Marks in End Semester Examination: 80
Minimum number of Class tests to be conducted: Two

Branch: Mechanical Engg., Mechatronics Engg.
Code: 328753 (28)
Total Tutorial Periods: 12

UNIT I
Audio Input Equipments: Microphones: characteristics, Types – Carbon, Crystal Dynamic, Ribbon, Capacitor, Electret, Gun, Lavalier, Tie-clip, Wireless, Dual-unit. Headphones and Headsets: Types - Movingiron,Crystal, Dynamic, Electrostatic, Electret. Hearing Impairments, Audiometry, Hearing Aids - internals,controls, filters, AGC.

UNIT II
Audio Output Equipments and Acoustics Fundamentals: Ideal Loudspeaker, Basic Loudspeaker, Types: Crystal, Electrostatic, Dynamic Loudspeakers, Permanent Magnet. Loudspeaker construction, Permanent magnet, Voice Coil, Loudspeaker impedance, Acoustic Impedance and Resonance, Woofers, Mid-range and Extended range Loudspeakers, HF Loudspeakers, Tweeters: Cone-type, Dome type, Horn type. Hi-Fi, Multispeaker Systems, Crossover Networks, Impedance Matching. Speaker Baffles and enclosures, Acoustic doublets, baffles, Infinite Baffle systems, Bass-reflex systems, Acoustic Labyrinth Systems, Folded-Horn Systems, Corner folded Horn Systems. Acoustics: Reflection of sound, Reverberation, Absorption of Sound, Sabin's Equation, Listening Room Characteristics, Live Rooms, Dead Rooms, Absorbent Materials, Acoustic Design of Auditoriums, Acoustics of Studios, Sound Insulation, Noise. Commercial sound: Electric Guitar, Electric Wind Instruments, Recording, Manual Synthesizer, Programmed Synthesizer, PA System, planning, speaker matching, characteristics, amplifiers, Megaphones, Intercommunication Equipment, Background Music and Paging Systems, Anatomy of Hi-Fi System, Source Units, Signal Propagation, Signal Multiplex, Compatibility, Theatre Sound System: Sound Track, Types of Sound Film, Theatre Sound Reproduction Systems, Working of a Projector, Sound Pick-up, Cine Screens, DTS and Dolby Systems for Theatres, Satellite relay system

UNIT – III
Musical Equipments: Portable Stereo: Eight-Track System, Stereo Car-cassette player, Auto-reverse Car Stereo Player, Car-Cassette Stereo Player with Auto-eject and Fast-Forward, Rewind System. Electronic Music Synthesizers: Typical Generators, Basic Modifiers, Voltage Control, Envelop Generator, Other Signal Modifiers. Set-Top Boxes: Interoperable Set-top boxes, Middleware for Set-top boxes.

UNIT – IV
Multipurpose Equipments: Facsimile, Xerography: Xerographic Process, Extension to a dynamic copier, Calculators: Structure, internal organization. Digital Clocks: Working, LSI Digital Clocks, In-Car Computers: Applications, Electronic Ignition, Electronic Ignition Lock System, ABS, ECS, Instrument Panel Displays, Ultrasonic Car Safety Belt System, Air Bag System, Vehicle Proximity Detection System, Car Navigation Systems – Travel Pilot and AVIC-1

UNIT – V
Domestic Equipments: Microwave Ovens: Microwave Oven Block Diagram, LCD Timer with alarm, Singlechip Controllers, Types of Microwave Ovens, Wiring and Safety, Operating Problems, Care and cleaning.
Washing Machines: Electronic Controller for Washing Machines, Washing Machine Hardware, Washing Cycle,Hardware and Software development, Types of Washing Machines, Fuzzy Logic Washing Machines, Air conditioners and Refrigerators: Air Conditioning, Components of Air Conditioning Systems, All-weather and All-air Air Conditioning Systems, Remote Control Buttons, Combination Systems, Unitary and Central Air Conditioning Systems, Split Air Conditioning Systems, Refrigeration, refrigerants, Refrigeration Systems, Domestic refrigerators.

TEXT BOOKS
Consumer Electronics, Bali S.P., Pearson Education

REFERENCE BOOKS

K. Blair, Benson "Audio Engineering Hand book"

Chhattisgarh Swami Vivekanand Technical University, Bhilai (C G)

Semester: B.E. VII Sem.
Subject: Artificial Intelligence & Expert System
Total Theory Periods: 40
Total Marks in End Semester Examination: 80
Minimum number of Class tests to be conducted: Two

Branch: Mechanical Engg., Mechatronics Engg.
Code: 328757 (28)
Total Tutorial Periods: 12

UNIT – I
Overview of AI : What is AI? The importance of AI, Early works in AI, AI and Related fields. Knowledge: Importance of Knowledge, knowledge-based system representation, organization, manipulation, acquisition.

UNIT – II
Search Techniques: Problem Solving, State space search, Blind search: Depth first search, Breadth first search, informed search: Heuristic search, Hill climbing search, Best first search, A*, AO*, Constraint satisfaction. Game Playing: Minimax search, Alpha – beta pruning.

UNIT – III
Knowledge Representation: Predicate Logic (well formed formulas, quantifiers, Prenex Normal Form, Skolemization , Unification, Modus pones, Resolution refutation – various strategies), Rule Based Systems (Forward reasoning: Conflict resolution, Conflict resolution, backward reasoning: Use of No. Backtracking, Structured Knowledge Representations (Semantic Net: slots, inheritance, Frames: exceptions and defaults handling. Conceptual Dependency formalism, Object oriented representations.

UNIT – IV
Handling uncertainty: Probabilistic reasoning: Bayes Net, Dempster Shafer Theory, Use of certainty Factors, Fuzzy Logic, Non monotonic reasoning, Dependency directed backtracking, Truth maintenance systems, Learning : Concept of learning, Learning automation, The Genetic algorithm, Learning by induction, Neural Networks: Hopfield Networks, Perceptrons- Learning algorithm, Back propagation Network, Boltzman Machine, Recurrent Networks.

UNIT – V
Planning: Components of Planning System, Plan Generation Algorithms: Forward state propagation, Backward state propagation, Nonlinear planning using constraint posting, Natural Language Processing: Syntactic analysis, Top down and bottom up parsing, Augmented Transition Networks, Semantic analysis,case grammars.
Expert System: Need and Justification for expert systems- cognitive problems, Expert System Architectures(Rule based systems, Non production system, knowledge acquisition, Case studies: MYCIN , R1.

TEXT BOOKS
1. Artificial Intelligence By Elaine Rich and Kevin Knight , Tata McGraw Hill.
2. Introduction to AI and Expert Systems By Dan W.Patterson, PHI.

REFERENCE BOOKS
1. Principles of Artificial Intelligence By Nils J.Nilsson, Narosa Pub. house.
2. Foundation Artificial Intelligence & Expert Systems by VS Janakiraman K, Sarukesi P Gopalakrishnan Macmillan series in computer science

Chhattisgarh Swami Vivekanand Technical University, Bhilai (C G)

Semester: B.E. VII Sem.   **Branch: Mechanical Engg., Mechatronics Engg.**
Subject: Computer Aided Design & Manufacturing (Lab)   **Lab Code: 337723 (37)**
Total Practical Periods: 40
Total Marks in End Semester Exam: 40

EXPERIMENTS TO BE PERFORMED

CAD (MINIMUM FIVE EXPERIMENTS)
1. Introduction & different features of the CAD Software
2. 2-D Drafting
3. 3-D Modeling
4. 3-D Advanced Modeling
5. Assembly modeling
6. Feature Modification and Manipulation
7. Detailing
8. Sheet Metal Operations
9. Surface Modeling
10. One Dimensional problems of Finite Element Method.
(These exercises may be performed by any of the following Advanced CAD Software)

CAM (MINIMUM FIVE EXPERIMENTS)

1. To prepare part programming for plain turning operation.
2. To prepare part programming for turning operation in absolute mode.
3. To prepare part program in inch mode for plain turning operation.
4. To prepare part program for taper turning operation.
5. To prepare part program for turning operations using turning cycle.
6. To prepare part program for threading operation.
7. To prepare part program for slot milling operation.
8. To prepare part program for gear cutting operation.
9. To prepare part program for gear cutting using mill cycle.
10. To prepare part program for drilling operation.
11. To prepare part program for multiple drilling operation in Z-axis.
12. To prepare part program for multiple drilling in X-axis.
13. To prepare part program for multiple drilling in X and Z axis using drilling cycle.

LIST OF EQUIPMENTS/MACHINES REQUIRED

1. Computer Numerically Control Lathe Trainer
2. P-IV (IBM) 2.6 GHz, 80 GB HDD,256/512 SD RAM(As Compatible with CAD Software) 52 X CD RW, 1.44 MB
FDD, 17" Colour Monitor, Laser Scroll Mouse
3. Software – Pro-E, Solid-work, CATIA, ANSYS
4. CNC Controlled Milling Machine
5. CNC Controlled Drilling Machine

Chhattisgarh Swami Vivekanand Technical University, Bhilai (C G)

Semester: B.E. VII Sem. **Branch: Mechanical Engg., Mechatronics Engg.**
Subject: Automobile Engineering **Lab Code: 337721 (37)**
Total Practical Periods: 40
Total Marks in End Semester Exam: 40

STUDIES TO BE CARRIED OUT (MINIMUM TEN EXPERIMENTS)

1. Study of Frame and Chassis.
2. Study of Clutches – Single Plate, Multi Plate and Centrifugal
3. Study of Gear Boxes – Sliding mesh, Constant mesh, Synchro mesh.
4. Study of Differential, Universal joints, Axles and Slip Joints.
5. Study of Brakes – Mechanical, Hydraulic, Air Brake and Disc Brake.
6. Study of Steering System used with Rigid Axle suspension and independent suspension system, Power Steering
7. Study of different types of springs used in Automobiles.
8. Study of Rigid Axle suspension system.
9. Study of Front Independent Suspension System.
10. Study of Read Independent Suspension System.
11. Study of Battery, Staring and Generating System and Battery Charging System.
12. Study of Automotive Electrical System.
13. Study of Educational Car Model.

LIST OF EQUIPMENTS/MACHINES REQUIRED

1. Working model of Single plate, Multi-plate & Centrifugal Clutch
2. Working model of Actual Differential System
3. Working model of Universal Joint, Axles & Slip Joints
4. Working model of Mechanical, Hydraulic and Air Brake
5. Working model of Steering System used with Rigid Axle suspension System
6. Working model of Steering System used with Independent Suspension System
7. Different types of Springs used in Automobiles
8. Working model of Rigid Axle Suspension System
9. Working model of Front Independent Suspension System
10. Working model of Rear Independent Suspension System
11. Working model of Battery, Staring and Generating System along with Charging unit
12. Working model of Electrical System
13. Cut section of Actual Master Cylinder of Hydraulic Brake System
14. Educational Car Model

Chhattisgarh Swami Vivekanand Technical University, Bhilai (C G)

Semester: VII   **Branch: Common to all branches**
Subject: Innovative and Entrepreneurial Skills   **Code: 300725 (36)**
Total Theory Periods: 28   **Total Tutorial Period: NIL**
Total Marks in End Semester Exam: 40
Minimum no. of Class test to be conducted:--

Unit I
Innovation: innovation- an abstract concept; creativity, innovation and imagination; types of innovation - classified according to products, processes or business organizations.

Unit II
Entrepreneurship: who is an entrepreneur? Entrepreneurship- A state of Mind, Emergence of entrepreneur; Role of Entrepreneur; A Doer not a Dreamer- Characteristics of an entrepreneur; Factors affecting entrepreneurial growth – Social, cultural, personality factors, psychological and Social Factors.Impact of Entrepreneurship for sustainable development.

Unit III
Difference between entrepreneur and entrepreneurship, Difference between entrepreneur and intrapreneur, Common Entrepreneurial competencies/Traits; Entrepreneurship stimulants, Obstacles inhibiting Entrepreneurship; Types of entrepreneurs, Functions of an entrepreneur.

Unit IV
Identification of Business Opportunities: Introduction, Sources of Business of Product Ideas, Steps in Identification of Business opportunity and its SWOT Analysis.

UNIT-V
Techno-Economic Feasibility of the project: Introduction, Techno- Economic feasibility of the Project,Feasibility Report, Considerations while preparing a Feasibility Report, Proforma of Feasibility Report,Role of Institutions and entrepreneurship.

Text and Reference Books:
1. Competing through Innovation-Bellon & Whittington, Prentice Hall of India
2. A Guide to Entrepreneurship – David Oates- JAICO Publishing House.
3. Entrepreneurship- Rober D Hisrich, Peters, Shepherd- TMH
4. Entrepreneurship in Action- Coulter, Prentice Hall of India
5. Entrepreneurship Management and Development – Ajith Kumar, HPH
6. Fundamentals of entrepreneurship- Mohanty, PHI
7. Patterns of Entrepreneurship- Jack M Kaplan, Wiley, student Edition