<table>
<thead>
<tr>
<th>S. No.</th>
<th>Board of Study</th>
<th>Sub. Code</th>
<th>SUBJECT</th>
<th>PERIODS PER WEEK</th>
<th>SCHEME OF EXAM</th>
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<td>Mech. Engg</td>
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<td>10.</td>
<td>Management</td>
<td>382765(76)</td>
<td>Innovative &amp; Entrepreneurial Skills</td>
<td>-</td>
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</table>

L – Lecturer, T – Tutorial, P – Practical, ESE – End Semester Exam, CT – Class Test, TA – Teacher’s Assessment

**To be completed after VI sem. and before the commencement of VII Sem.
Table – II
Professional Elective - II

<table>
<thead>
<tr>
<th>S.No.</th>
<th>Branch</th>
<th>Subject Code</th>
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<tbody>
<tr>
<td>1</td>
<td>Automobile</td>
<td>382741(82)</td>
<td>Advanced Theory Of I.C Engines</td>
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<td>2</td>
<td>Automobile</td>
<td>382742(82)</td>
<td>Auto Pollution Control</td>
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<td>Automobile</td>
<td>382743(82)</td>
<td>Tribology</td>
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<td>382744(82)</td>
<td>Quality Control &amp; Total Quality Management</td>
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<td>5</td>
<td>Automobile</td>
<td>382745(82)</td>
<td>Tractor &amp; Farm Equipments</td>
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<td>6</td>
<td>Automobile</td>
<td>382746(82)</td>
<td>Computer Simulation of I.C Engine Process</td>
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<td>7</td>
<td>Automobile</td>
<td>382747(82)</td>
<td>Artificial Intelligence &amp; Expert Systems</td>
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</table>

Note: (1) 1/4th of total strength of students subject to minimum of 20 students is required to offer and elective in the college in a particular academic session.

Note: (2) Choice of elective course once made for an examination cannot be changed in future examinations.
UNIT - I

AIRCONDITIONING FUNDAMENTALS

Basic air conditioning system - Location of air conditioning components in a car - Schematic layout of a refrigeration system. Compressor components - Condenser and high pressure service ports. Thermostatic expansion valve - Expansion valve calibration - Controlling evaporator temperature - Evaporator pressure regulator - Evaporator temperature regulator.

UNIT - II

AIR CONDITIONER - HEATING SYSTEM


UNIT - III

REFRIGERANTS

Classification, Nomenclature, selection of Refrigerants, global warming potential of CFC Refrigerants.

REFRIGERATION EQUIPMENTS

Compressor, condenser, evaporator, expansion devices – types & working.

UNIT - IV

AIR ROUTING & TEMPERATURE CONTROL

Objectives - Evaporator care airflow through the Dash recirculation unit - Automatic temperature control – Duct system - Controlling flow - Vacuum reserve - Testing the air control and handling systems.

UNIT - V

TROUBLE SHOOTING AND SERVICE

Causes of air conditioner failure - Trouble shooting of air controlling system - Air conditioner maintenance and service - Servicing heater system. Removing and replacing components – leak testing - Compressor service.

TEXT BOOK:

REFERENCE BOOKS
1. Dwiggins, Automotive Air Conditioning , Thomson Asia, 2002
COURSE OBJECTIVES
At the end of the course, students will be able to know
1. Car body details
2. Vehicle aerodynamics
3. Bus body, Commercial Vehicle details
4. Body material and mechanisms

UNIT I

CAR BODY

UNIT II

VEHICLE AERODYNAMICS
Objectives -Vehicle drag and types - various types of forces and moments -Effects of forces and moments – Side wind effects - Various body optimization techniques for minimum drag –Wind tunnel testing: Flow visualization techniques, Scale model testing, Component balance to measure forces and moments. Simple problems.

UNIT III

BUS BODY

UNIT IV

COMMERCIAL VEHICLE
Types: Flat platform, drop side, fixed side, tipper body, tanker body. LCV body types: pickup, van. Dimensions of driver's seat in relation to controls and steering angle -Driver cab design.

UNIT V

BODY MATERIALS, TRIM AND MECHANISMS

TEXT BOOK

REFERENCE BOOKS:
**Name of the program:** Bachelor of Engineering  
**Branch:** Automobile Engineering  
**Subject:** Computer Aided Design & Manufacturing  
**Semester:** VII  
**Code:** 337733(37)  
**Total No. of Periods:** 2 per week  
**Class Tests:** 2 (minimum)  
**Total Tutorial Periods:** Nil  
**Assignments:** 2 (minimum)  
**Teachers’s Assessment:** 40 Marks  
**Maximum Marks:** NA  
**Minimum marks:** NA

**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**

**Finit 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
CHHATTSIRGH SWAMI VIVEKANAND TECHNICAL UNIVERSITY, BILHAI

Name of the program: Bachelor of Engineering
Branch: Automobile Engineering
Semester: VII
Code: 382734(37)
Total Theory Periods: 40
Total Tutorial Periods: 10
Class Tests: 2 (minimum)
Assignments: 2 (minimum)
ESE duration: 3 hours
Maximum Marks: 80
Minimum marks: 28

COURSE OBJECTIVE
When the vehicle is at dynamic condition more vibration will be produced. It is essential to study about vibrations and how to reduce the vibration under different loads, speed and road conditions in order to improve the comfort for the passengers and life of the various components of the vehicle. In this subject these aspects have been given.

UNIT I
INTRODUCTION
Fundamentals of vibration, single degree of freedom, two degree of freedom, multi degree freedom, free, forced and damped vibrations, modeling and simulation studies, model of an automobile, magnification factor, transmissibility, vibration absorber.

UNIT II
STABILITY OF VEHICLES
Load distribution, calculation of acceleration, attractive effort and reactions for different drives, stability of a vehicle on a curved track, slope and a banked road.

UNIT III
MULTI DEGREE FREEDOM SYSTEMS
Closed and far coupled system, eigen value problems, orthogonality of mode shapes, modal analysis, forced vibration by matrix inversion.

UNIT IV
SUSPENSION, TYRES AND VEHICLE HANDLING
Requirements, sprung mass frequency, wheel hop, wheel wobble, wheel shimmy, choice of suspension spring rate, calculation of effective spring rate, vehicle suspension in fore and aft, roll axis and vehicle under the action of side forces, tyre, dynamics, ride characteristics power consumed by a tyre. Over steer, under steer, steady state cornering, effect of braking, driving torques on steering, effect of camber, transient effects in cornering.

UNIT V
NUMERICAL METHODS
Approximate methods for determining fundamental frequency, Dunkerleys lower bound, Rayleighs upper bound, Holzer method for closed coupled system and branched systems.

TEXT BOOKS

REFERENCES
INSTRUCTIONAL OBJECTIVES

To familiarize the students in
1. Engine Reboring and Crank shaft grinding
2. Valve repairing and refitting
3. Fuel system reconditioning

LIST OF EXPERIMENTS

1. Engine Reboring
2. Crank shaft grinding
4. Silencer Decarbonising
5. Fuel Nozzle reconditioning
6. Fuel Injection Pump Calibration

REFERENCES

1. Manufacturer’s Manual
2. Lab Manual
Name of the program: Bachelor of Engineering
Branch: Automobile Engineering
Subject: Vehicle Testing Lab
Total Lab Periods: 24
Maximum Marks: 40

Semester: VIII
Code: 382762(37)
Batch Size: 30
Minimum Marks: 20

PURPOSE
To provide practical knowledge about Vehicle testing.

INSTRUCTIONAL OBJECTIVES
At the end of the course, students will be able to know
1. About testing of automobiles using dynamometers and on Road
2. Engine analysis using diagnostic Systems
3. Wheel Balancing and alignment.
4. Exhaust gas analysis

LIST OF EXPERIMENTS
2. Testing of 4-wheeler using chassis dynamometer.
3. Road Test of Vehicles for
   a) Brake
   b) Acceleration
   c) Fuel Consumption
4. Engine Analysis using Engine Diagnostic System for
   a) Petrol Engine
   b) Diesel Engine.
5. Wheel Balancing and Wheel Alignment
6. Study of Chemiluminescent NOx analyzer.
8. Diesel smoke measurement.

REFERENCES
1. Manufacturer’s Manual
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

Name of the program: Bachelor of Engineering
Branch: Automobile Engineering
Subject: Advanced Theory of I.C Engines
Semster: VII
Code: 382741(82)
Total Theory Periods: 45
Total Tutorial Periods: 10
Class Tests:2(minimum)
Assignments: 2(minimum)
ESE duration: 3 hours
Maximum Marks: 80
Minimum marks: 28

UNIT I
COMBUSTION IN SI ENGINES

UNIT II
GAS EXCHANGE PROCESSES
Gas exchange processes in two and four stroke engines, factors affecting volumetric efficiency, flow through valves and ports, multi valve concept. Charge motion within the cylinder. Turbocharging and Turbocharger control. Different methods of charging and scavenging two stroke engines.

UNIT III
COMBUSTION ANALYSIS
Introduction to HWA, LDA and PIV systems to analyse engine flows. Engine heat transfer and energy balance, correlations for heat transfer coefficient, variables affecting heat transfer in engines. Cylinder pressure data acquisition and thermodynamic analysis of engine pressure data to yield heat release rates.

UNIT IV
ALTERNATIVE FUELS
Alternative gaseous and liquid fuels for SI and CI engines, Alcohols, Biogas, LPG, CNG, Hydrogen, Biodiesel and Straight Vegetable oils, their properties and characteristics when used as engine fuels. Production, storage and distribution of different alternative fuels.

UNIT V
RECENT DEVELOPMENTS
Homogeneous charge compression ignition, Stratified charge and gasoline direct injection, Dual fuel, lean burn and Hot surface Ignition engine concepts. Hybrid Electric Drives.

TEXT BOOKS:
1. Internal Combustion Engines by V. Ganesan, 2007, Tata Mc Graw Hill
3. Advanced Engine Technology by Heisler, SAE Publication

REFERENCES:
1. Internal Combustion Engines by Richard Stone, Macmillan Book Company also SAE Publications
2. Internal Combustion Engines by Colin R Ferguson, John Wiley and Sons
3. Design and Simulation of Two Stroke Engines, GP Blair SAE Publications
UNIT I

MECHANISM OF POLLUTANT FORMATION IN ENGINES
Introduction, Pollutants, sources, formation of HC and CO in SI engines, NO formation in SI and CI engines, Particulate emission from SI and CI engines, Smoke Emission in CI engines. Effect of operating variables on emission formation.

UNIT II

POST COMBUSTION TREATMENTS
Introduction, physical conditions and exhaust gas compositions before treatment, catalytic mechanism. Thermal Reactions, installation of catalyst in exhaust lines, NOx treatment in diesel engines. Diesel trap oxidizers

UNIT III

CONTROL TECHNIQUES
Pollution control in SI and CI engines, design changes, optimization of operating factors, exhaust gas recirculation, fuel Additives to reduce smoke and particulates.

UNIT IV

INSTRUMENTATION FOR POLLUTION MEASUREMENTS
NDIR analyzers, thermal conductivity and flame ionization detections, analyzers for NOx, gas chromatograph, Orsat apparatus, smoke meters - spot sampling and continuous indication types like Bosch, Hartridge.

UNIT V

LAWS AND REGULATION
Historical background, regulatory test procedures (European cycles), exhaust gas pollutants (European rail road limits), particulate pollutants, European statutory values, inspection of vehicles in circulation (influence of actual traffic conditions and influence of vehicle maintenance) Indian Emission Standards.

TEXT BOOKS


REFERENCE BOOKS

Introduction
Nature of surfaces and contact, surface topography, friction and wear mechanisms and effect of lubricants, methods of fluid film formation.

Selection of rolling element bearings
Nominal life, static and dynamic capacity, equivalent load, probabilities of survival, cubic mean load, bearing mounting details, preloading of bearings, condition monitoring using shock pulse method.

UNIT – II
Hydrodynamic bearings

UNIT – III
Hydrostatic bearings
Thrust bearings - pad coefficients - restriction - optimum film thickness - Journal bearings - design procedures.
Aerostatic bearings: thrust bearings and journal bearings, design procedure.
Dry rubbing bearings
Porous metal bearings and oscillatory journal bearings, qualitative approach only.

UNIT – IV
Lubrication
Choice of lubricant type, oil, grease and solid lubricants, additives, lubrication systems and their selection, selection of pump, filters, piping design, oil changing and oil conservation.

UNIT – V
Seals
Different types, mechanical seals, lip seals, packed glands, soft piston seals, mechanical piston rod packing, labyrinth seals and throttling bushes, oil flinger rings and drain grooves, selection of mechanical seals.
Failure of tribological components
Failure analysis of plain bearings, rolling bearings, gears and seals, wear analysis using SOAP and Ferrography.

TEXT BOOKS
2. Engineering Tribology – Prasanta Sahoo - PHI

REFERENCES BOOKS
Name of the program: Bachelor of Engineering
Branch: Automobile Engineering
Subject: Quality Control & Total Quality Management
Semester: VII
Total Theory Periods: 45
Class Tests: 2 (minimum)
ESE duration: 3 hours
Maximum Marks: 80
Minimum marks: 28

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 rating quality (VQR), vendor rating (VR), manufacturing planning for quality, Quality function deployment (QFD).

Statistical Quality Control

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 IV
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

TEXT BOOKS

REFERENCE BOOKS
5. Managing for Total quality from Deming to Tguchi and SPC. - Logothetis – Prentice Hall of India
Name of the program: Bachelor of Engineering
Branch: Automobile Engineering
Subject: Tractor & Farm Equipments

<table>
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<th>Total Theory Periods: 45</th>
<th>Total Tutorial Periods: 10</th>
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<td>Class Tests:2(minimum)</td>
<td>Assignments: 2(minimum)</td>
</tr>
<tr>
<td>ESE duration: 3 hours</td>
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</table>

| Maximum Marks: 80 | Minimum marks: 28 |

### COURSE OBJECTIVES
At the end of the course, students will be able to know
- The general design of tractors.
- Control of the tractors and fundamentals of Engine operation.
- Engine Frame work and Valve mechanism of Tractor.
- Cooling system, lubrication system and Fuel system of tractors.
- Farm equipments.

### UNIT-I

**GENERAL DESIGN OF TRACTORS**
Classification of tractors - Different types and purpose - Main components of tractor – Safety rules.

### UNIT-II

**CONTROL OF THE TRACTOR AND FUNDAMENTALS OF ENGINE OPERATION**
Tractor controls and the starting of the tractor engines - Basic notions and definition - Engine cycles – Operation of multi cylinder engines - General engine design - Basic engine performance characteristics.

### UNIT-III

**ENGINE FRAME WORK AND VALVE MECHANISM OF TRACTOR**
Cylinder and pistons - Connecting rods and crankshafts - Engine balancing - Construction and operation of the valve mechanism - Valve mechanism components - Valve mechanism troubles.

### UNIT-IV

**COOLING SYSTEM, LUBRICATION SYSTEM AND FUEL SYSTEM OF A TRACTOR**
Cooling system - Classification - Liquid cooling system - Components, Lubricating system servicing and troubles - Air cleaner and turbo charger - Fuel tanks and filters - Fuel pumps.

### UNIT-V

**FARM EQUIPMENTS**
Working attachment of tractors - Farm equipment - Classification - Auxiliary equipments - Trailers and body tipping mechanism.

### TEXT BOOKS

### REFERENCE BOOK
1. Tractors and their power units John B. Lilzedaw et-al,.
Branch: Automobile Engineering  
Subject: Computer Simulation of IC Engine Process  
Total Theory Periods: 45  
Class Tests: 2 (minimum)  
ESE duration: 3 hours  
Maximum Marks: 80  
Minimum marks: 28  

UNIT-I

INTRODUCTION

UNIT-II

SI ENGINE SIMULATION WITH AIR AS WORKING MEDIUM
Deviation between actual and ideal cycle - Problems, SI engine simulation with adiabatic combustion, temperature drop due to fuel vaporization, full throttle operation - efficiency calculation, part-throttle operation, super charged operation.

UNIT-III

PROGRESSIVE COMBUSTION
SI Engines simulation with progressive combustion with gas exchange process, Heat transfer process, friction calculation, compression of simulated values, validation of the computer code, engine performance simulation, pressure crank angle diagram and other engine performance.

UNIT-IV

SIMULATION OF 2-STROKE SI ENGINE
Introduction – Air fuel mixture formation – Chemically correct mixture combustion – Scavenging – Exhaust and mixing processes in a two stroke engine.

UNIT-V

DIESEL ENGINE SIMULATION
Multi zone model for combustion, different heat transfer models, equilibrium calculations, simulation of engine performance and simulation for pollution estimation.

TEXT BOOKS


REFERENCE BOOKS

COURSE OBJECTIVES
To familiarize
- Basic concepts of artificial intelligence
- Various steps involved in artificial intelligence
- Basic concepts of expert systems

UNIT-I

INTRODUCTION
History, Definition of A.I., Emulation of Human cognitive process. The knowledge search tradeoff, stored knowledge, semantic nets, An abstract view of modeling,Elementary knowledge. Computational Logic, Analysis of compound statements using simple logic connectives, predicate logic, knowledge organization and manipulation, knowledge acquisition.

UNIT-II

PROBLEM SOLVING AGENTS

UNIT-III

KNOWLEDGE ORGANISATION, COMMUNICATION

UNIT-IV

INTRODUCTION TO PROGRAMMING LANGUAGE

UNIT-V

EXPERT SYSTEMS

TEXT BOOKS

REFERENCE BOOKS
2. Introduction to Artificial Intelligence and Expert systems -Patterson, , Prentice Hall of India, New Delhi,1990.
Name of the program: Bachelor of Engineering
Branch: Automobile Engineering
Subject: Innovation and Entrepreneurial Skill
No Periods: 2 per week
Maximum Marks: 40

Semester: VII
Code: 382765(76)
Total Tutorial periods: Nil
Minimum Marks: 24

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 entrepreneur, Common Entrepreneurial competencies/Traits; Entrepreneurship stimulants, Obstacles inhibiting Entrepreneurship; Types of entrepreneurs, Functions of an entrepreneur.

Unit IV

UNIT-V

Text and Reference Books:
1. Competing through Innovation-Bellon & Whittington, Prentice Hall of India
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