

Deenbandhu Chhotu Ram University of Science & Technology, Murthal (Sonapat)

Scheme of Studies & Examinations under Choice Based Credit System

Programme: B. Tech. in Mechanical Engineering; Year – 3rd (Semester – VI); Session: 2020-21

S. No.	Course Code	Course Title	Teaching Schedule			Marks of Class Work	Examination Marks		Total	Credit	Duration of Exam
			L	T	P		Theory	Practical			
1	ME 302C	Manufacturing Technology and Management	4	0	0	25	75	-	100	4	3
2	ME 304C	Design of Machine Elements	3	1	0	25	75	-	100	4	3
3		Professional Elective-I	4	0	0	25	75	-	100	4	3
4		Professional Elective-II	4	0	0	25	75	-	100	4	3
5		Open Elective-I	3	0	0	25	75	-	100	3	3
6	ME 306C	Laboratory - IV (Design)	0	0	2	25	-	75	100	1	3
7	ME 308C	In-house Project	0	0	6	100	-	-	100	3	
Total			18	1	8	250	375	75	700	23	

List of Professional Elective- I & II Courses			List of Open Elective-I Courses (Any One)		
S. No.	Course Code	Course Title	S. No.	Course Code	Course Title
1	ME 322C	Robotics and Automation	1	HUM350C	Communication Skills for Professionals (Except BME & BTE)
2	ME 324C	Composite Materials	2	HUM352C	Soft Skills and Inter-personal Communication
3	ME 326C	Modern Manufacturing Processes	3	MGT402C	Human Values, Ethics And IPR
4	ME 328C	Internal Combustion Engines	4	MGT404C	Human Resource Management
5	ME 330C	Gas Dynamics and Jet Propulsion	5	HUM354C	Introduction to French language
			6	HUM356C	Introduction to German Language

L = Lecture, T = Tutorial, P = Practical, AUD = Audit Course, & C = Credits NOTE:

- For student admitted in B. Tech. 1st Semester (C-Scheme) in 2019 and all trailing students, Examinations and evaluation of students shall be conducted as per guidelines AICTE Examinations Reforms covering the entire syllabus. The students shall be made aware about the reforms.
- Students will be allowed to use non-programmable scientific calculator. However, sharing of calculators will not be permitted in the examination

Subject: MANUFACTURING TECHNOLOGY AND MANAGEMENT
Subject Code: ME302C

Study Scheme				Evaluation Scheme			Total Marks
Lectures per week				Internal Assessment	External Assessment (Examination)		
L	T	P	Credits	Max. Marks	Max. Marks	Exam Duration	
3	1	-	4	25	75	3 hours	100

UNIT – I: Tooling for Conventional and Non-Conventional Machining Processes:

- Topic No1 Principles of Mould & die design
- Topic No2 Press tools Cutting tools; and Holding tools: Jigs and fixtures
- Topic No3 Principles, applications and design
- Topic No4 Brief review of Press Tools: Configuration, design of die and punch
- Topic No5 Principles of forging die design

Metrology

- Topic No6 Dimensions, forms and surface measurements
- Topic No7 Limits, fits and tolerances, linear and angular measurements
- Topic No8 Comparators, gauge design, interferometry
- Topic No9 Metrology in tool wear and part quality including surface integrity

UNIT – II: Alignment and Testing Methods:

- Topic No10 Tolerance analysis in manufacturing and assembly
- Topic No11 Process metrology for emerging machining processes such as micro scale machining
- Topic No12 Inspection and work-piece quality
- Topic No13 Assembly Practices: Manufacturing and assembly
- Topic No14 process planning, selective assembly
- Topic No15 Material handling and devices

Facility Models and selection of equipments:

- Topic No16 Principle and Models for Facility Location,
- Topic No17 Layout Design and selection of Equipments
- Topic No18 Simple queuing theory models

UNIT – III: Linear Programming:

- Topic No19 Objective function and constraints
- Topic No20 Graphical method, Simplex and duplex algorithms
- Topic No21 Transportation assignment
- Topic No22 Traveling Salesman problem Network Models:
- Topic No23 Shortest route, minimal spanning tree, maximum flow model
- Topic No24 Project networks: CPM and PERT, critical path scheduling

UNIT – IV

Production Planning & Control:

- Topic No25 Forecasting Models, Aggregate production planning
- Topic No26 Materials Requirement Planning

Inventory models:

- Topic No27 Economic Order Quantity
- Topic No28 Quantity Discount Models, Stochastic Inventory Models
- Topic No29 Practical Inventory Control models, JIT.

TEXT BOOK:

1. Pandey and Singh, Production engineering sciences, 7e, standard publisher and distributor
2. Buffa and Sarin, Modern Production/Operations Management, 8th Ed, Willey pub

REFERENCE BOOKS:

1. Kalpakjian and Schmid, Manufacturing processes for engineering materials (5th Edition)-Pearson India
2. Modern Machining Processes, PC Pandey, HS Shan, Mc Graw Hill Education
3. Shenoy G.V. and Shrivastava U.K., Operations Research for Management, Wiley Eastern
4. Taha H. A., Operations Research, 6th Edition, Prentice Hall of India

NOTES:

1. In the semester examination, the examiner will set two questions from each unit (total 08 questions in all), covering the entire syllabus. The students will be required to attempt only 5 questions selecting at least one question from each unit.
2. The use of scientific calculator will be allowed in the examination. However, programmable calculator and cellular phone will not be allowed.
3. For students admitted in B.Tech. 1st Year (C-Scheme) in 2019 & onwards and all trailing students:
Examinations and evaluations of students shall be conducted, covering the entire syllabus, as per guidelines "AICTE Examination Reforms". Students shall be informed about these reforms.



Subject: DESIGN OF MACHINE ELEMENTS
Subject Code: ME304C

Study Scheme				Evaluation Scheme			Total Marks
Lectures per week				Internal Assessment	External Assessment (Examination)		
L	T	P	Credits	Max. Marks	Max. Marks	Exam Duration	
3	1	-	4	25	75	3 hours	100

UNIT – I

Topic No1 Design considerations - limits, fits and standardization
 Topic No2 Stress concentration, Review of failure theories for static and dynamic loading (including fatigue failure)
 Topic No3 Design of shafts under static and fatigue loadings

UNIT – II

Topic No4 Design of joints: Riveted joint for structures
 Topic No5 Threaded fasteners, pre-loaded bolts and welded joints
 Topic No6 Analysis and applications of power screws
 Topic No7 Keys and Couplings: various types of keys and design of keys
 Topic No8 Muff, split muff, flange, bush-pin flexible flange coupling
 Topic No9 Flywheel
 Topic No10 Design of transmission elements

UNIT – III

Topic No11 Belt and chain drives
 Topic No12 Analysis of clutches and brakes
 Topic No13 Design of transmission elements: spur, helical
 Topic No14 Bevel and worm gears

UNIT – IV

Topic No15 Design of springs: helical compression
 Topic No16 Tension, torsional and leaf springs
 Topic No17 Analysis and design of hydrodynamic journal bearing
 Topic No18 Sliding and rolling contact bearings

TEXT BOOK:

1. Mechanical Engineering Design, Fifth Edition, Shigley, J.E. and Mischke, C.R., McGraw-Hill International
2. Machine Design Theory and Practice, Deutschman, D., Michels, W.J. and Wilson, C.E. Macmillan
3. Fundamentals of Machine Component Design, Juvinal, R.C., John Wiley
4. Machine Design Data Book, 2nd edition, Jadon V K, Verma S.I. K. International publication, New Delh, Distributed by Wiley
5. Design Data: Data Book of Engineers, By PSG College-Kalaikathir Achchagam – Coimbatore PSG College- Coimbatore

REFERENCE BOOKS:

1. Design of Machine elements, Spottes, M.F., Prentice-Hall India
2. Mechanical Design – An Integrated Approach, R. L. Norton, Prentice Hall,
3. Analysis and Design of Machine Elements, 2nd edition, Jadon V K, Verma S,
4. I. K. International publication, New Delhi, Distributed by Wiley

Subject: MODERN MANUFACTURING PROCESSES

Subject Code: ME 326C

Study Scheme				Evaluation Scheme			Total Marks
Lectures per week				Internal Assessment	External Assessment (Examination)		
L	T	P	Credits	Max. Marks	Max. Marks	Exam Duration	
3	-	-	3	25	75	3 hours	100

UNIT I

- Topic No 1 Limitations of conventional manufacturing processes,
- Topic No 2 Need of unconventional manufacturing processes,
- Topic No 3 Classification of Modern Manufacturing Processes and its future possibilities.
- Topic No 4 ULTRASONIC MACHINING- Introduction, Basic Principle of USM,
- Topic No 5 Elements of Process, tool feed mechanism,
- Topic No 6 Cutting tool system design, effect of parameters on MRR,
- Topic No 7 Economic considerations, applications,
- Topic No 8 Limitations of the process, advantages and disadvantages.
- Topic No9 ABRASIVE JET MACHINING- Process description, features of AJM,
- Topic No10 Parameters in AJM, Topic No 10 metal removal rate (MRR) in AJM. Advantages, limitations And Practical applications of AJM,
- Topic No 11 Water Jet Machining- Jet cutting equipments, process details

UNIT II: CHEMICAL MACHINING:

- Topic No12 Basic technique of chemical machining,
- Topic No 13 Mechanism of metal removal, process variables, advantages and applications.
- Topic No 14 Electrochemical machining, principle of ECM process, ECM process detail,
- Topic No 15 Chemical reactions in ECM, tool work gap,
- Topic No 16 Process variables and characteristics in ECM, a
- Topic No 17 Advantages, disadvantages and application of ECM ,
- Topic No 18 Electrochemical Grinding - Material removal, surface finish, accuracy, advantages, applications.

UNIT III:THERMAL SPARK EROSION PROCESSES:

- Topic No 19 Electric Discharge Machining (EDM) or spark erosion machining processes,
- Topic No 20 Practical aspects of spark erosion machining, mechanism of metal removal,
- Topic No 21 Spark erosion generators, electrode feed control,
- Topic No 22 Dielectric fluids, flushing, electrodes for spark erosion,
- Topic No 23 Selection of electrode material, tool electrode design,
- Topic No 24 Surface finish, machining accuracy, machine tool selection, applications.
- Topic No 25 Wire cut EDM. Advantages and disadvantages of spark erosion machining.

LASER BEAM MACHINING (LBM)-

- Topic No 26 Introduction, lasing process, Laser machining system,
- Topic No 27 Thermal effect on work piece, calculation of MRR,
- Topic No 28 Description of laser drilling machine,
- Topic No 29 Cutting speed and accuracy of cut, advantages and limitations.

UNIT IV: PLASMA ARC MACHINING (PAM):

- Topic No 30 Introduction, non thermal generation of plasma
- Topic No 31 Types of plasma arc, the stabilized arc,
- Topic No 32 Mechanism of plasma torch, , mechanism of metal removal,
- Topic No 33 PAM parameters, equipments for D.C. plasma torch unit,
- Topic No 34 Safety precautions, economics, other applications of plasma jets.

ELECTRON BEAM MACHINING (EBM) –

- Topic No 35 Description of the process, need for high vacuum in EBM,

Topic No 36 Process parameters in EBM.

Topic No 37 Advantages and disadvantages of EBM, Electron beam welding.

Text Books:

1. Advanced Machining Processes by V.K. Jain. Allied Publishers Pvt Ltd
2. Modern Machining Methods by M. Adithan, Khanna Publishers
3. Modern Machining Processes by P.C. Pandey and H.S. Shan. Tata McGraw- Hill
4. Advanced Methods of Machining by J. A. Mcgeough, Springer
5. Non-Traditional Manufacturing Process by Benedict, CRC pub.
6. Unconventional Manufacturing Process by M K Singh, New Age Publishers
7. Nonconventional manufacturing by P. K. Mishra, Narosa Publishers

NOTES:

1. In the semester examination, the examiner will set two questions from each unit (total 08 questions in all), covering the entire syllabus. The students will be required to attempt only 5 questions selecting at least one question from each unit.
2. The use of scientific calculator will be allowed in the examination. However, programmable calculator and cellular phone will not be allowed.
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Subject: INTERNAL COMBUSTION ENGINES
Subject Code: ME 328C

Study Scheme				Evaluation Scheme			Total Marks
Lectures per week				Internal Assessment	External Assessment (Examination)		
L	T	P	Credits	Max. Marks	Max. Marks	Exam Duration	
3	-	-	3	25	75	3 hours	100

UNIT I: AIR STANDARD CYCLES:

Topic No 1 Internal and external combustion engines; classification of I.C. Engines,
 Topic No 2 Brief review of air standard cycles;
 Topic No 3 Deviation of actual engine cycle from ideal cycle. Problems.

CARBURETION, FUEL INJECTION AND IGNITION SYSTEMS:

Topic No 4 Mixture requirements for various operating conditions in S.I. Engines;
 Topic No 5 Elementary carburetor, Requirements of a diesel injection system;
 Topic No 6 Types of injection systems; petrol injection,
 Topic No 7 Requirements of ignition system;
 Topic No 8 Types of ignition systems ignition timing; spark plugs. Problems.

UNIT II: COMBUSTION IN I.C. ENGINES :

Topic No 9 S.I. engines; Ignition limits; stages of combustion in S.I. Engines;
 Topic No 10 Ignition lag; Velocity of flame propagation; detonation;
 Topic No 11 Effects of engine variables on detonation; theories of detonation;
 Topic No 12 Octane rating of fuels; pre-ignition; S.I. engine combustion chambers,
 Topic No 13 Stages of combustion in C.I. Engines; delay period;
 Topic No 14 Variables affecting delay period;
 Topic No 15 Knock in C.I. engines, Cetane rating;
 Topic No 16 C.I. engine combustion chambers.

LUBRICATION AND COOLING SYSTEMS:

Topic No 17 Functions of a lubricating system, Types of lubrication system;
 Topic No 18 Mist, Wet sump and Dry sump systems; Properties of lubricating oil;
 Topic No 19 SAE rating of lubricants, engine performance and lubrication,
 Topic No 20 Necessity of engine cooling; disadvantages of overcooling;
 Topic No 21 Cooling systems; Air-cooling, Water cooling; Radiators.

UNIT-III: ENGINE TESTING AND PERFORMANCE:

Topic No 22 Performance parameters: BHP, IHP, Mechanical efficiency,
 Topic No 23 Brake mean effective pressure and indicative mean effective pressure,
 Topic No 24 Torque, Volumetric efficiency; specific fuel consumption (BSFC, ISFC),
 Topic No 25 Thermal efficiency; Heat balance;
 Topic No 26 Basic engine measurements; fuel and air consumption,
 Topic No 27 Brake power, Indicated power and friction power,
 Topic No 28 Heat lost to coolant and exhaust gases; Performance curves. Problems.

AIR POLLUTION FROM I.C. ENGINES AND ITS REMEDIES:

Topic No 29 Pollutants from S.I. and C.I. Engines,
 Topic No 30 Methods of emission control; alternative fuels for I.C. Engines;
 Topic No 31 The current scenario on the pollution front.

UNIT-IV: ROTARY COMPRESSORS:

Topic No 32 Root and vane blowers; Static and total head values;
 Topic No 33 Centrifugal compressors- Velocity diagrams, slip factor,
 Topic No 34 Ratio of compression, pressure coefficient, pre-whirl;

Topic No 35 Axial flow compressor- Degree of reaction,
Topic No 36 Polytropic efficiency, surging, choking and stalling,
Topic No 37 Performance characteristics, Problems.

GAS TURBINES:

Topic No 38 Components of a gas turbine plant; open and closed types of gas turbine plants;
Topic No 39 Optimum pressure ratio; Improvements of the basic gas turbine cycle;
Topic No 40 Multi stage compression with inter-cooling;
Topic No 41 Multi stage expansion with reheating between stages;
Topic No 42 Exhaust gas heat exchanger, Applications of gas turbines. Problems.

TEXT BOOKS:

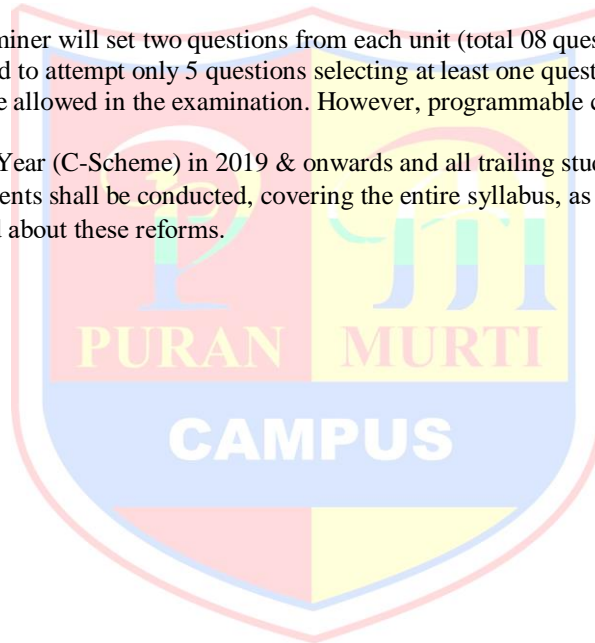
1. Internal Combustion Engines –V. Ganesan, Pub.-Tata McGraw-Hill.
2. Gas Turbines - V. Ganesan, Pub.- Tata McGraw Hill.
3. Engineering fundamental of the I. C. Engines – Willard W. Pulkrabek Pub.-PHI,India

REFERENCE BOOKS:

1. Internal Combustion Engines & Air pollution- Obert E.F, Pub.-Hopper & Row Pub., New York
2. Internal Combustion Engines Fundamentals- John B. Heywood, Pub.-McGraw Hill, New York

NOTES:

1. In the semester examination, the examiner will set two questions from each unit (total 08 questions in all), covering the entire syllabus. The students will be required to attempt only 5 questions selecting at least one question from each unit.
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Subject: Communication Skills for Professionals (Except BME & BTE)
Subject Code: HUM350C

B.Tech. 3rd YEAR (SEMESTER –VI)

L	T	P	Credits
3	0	0	3

Class Work	: 25
Examination	: 75
Total Marks	: 100
Duration of Exam	:3Hours

Unit 1**Mechanics of Report Writing:**

Topic No. 1 Objectives of Report Writing;
Topic No. 2 Types of Reports on the basis of forms and content.
Topic No. 3 Introduction to Formats of Reports;
Topic No. 4 Structure of Reports: Front Matter,
Topic No. 5 Main Body, Back Matter.

Unit 2**Writing Business and Technical Report:**

Topic No. 6 Preliminary Strategies for Report Writing;
Topic No. 7 Data Collection, Report Planning, Use of Illustrations,
Topic No. 8 Point Formation, Preparing Notes/Drafts. Using Appropriate Formats:
Topic No. 9 Memo Format, Letter Format, Manuscript Format, Printed Forms

Unit 3**Oral Communication and Soft Skills**

Topic No. 10 Group Discussions; Interviews for jobs: preparation and facing them.
Topic No. 11 Professional Presentations: Power Point Presentation, Oral Presentation.
Topic No. 12 Role of Kinesics (Body Language) in Communication. General
Topic No. 13 Etiquettes in Office areas, corporate lunch and dinner. Handling Telephone calls.

Unit 4**Resumes and Job application:**

Topic No. 14 Writing of Resume--Chronological Resume and Functional
Topic No. 15 Resume. Request for Reference/Recommendation .
Topic No. 16 Writing Application Letters for Job;
Topic No. 17 Writing Covering letter.

Text/ Reference Books:

1. Sharma, Sangeeta, and Binod Mishra. Communication Skills for Engineers and Scientists. PHI, 2009.
2. Tyagi, Kavita, and Padma Mishra. Advanced Technical Communication. PHI, 2011.
3. Rizvi, M. Ashraf. Effective Technical Communication. McGraw Hill Education, 2014.
4. Kumar, Sanjay, and PushpLata. Communication Skills. OUP, 2011.
5. Raman, Meenakshi and Sangeeta Sharma. Communication Skills. OUP, 2011.
6. *Bhatnagar, Nitin, and Mamta Bhatnagar. Communicative English for Engineers and Professionals. Pearson Education, 2013. (The soft copy of the book is available in the university library)
7. Mitra, Barun K. Personality Development and Soft Skills. OUP, 2011.
8. Kaul, Asha. Business Communication. PHI, 2nd Edition.
9. Namee, Patrick Mc. Success in Interviews: How to Succeed in any Job Interview, 1st Edition.
10. Argenti, Paul. Corporate Communication. 6th Edition. McGraw Hill Education, 2012.

Course Outcomes: At the end of the course, students will demonstrate the ability to:

1. Get acquainted with multiple forms and formats of various technical and business reports
2. Develop competence for report writing with a focus on its complex writing techniques and procedures.
3. Develop their speaking skills with professional proficiency.
4. Equip themselves for Letter Writing Skills.

Note:

1. In Semester Examinations, the paper setter will set two questions from each unit (total 8 questions in all), covering the entire syllabus. Students will be required to attempt only five questions, selecting atleast one question from each unit.
2. The use of scientific calculator will be allowed in the examination. However, programmable calculator, mobile phones or other electrical/ electronic items will not be allowed in the examination.
3. For students admitted in B.Tech. 1st Year (C-Scheme) in 2019 & onwards and all trailing students:
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Subject: Laboratory – IV (Design)
Subject Code: ME 306C
B. Tech. Semester – VI (Mechanical Engineering)

L	T	P	Credits
-	-	2	1

Class Work	:	25 Marks
Examination	:	75 Marks
Total	:	100 Marks
Duration of Examination	:	3 Hours

LIST OF EXPERIMENTS:**UNIT I - (STRENGTH OF MATERIALS)**

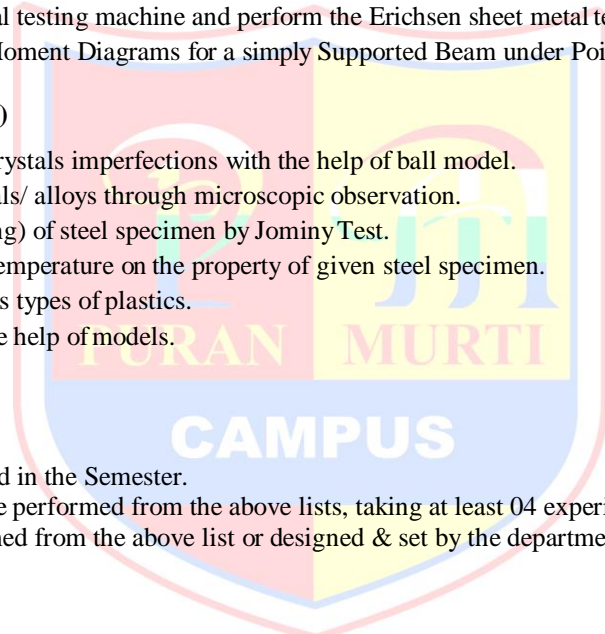
1. To study the Hardness testing machine (s) and perform the Rockwell hardness / Brinell hardness / Vickers test.
2. To study the Impact testing machine and perform the Impact tests (Izod and Charpy).
3. To study the Universal Testing Machine and perform the tensile test /compression / bending /shear test tests on UTM.
4. To study the torsion testing machine and perform the torsion test.
5. To study the Erichsen sheet metal testing machine and perform the Erichsen sheet metal test.
6. To draw shear Force, Bending Moment Diagrams for a simply Supported Beam under Point and Distributed Loads.

UNIT II - (MATERIAL SCIENCE)

7. To study crystal structures and crystals imperfections with the help of ball model.
8. To study microstructures of metals/ alloys through microscopic observation.
9. To study hardening (by quenching) of steel specimen by Jominy Test.
10. To observe effect of tempering temperature on the property of given steel specimen.
11. To study the properties of various types of plastics.
12. To study Bravais lattices with the help of models.

Note:

1. Ten experiments are to be performed in the Semester.
2. At least eight experiments should be performed from the above lists, taking at least 04 experiments from each Unit. Remaining two experiments may either be performed from the above list or designed & set by the department as per the scope of the syllabus.



Subject: IN HOUSE PROJECT
Subject Code:ME308C
B. Tech. Semester – VI (Mechanical Engineering)

L	T	P	Credits
-	-	6	3

Class Work	:	100 Marks
Examination	:	--
Total	:	100 Marks
Duration of Examination	:	3 Hours

In-house Project is a group activity with a batch size of 4-5 students.

The expected outcome of this course is the development of capability to employ technical knowledge obtained in the field of Engineering & Technology for societal use through an in-house project work involving design/ analysis/fabrication/ testing/ computer simulation/ case studies etc, augmented with creativity, innovation and ingenuity.

Students may also choose to work on innovation or entrepreneurial activities resulting in start-up. Each group will work under the guidance of a faculty adviser.

After completion of the Project, the each group should prepare a comprehensive report to indicate what they have observed and learnt in the training period. The format of the cover page and the organization of the body of the report should be circulated by In-house Project coordinator.

At the end of the semester, the project will be evaluated through a panel of examiners consisting of three members. The chairman may constitute stream specific committees for the evaluation of the project. Each committee shall consist of three members as given below:

1. A senior faculty member (Chairman of the committee)
2. In-house Project coordinator (Member Secretary)
3. Respective In-house faculty adviser

The evaluation process will be as given below:

- The group will be required to submit two copies of his/her project report to the department for record (one copy each for the department and participating teacher).
- Project coordinator will be assigned the project load of maximum of 2 hrs. per week including his own guiding load of one hr. However, each faculty adviser will be assigned maximum of one period of teaching load irrespective of number of students/groups under him/her.
- The evaluation of In-house Project will be carried out on the basis of the following criteria:
 - Originality and relevance of the Project (20%)
 - Adequacy and quality of report (40%)
 - Presentation of the Project report (Quality of content /Effectiveness of presentation/Communication skill) 40%

