West Bengal State Council of Technical & Vocational Education and Skill Development
(Technical Education Division)

Syllabus
of

Diploma in Electrical Engineering [EE]

Part-III (6th Semester)

2023

6th Semester

Sl.No	Category of course	Code No	Course Title	Credits	Marks	Total Contact Hours per Week	
						L	P
1	Program Core Course	**EEPC302**	Energy conservation and Audit	3	100	3	0
2	Program Core Course	**EEPC304**	Energy conservation and Audit Laboratory	1	100	0	2
3	Program Elective course IV	**EEPE 302/1**	**Any one of the following subjects to be chosen** 1. Industrial Instrumentation and Condition Monitoring	3	100	3	0
		EEPE 302/2	2. Electrical Testing and Commissioning				
		EEPE 302/3	**3.** Electric vehicles				
4	Program Elective course IV Lab	**EEPE 304/1**	**Any one of the following subjects to be chosen** 1.Industrial Instrumentation and Condition Monitoring lab	1	100	0	2
		EEPE 304/2	2. Electrical Testing and Commissioning Laboratory				
		EEPE 304/3	3. Electric vehicles Laboratory				
5	Humanities and Social Science	**HS302**	Entrepreneurship and Start-ups	3	100	3	0
6	Open Elective course-I	**OE302**	Engineering Economics and Project Management	3	100	3	0
7	Open Elective course- II	**OE 304**	**Any one of the following subjects to be chosen.** i. Mechatronics ii. Disaster management iii. Internet of Things iv. Environmental Engineering and Science v. Industrial Management vi. Sustainable development vii. Industrial Safety Engineering viii. Medical Electronics	3	100	3	0
8	Major Project	PR302		2	100	0	4
9	Seminar	SE302		2	100	0	4
	Total			**21**	**900**	**15**	**12**
Total contact hrs= 27 hrs/week							

- Student **contact hrs./ week =27**
- Theory and practical periods of 60 minutes each
- Abbreviation: L: Lecture class; P: Practical class
- **For Theoretical subjects**: Internal Assessment (40 Marks): Mid semester class test: 20 Marks; Quizzes, viva-voce, Assignment: 10 Marks; Attendance: 10; External Assessment: 60 Marks.
- **For Practical/ Sessional Subjects**: Internal Assessment-60 Marks [Continuous Evaluation:50; Class Attendance:10]; End Semester Assessment-40 Marks [Assignment on the day of Viva-voce and Practical Report submission:20; Viva-voce:20]
- To make the students more familiar with software, effort should be made to prepare laboratory report (like graph; data table etc.) in soft format in addition with traditional hard copy wherever possible.

Course Code	:	EEPC302
Course Title	:	**ENERGY CONSERVATION AND AUDIT**
Semester		6
Number of Credits	:	3 (L:3,T:0,P:0)
Prerequisites	:	NIL
Course Category	:	PC

Course Objective

The aim of this course is to help the student to attain the following industry identified competency through various teaching learning experiences:

1. Know energy conservation in various electrical machines and electrical installation systems.
2. Know Energy conservation through Cogeneration and Tariff.
3. Know energy audit of electrical systems.

Contents (Theory):		Hrs./Unit
Unit : 1	**Energy Conservation Basics:** 1.1 Energy Scenario: Primary and Secondary Energy, Energy demand and supply, National scenario. 1.2 Energy conservation and Energy audit – concept, need and difference. 1.3 Indian Electricity Act 2003; relevant clauses of energy conservation 1.4 BEE and its Roles in energy conservation 1.5 Star Labelling: Concept, Need and its benefits.	**04**
Unit : 2	**Energy Conservation in Electrical Machines:** 2.1 Need for energy conservation in induction motor and transformer. 2.2 Energy conservation techniques in induction motor by – i) Improving Power quality. ii) Motor survey iii) Matching motor with loading. iv) Minimizing the idle and redundant running of motor. v) Operating in star mode lower output power. vi) Rewinding of motor. vii) Replacement by energy efficient motor viii) Periodic maintenance 2.3 Energy conservation techniques in Transformer by – i) Load sharing ii) Parallel operation iii) Isolating techniques. iv) Replacement by energy efficient transformers. v) Periodic maintenance. 2.4 Energy Conservation Equipment: i) Soft starter ii) Automatic star delta converter	**11**

	iii) Variable Frequency Drives iv) Automatic p. f. controller (APFC) v) Intelligent p. f. controller (IPFC) 2.5 Energy efficient motor – features, advantages, applications and limitations. 2.6 Energy efficient transformers, amorphous transformers, epoxy Resin cast transformer / Dry type of transformer.	
Unit: 3	**Energy conservation in Electrical Installation systems:** 3.1 Aggregated Technical and commercial losses (AT&C) – Power system at state, regional, national and global level. 3.2 Causes of Technical losses and measures to reduce it – i) Controlling I^2R losses ii) Optimizing distribution voltage iii) Balancing phase currents iv) Compensating reactive power flow v) Demand side management 3.3 Causes of Commercial losses and measures to reduce it – i) In meter reading ii) In metering iii) Theft of electricity by any means 3.4 Energy conservation equipment: Maximum Demand Controller, KVAR Controller, Automatic Power Factor controller (APFC); Active harmonic filter. 3.5 Energy Conservation in Lighting System – i) Replacing Lamp sources. ii) Using energy efficient luminaries. iii) Using light controlled gears. iv) Installation of separate transformer / servo stabilizer for lighting. v) Periodic survey and adequate maintenance programs. 3.6 Energy Conservation techniques in fans, Electronic regulators. 3.7 Techniques of Energy Saving in Ventilating systems and Air Conditioners 3.8 Techniques of Energy Saving in Furnace, Ovens and Boiler.	**12**
Unit: 4	**Energy conservation through Cogeneration and Tariff:** 4.1 Co-generation and Tariff – concept, significance for energy conservation 4.2 Co-generation – Types of cogeneration on basis of sequence of energy use (Topping cycle,Bottoming cycle) 4.2.1 Types of cogeneration basis of technology (Steam turbine cogeneration, Gas turbine cogeneration, Reciprocating engine cogeneration). 4.2.2 Factors governing the selection of cogeneration system. 4.2.3 Advantages of cogeneration. 4.3 Tariff: Types of tariff structure: Special tariffs; Time-off-day tariff, Peak-off-day tariff, Power factor tariff, Maximum Demand tariff, Load factor tariff. Application of tariff system to reduce energy bill. 4.4 Energy conservation by improving load factor and power factor.	**09**
Unit: 5	**Energy Audit of Electrical System:** 5.1 Energy audit (definition as per Energy Conservation Act). 5.2 ABC analysis – its need and application.	**09**

	5.3 Energy audit instruments and their use. 5.4 Questionnaire for energy audit projects. 5.5 Energy flow diagram (Sankey diagram) and its importance. 5.6 Calculation of simple payback period for energy conservation equipment. Energy Audit procedure (walk through audit and detailed audit). 5.7 Energy Audit report format. 5.8 Numericals on energy audit.	
	Total	**45**

References:

1. Guide Books No. 1 and 3 for National Certification Examination for Energy Managers and Energy Auditors, Bureau of Energy Efficiency (BEE), Bureau of Energy Efficiency (A Statutory body under Ministry of Power, Government of India) (Fourth Edition 2015).

2. O.P. Gupta, Energy Technology, Khanna Publishing House, New Delhi

3. Henderson, P. D., India - The Energy Sector, University Press, Delhi, 2016. ISBN: 978-0195606539

4. Turner, W. C., Energy Management Handbook, Fairmount Press, 2012, ISBN 9781304520708

5. Sharma, K. V., Venkataseshaiah; P., Energy Management and Conservation, I K International Publishing House Pvt. Ltd; 2011 ISBN 9789381141298

6. Mehta ,V. K., Principles of Power System, S. Chand &Co.New Delhi, 2016, ISBN 9788121905947

7. Singh, Sanjeev; Rathore, Umesh, Energy Management, S K Kataria&Sons,New Delhi ISBN-13: 9789350141014.

8. Desai, B. G.; Rana, J. S.; A. Dinesh, V.; Paraman, R., Efficient Use and Management of Electricity in Industry, Devki Energy Consultancy Pvt. Ltd.

9. Chakrabarti, Aman, Energy Engineering And Management, e-books Kindle Edition

Course Outcomes:

The theory and relevant soft skills associated with this course are to be taught and implemented, so that the student demonstrates the following industry oriented COs associated with the above mentioned competency:

a) Interpret energy conservation policies in India.
b) Know energy conservation techniques in electrical machines & implement it.
c) Know different types of measuring instruments for measuring electric power.
d) Apply energy conservation techniques in electrical installations.
e) Use Co-generation and relevant tariff for reducing losses in facilities.
f) Know energy audit for electrical system and apply it for real cases.

Internal Assessment (40 Marks)		
Mid Semester Class Test:20 Marks	Quizzes, viva-voce, Assignment: 10 Marks	Attendance: 10
External Assessment (End Semester Examination:60 Marks)		
GROUP	UNIT	
A	1,2	
B	3	
C	4,5	

Course Code	:	EEPC304
Course Title	:	**ENERGY CONSERVATION AND AUDIT LABORATORY**
Number of Credits	:	1 (L:0,T:0,P:2)
Prerequisites	:	NIL
Course Category	:	PC

Course Objective

The aim of this course is to help the student to attain the following industry identified competency through various teaching learning experiences –

1. Apply energy conservation in various electrical machines and electrical installation systems.
2. Apply Energy conservation through Cogeneration and Tariff.
3. Apply energy audit in electrical systems.

List of Practicals: (At least EIGHT are to be performed)

1. Experiment to compare power consumption of different types of TL with electromagnetic ballast, electronic ballast and LED lamps by direct measurements and estimate energy saving.
2. Experiment to determine the reduction in power consumption in star mode operation of Induction motor compared to delta mode at different load conditions.
3. Experiment to estimate energy saving by improving power factor using PFC/APFC for an electrical load.
4. Experiment to estimate energy saving by improving load factor for an establishment.
5. Perform experiment to determine the reduction in power consumption by replacement of Fans and regulators in a class room / laboratory.
6. Collect electricity bill of a residential consumer and suggest suitable means for energy conservation and reduce consumption.
7. Prepare an energy audit report (Phase-I, Phase-II, Phase-III) for a Workshop/ Institute.
8. Identify star labeled electrical apparatus and compare the data for various star ratings.
9. Collect electricity bill of a commercial consumer and suggest suitable tariff for energy conservation and reduction of its energy bill.
10. Collect electricity bill of an industrial consumer and suggest suitable tariff for energy conservation and its impact on energy bill.
11. Prepare a sample energy audit questionnaire for the given industrial/Commercial facility.
12. Energy flow diagram (Sankey diagram) through EMS software Web Link : demo.ecostruxure-power-monitoring-expert.se.app/Web ;User ID : demo; Password : demo

Course Outcomes

The theory, practical and relevant soft skills associated with this course are to be taught and implemented, so that the student demonstrates the following industry oriented COs associated with the above mentioned competency:

a) Interpret energy conservation policies in India.
b) Implement energy conservation techniques in electrical machines.
c) Apply energy conservation techniques in electrical installations.

Course Code	:	EEPE 302/2
Course Title	:	ELECTRICAL TESTING AND COMMISIONING
Number of Credits	:	3 (L: 3, T: 0, P: 0)
Prerequisites	:	NIL
Course Category	:	PC

Course objective

The aim of this course is to help the student to attain the following industry identified competency through various teaching learning experiences:

- Follow standard safety procedures in testing and commissioning of electrical equipments.

Contents (Theory):		Hrs./Unit
Unit : 1	1.1. Do's and don'ts regarding safety in domestic electrical appliances. 1.2. Electrical safety in industry/power stations/ substations at the time of operation/ control/ maintenance. 1.3. Procedure for rescuing the person who has received an electric shock, methods of providing artificial respiration (CPR). 1.4. Class of fire; Fire detection alarm, fire-fighting equipments. Precautions to be taken to avoid fire due to electrical reasons.	**04**
Unit : 2	**Installation and Erection** 2.1 Concept of foundation for installation of machinery. Requirements of foundation for static and rotating electrical machinery. 2.2 Concept of leveling and aligning Procedure for leveling and alignment of direct coupled drive, effects of misalignment. 2.3 **Installation of transformer as per** I.S. 10028(part II): 1981 reaffirmed 2021. 2.3.1 INSTALLATION: Precautions, Site Preparation, Cabling, Bushings and Cable Boxes, Connections, Precautions against Risk of Fire, Safety Precautions. 2.3.2. DRYING OF TRANSFORMERS: Precautions When Drying and Methods of Drying. 2.3 **Requirements of installation of induction motor** as per I.S. 900 – 1992: INSTALLATION WORK: Location of Motors and Control Apparatus; Drying Out; Commissioning of motor.	**10**
Unit: 3	**Testing and Commissioning** 3.1 Objectives of testing, Types of tests and concepts: Routine test, type test, supplementary test, special tests. Methods of testing - Direct/Indirect/Regenerative testing. 3.2 Factors affecting life of insulating materials. Classifications of insulating materials as per IS:1271-1985 Reaffirmed 2001. Ageing Factors and Thermal Classes 3.3 Insulating oil - properties of insulating oil: viscosity, purity, acidity, flash point and fire point; causes of deterioration of oil. **3.4 Tests before and after Commissioning**: 3.4.1 Testing of transformer oil: a) dielectric strength test; b) acidity test; c) sludge test; d) moisture test, e) flash point test. 3.4.2. Testing of transformer: Impedance voltage, load losses, Insulation resistance, induced over voltage withstand test, Impulse voltage withstand test, Temperature	**15**

	rise test of oil & winding, Different methods of determining temperature rise- back-to-back test, open delta (delta – delta) test. 3.4.3 Testing of three-phase induction motor as per I.S.4029 -2010: High voltage test; Temperature-Rise Test; No load and locked rotor test. 3.4.4 List of type, routine and acceptance tests of single-phase induction motor as per I.S.996-2009. 3.4.5 Testing methods of synchronous machines as per IS 7132-1973: High voltage tests.	
Unit: 4	**Troubleshooting Plans** 4.1 Internal and external causes for failure / abnormal operation of equipment. 4.2 List of mechanical faults, electrical faults and magnetic faults in the electrical equipment and their remedies. 4.3 Preparation of trouble shooting charts for D.C. Machines, AC Machines and transformers, batteries.	**08**
Unit: 5	**Maintenance** 5.1 Concept of maintenance, types of maintenance, time based and condition based preventive maintenance, breakdown maintenance. 5.2 Preventive maintenance schedules for electrical machines, Factors affecting preventive maintenance schedules 5.3 Concept of Total productive maintenance (TPM), Pillars of TPM 5.4 Maintenance schedules of the following: i. Power and Distribution transformer. ii. Three phase Induction motors. iii. LV and HV switchgear. iv. Station Batteries.	**08**
	Total	**45**

References:

1. Deshpande.M. V. PHI Learning Pvt. Ltd., 2010, Design and Testing of Electrical Machines ISBN No 8120336453, 9788120336452.
2. Rao, B V S Asia Club House, First Reprint, 2011, Operation and Maintenance of Electrical Equipment Vol-I, ISBN No 8185099022
3. Rosenberg. Mc GRAW-HILL, 1st Edition, May 2003, Maintenance and Repairs, ISBN No 9780071396035
4. Sharotri, S.K. Glencoe/ Mcgraw- Hill; 2ndEdition , June 1969; Preventive Maintenance of Electrical Apparatus, ISBN No 10: 007030839X 13: 978-0070308398
5. Tarlok Singh; S. K. Kataria and Sons; Installation, Commissioning and Maintenance of Electrical Equipments.
6. P.P Gupta; Dhanpat Rai Publication Ltd; Installation, Commissioning and Maintenance of Electrical Equipments.

Course outcomes:

The theory and relevant soft skills associated with this course are to be taught and implemented, so that the student demonstrates the following industry oriented COs associated with the above mentioned competency:

a) Follow safety procedures with respect to earthing and insulation of electrical equipment
b) Select proper tools, equipment, for installation, testing, maintenance of electrical machines and transformers
c) Test and commission electrical equipment in accordance with IS codes
d) Make plans for troubleshooting electrical machines.
e) Undertake regular preventive and breakdown maintenance.

Internal Assessment (40 Marks)		
Mid Semester Class Test:20 Marks	Quizzes, viva-voce, Assignment: 10 Marks	Attendance: 10
External Assessment (End Semester Examination:60 Marks)		
GROUP	UNIT	
A	1,2	
B	3	
C	4,5	

Course Code	:	EEPE304/2
Course Title	:	ELECTRICAL TESTING AND COMMISIONING LABORATORY
Number of Credits	:	1 (L: 0, T: 0, P: 2)
Prerequisites	:	NIL
Course Category	:	PE

Course objectives:

The aim of this course is to help the student to attain the following industry identified competency through various teaching learning experiences:

- Follow standard safety procedures in testing and commissioning of electrical equipment.

Practicals:

List of Practical:(at least EIGHT are to be done)	
1.	Determine breakdown strength of transformer oil.
2.	Perform insulation resistance test on any one motor/transformer.
3.	Prepare trouble shooting charts for electrical machines such as Transformer, D.C. machines, Induction motor and Synchronous machines.
4.	Measure impedance voltage and load losses of three-phase transformer.
5.	Find regulation and efficiency of single-phase transformer using back-to-back connection method.
6.	Determine efficiency of D.C. motor by direct loading or by electrical loading.
7.	Determine efficiency of D.C. machine by Hopkinson's test.
8.	Perform reduced voltage running up test on three-phase Induction motor as per I.S.325.
9.	Measure no load power, losses, current of a single-phase transformer upto 110% of rated voltage.
10.	Perform no load test on single phase Induction motor for the measurements of no load current, power input, and speed at rated voltage.
11.	Methods of providing artificial respiration (CPR) and prepare a report.
12.	Study of different types of fire extinguisher.

Course outcomes:

The practical experiences and relevant soft skills associated with this course are to be taught and implemented, so that the student demonstrates the following industry oriented COs associated with the above mentioned competency:

a) Select proper tools, equipment, for installation, testing, maintenance of electrical machines and transformers

b) Test the performance of insulating oil and transformers

c) Test the performance of induction machine.

d) Test the performance of dc machines.

e) Make plans for troubleshooting electrical machines.

E X A M I N A T I O N S C H E M E (SESSIONAL)

3. **Continuous Internal Assessment of 60 marks** is to be carried out by the teachers throughout the fourth Semester. **Distribution of marks:** Continuous evaluation:50 Marks; Class Attendance: 10 Marks
4. **External Assessment (end Semester examination) of 40 marks** shall be held at the end of the sixth Semester on the entire syllabus. Assignment on the day of Viva-voce and practical report submission:20; Viva-voce:20.

Course Code	:	PR302
Course Title	:	Major Project
Number of Credits	:	2 (L: 0, T: 0, P: 4)
Prerequisites	:	Knowledge of subjects up to 5th Semester of Electrical Engineering.
Course Category	:	PR

Course Objective:

The aim of this course is to help the student to attain the following industry identified competency through various teaching learning experiences:

- Design and development of small electrical and electronics device/equipment.

Project group:
1. Formation of project group: Maximum **6 students per batch**.
2. Each project group should select work by consulting the guide.

Activity (Atleast one):

i. Speed control of stepper motor/ dc motor using microcontroller.

ii. Robotic car using microcontroller.

iii. Over voltage/ over current protection using microcontroller/ static system.

iv. Battery management system using microcontroller.

v. Home automation using microcontroller.

vi. Any topic relevant to Diploma in Electrical Engineering course as suggested by the Department/supervisor(s).

References:

1. A K Sawhney; A course in Electrical Machine Design; Dhanpat Rai & Co.
2. Raina Bhattacharya; Electrical Design, Estimating and Costing; New Age International Publishers
3. V. Rajini and V.S. Nagarajan; Electrical Machine Design; Pearson
4. Bhattacharya Chatterji; Projects in Electrical, Electronics, Instrumentation and computer Engineering.

Course outcome:

i. Develop proper planning to achieve the project goal.
ii. Collect relevant information and resources.
iii. Identify and apply proper techniques.
iv. Analyse the performance of project output.
v. Organize the Written documentation of the project work

E X A M I N A T I O N S C H E M E (SESSIONAL)

1. Continuous Internal Assessment of 60 marks is to be carried out by the teachers throughout the fourth Semester. **Distribution of marks:** Continuous evaluation: 30 Marks; Project report:20 Class Attendance: 10 Marks

2. External Assessment (end Semester examination) of 40 marks shall be held at the end of the sixth Semester on the entire syllabus. Project and project report:20; Viva-voce:20

Course Code	:	SE302
Course Title	:	Seminar
Number of Credits	:	2 (L: 0, T: 0, P: 4)
Prerequisites	:	Knowledge of subjects up to 5th Semester of Electrical Engineering.
Course Category	:	SE

The course 'Seminar' is intended to enable a student to read, understand, prepare and present report about an academic document. The learner shall search in the literature including various journals, books, project reports, online resources etc., and identify an appropriate paper /report in her/his area of interest, in consultation with her/his seminar guide. This course can help the learner to experience how a presentation can be made about a selected academic document and also empower her/him to prepare a technical report.

Course Objectives:

- To do literature survey in a selected area of study.
- To understand an academic document from the literature and to give a presentation about it.
- To prepare a technical report.

General Guidelines: It's advisable to choose topics for the Seminar to be closely linked with following topics.
Seminar1: Based on any theoretical paper/ laboratory/ previous semester project or any other topics as instructed by concerned teacher.
Seminar2 : Based on final semester project . (group/ individual student)

(Every student has to submit report and presentation on Seminar1 and Seminar2.)

The Electrical Engineering Department shall form an Internal Evaluation Committee for the seminar. During the seminar presentation of a student, all members of committee shall be present. Formation of group of students and corresponding guide allotment shall be completed as earlier after completion of 5th semester examination.

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

- Identify academic documents from the literature which are related to her/his areas of interest.
- Read and apprehend an academic document from the literature which is related to her/ his areas of interest.
- Prepare a presentation about an academic document.
- Give a presentation about an academic document.
- Prepare a technical report.

E X A M I N A T I O N S C H E M E (SESSIONAL)

1. Continuous Internal Assessment of 60 marks is to be carried out by the teachers throughout the fourth Semester. **Distribution of marks:** Continuous evaluation: 30 Marks; Presentation report:20 Class Attendance: 10 Marks

2. External Assessment (end Semester examination) of 40 marks shall be held at the end of the sixth Semester: Presentation:20; Viva-voce:20

Course Title	Entrepreneurship and Start-ups
Course Code	HS 302
Number of Credits	3
Pre-Requisites	None
Total Contact Hours	3(L: 2; T: 1)/week = 45 hrs
Course Category	HS

Course Learning Objectives

1. To raise awareness, knowledge and understanding of enterprise/ entrepreneurship.
2. To motivate and inspire students toward an entrepreneurial career.
3. To understand venture creation process and to develop generic entrepreneurial competences.
4. To introduce students to the basic steps required for planning, starting and running a business.
5. To familiarise students with the different exit strategies available to entrepreneurs.

Course Outcomes:

After completing the course students will able to:

CO 1	Identify qualities of entrepreneurs, develop awareness about entrepreneurial skill and mindset and express knowledge about the suitable forms of ownership for small business
CO 2	Comprehend the basics of Business idea, Business plan, Feasibility Study report, Project Report and Project Proposal
CO 3	Understand the concept of start-up business and recognise its challenges within legal framework and compliance issues related to business.
CO 4	Make a Growth Plan and pitch it to all stakeholders and compare the various sources of funds available for start-up businesses

Detailed Course Content

Unit	Name of the Topic	Hours

1.	**ENTREPRENEURSHIP – INTRODUCTION AND PROCESS**
	• Concept, Competencies, Functions and Risks of entrepreneurship
	• Entrepreneurial Values& Attitudes and Skills
	• Mindset of an employee/manager and an entrepreneur
	• Types of Ownership for Small Businesses
	  o Sole proprietorship
	  o Partnerships
	  o Joint Stock company- public limited and private limited companies
	• Difference between entrepreneur and Intrapreneur
		10

2.	**PREPARATION FOR ENTREPRENEURIAL VENTURES** • Business Idea- Concept, Characteristics of a Promising Business Idea, Uniqueness of the product or service and its competitive advantage over peers.	20

	• Feasibility Study – Concept – Locational, Economic, Technical and Environmental Feasibility. Structure and Contents of a standard Feasibility Study Report • Business Plan – Concept, rationale for developing a Business Plan, Structure and Contents of a typical Business Plan • Project Report- Concept, its features and components • Basic components of Financial Statements- Revenue, Expenses (Revenue & capital exp), Gross Profit, Net Profit, Asset, Liability, Cash Flow, working capital, Inventory. Funding Methods-Equity or Debt. Students are just expected to know about the features and key inclusions under, Business Plan and Project Report. <u>They **may not** be asked to prepare a Business Plan/ Project Report/ Project Feasibility Report in the End of Semester Examination.</u>	
3.	**ESTABLISHING SMALL ENTERPRISES** • Legal Requirements and Compliances needed for establishing a New Unit- o NOC from Local body o Registration of business in DIC o Statutory license or clearance o Tax compliances	03
4.	**START-UP VENTURES** • Concept & Features • Mobilisation of resources by start-ups: Financial, Human, Intellectual and Physical • Problems and challenges faced by start-ups. • Start-up Ventures in India – Contemporary Success Stories and Case Studies to be discussed in the class. Case studies have been included in the syllabus to motivate and inspire students toward an entrepreneurial career from the success stories. <u>No questions are to be set from the case studies.</u>	04
5.	**FINANCING START-UP VENTURES IN INDIA** • Communication of Ideas to potential investors – Investor Pitch • Equity Funding, Debt funding – by Angel Investors, Venture Capital Funds, Bank loans to start-ups • Govt Initiatives including incubation centre to boost start-up ventures • MSME Registration for Start-ups –its benefits	06
6.	**EXIT STRATEGIES FOR ENTREPRENEURS** • Merger and acquisition exit, Initial Public Offering (IPO), Liquidation, Bankruptcy – **<u>Basic Concept only</u>**	02

Examination Scheme

- **End Semester Examination: 60 marks**

Suggested Question Paper Scheme for End Semester Examination

Group A: 20marks

Question Type	umber of questions to be set	umber of questions to be answered
MCQ, Fill in the blanks, True or False (Carrying 1 mark each)	25	20

Group B: 40marks

Question Type	umber of questions to be set	umber of questions to be answered
Subjective Type questions (Carrying 8 marks each)	10	5

- **Internal Assessment: 40 marks**
  - Class test : 20 marks
  - Assignment: 10 marks
  - Class attendance: 10 marks

Suggested Learning Resources

Sl. No.	Title of Book	Author	Publication
1.	Entrepreneurship Development	Sangeeta Sharma	Prentice Hall of IndiaLearning Private Ltd
2.	Entrepreneurship Development	S. Anil Kumar	New Age International
3.	Fundamentals of Entrepreneurship	Sangram Keshari Mohanty	Prentice Hall of India Learning Private Ltd
4.	Fundamentals of Entrepreneurship	Dr. G.K. Varshney	Sahitya Bhawan Publication
5.	Managing New Ventures: Concepts and Caseson Entrepreneurship	Anjan Raichaudhuri	Prentice Hall of India Learning Private Ltd
6.	How to Start a Business in India	Simon Daniel	Buuks, Chennai
7.	Entrepreneurship and Small Business Management	S.S. Khanka	S. Chand & Sons, New Delhi
8.	Entrepreneurship Development	Abhik Kumar	Oxford University

	and Business Ethics	Mukherjee & Shaunak Roy	Press
9.	Entrepreneurship Development and Business Ethics	Dr B Chandra & Dr B Biswas	Tee Dee Publications
10.	Entrepreneurship Development Small Business Entrepreneurship	Poornima Charantimath	Pearson Education India

Engineering Economics & Project Management

Course Code:	OE302
Course Title:	Engineering Economics & Project Management
No. of Credits:	3 (L:3, T:0,P: 0)
Prerequisites:	NIL
Course Category:	Open Elective (Compulsory for all branches)

Course Objectives:

- To acquire knowledge of basic economics to facilitate the process of economic decision making.
- To acquire knowledge on basic financial management aspects.
- To develop the idea of project plan, from defining and confirming the project goals and objectives, identifying tasks and how goals will be achieved.
- To develop an understanding of key project management skills and strategies.

Group-A

Unit-I (INTRODUCTION, THEORY OF DEMAND & SUPPLY) [9 hours]

1.1 Introduction to Engineering Economics, the relationship between Engineering and Economics

1.2 Resources, scarcity of resources, and efficient utilization of resources.

1.3 Opportunity cost, rationality costs, and benefits

1.4 Theory of Demand: the law of demand, different types of demand, determinants of demand, demand function, price elasticity of demand.

1.5 Theory of Supply: determinants of supply, supply function.

1.6 Market mechanism: Equilibrium, basic comparative static analysis (Numerical problems)

Unit-II (THEORY OF PRODUCTION & COSTS) [10 hours]

2.1 Concept of production (goods & services), Different factors of production (fixed and variable factors), Short-run Production function (Graphical illustration), and Long run production function (returns to scale).

2.2 Theory of Cost: Short-run and long-run cost curves with graphical illustration, basic concept on total cost, fixed cost, variable cost, marginal cost, average cost etc.

2.3 Economic concept of profit, profit maximization (numerical problems)

UNIT-III (DIFFERENT TYPES OF MARKET AND ROLE OF GOVERNMENT) [4 hours]

3.1 Perfect Competition: Features of Perfectly Competitive Market.

3.2 Imperfect Competition: Monopoly, Monopolistic Competition, and Oligopoly.

3.3 Role of government in Socialist, Capitalist and Mixed Economy structure with example.

Group-B

Unit-I (CONCEPT OF PROJECT) [4 hours]

1.1 Definition and classification of projects)

1.2 Importance of Project Management.

1.3 Project life Cycle [Conceptualization→Planning→Execution→Termination]

Unit-II (FEASIBILITY ANALYSIS OF A PROJECT) [10 hours]

2.1 Economic and Market analysis.

2.2 Financial analysis: Basic techniques in capital budgeting– Payback period method, Net Present Value method, Internal Rate of Return method.

2.3 Environmental Impact study–adverse impact of the project on the environment.

2.4 Project risk and uncertainty: Technical, economical, socio-political, and environmental risks.

2.5 Evaluation of the financial health of a project–Understanding the basic concept of Fixed & Working Capital, Debt & Equity, Shares, Debentures etc., and different financial ratios like Liquidity Ratios, Activity Ratios, Debt-equity ratio & Profitability Ratio (Basic concept only).

N.B: Knowledge of financial statements is not required; for the estimation of ratios the values of the relevant variables will be provided.

Unit-III (PROJECT ADMINISTRATION) [8 hours]

3.1 Gantt Chart– a system of bar charts for scheduling and reporting the progress of a project (basic concept).

3.2 Concept of Project Evaluation and Review Technique (PERT) and Critical Path method (CPM): basic concept and application with real-life examples.

Examination Scheme:

A. Semester Examination pattern of 60 marks:

1. Objective type Question (MCQ, Fill in the blanks, and Very Short question-1 mark each): At least five questions from each unit. [Total marks: 20]

2. Subjective questions: Eight questions to be answered taking at least three from each group. (Two questions should be given from each unit). [Total marks: 40]

B. Assignment (10Marks)

Guide line for Assignment (10 Marks)

Students should be instructed to prepare a report on a project (preferably the Major Project they prepare in 6th Semester), using a popular project management software in IT/ Computer Laboratory, under the guidance of the Lecturer in Computer Science & Technology and Lecturer in Humanities.

C. Class Test: Two examinations 20 marks each. Take best of two.

D. Attendance: 10 Marks

Suggested reference books:

1 *Principles of Economics – Case and Fair, Pearson Education Publication*
2 *Principles of Economics – Mankiw, Cengage Learning*
3 *Project planning, analysis, selection, implementation and review – Prasannachandra– Tata McGraw Hill.*
4 *Project Management – Gopala Krishnan – Mcmillan India Ltd*

Theoretical Paper:

<table>
<tr><th colspan="5">Name of the Course: Open Elective for All disciplines except Mechanical Engineering</th></tr>
<tr><td colspan="3">Course Title : Industrial Management</td><td colspan="2">Semester : Sixth</td></tr>
<tr><td colspan="3">Category: Open Elective</td><td colspan="2">Full Marks: 100</td></tr>
<tr><td colspan="3">Code no. : OE</td><td colspan="2">Examination Scheme:</td></tr>
<tr><td colspan="3" rowspan="3">Duration : 17 weeks</td><td colspan="2">External Assessment</td></tr>
<tr><td>End Semester Examination</td><td>60</td></tr>
<tr><td colspan="2">Internal Assessment</td></tr>
<tr><td colspan="3" rowspan="2">Teaching Scheme</td><td>Class Test :</td><td>20</td><td rowspan="3">40</td></tr>
<tr><td>Assignment/Student activity</td><td>10</td></tr>
<tr><td>L</td><td>T</td><td>Total</td><td>Credit</td><td>Class attendance</td><td>10</td></tr>
<tr><td>3</td><td></td><td></td><td>3</td><td colspan="2">Total</td><td>100</td></tr>
<tr><td colspan="5">Pass Criterion: Students have to obtain at least 40% marks (pass marks) in both internal assessment and end semester examination separately.

Assignment / Student Activity: Submission of Home assignment, submission of report after conducting site visit/ industry visit/ micro-project / market survey / internet search on specific topic, preparation of chart, creation of innovative model or present seminar on specific topic which is suitable for the given subject as per instruction of subject teacher.</td></tr>
</table>

1. **Course Outcomes:**

    1. Explain the importance of management process in Business.
    2. Understand different types of organization, Objectives and functions of management.
    3. Understand the functional areas of management relating human resources, Materials, Finance.
    4. Apply various rules and regulations concerned with Business & Social Responsibilities of the Technician
    5. Identify various components of management
    6. Find the economic order quantity (EOQ) for given situation.
    7. Apply beak even analysis for optimum production
    8. Apply principles of safety in industrial activities.

2. **Theory Components:**

Unit	Topics	Teaching Hours
Unit: 1 Overview Of Business	1.1. Types of Business -Service -Manufacturing -Trade 1.2. Industrial sectors Introduction to: -Engineering industry -Process industry -Textile industry -Chemical industry -Agro industry 1.3 Globalization Introduction - Advantages & disadvantages w.r.t. India	04

	1.4 Intellectual Property Rights (I.P.R.)	
Unit: 2 Management Process	2.1 What is Management? -Evolution - Various definitions - Concept of management -Management is the combination of art and science - Levels of management -Administration & management - Scientific management by F.W.Taylor 2.2 Principles of Management (14 principles of Henry Fayol) 2.3 Functions of Management -Planning -Organizing -Directing -Controlling 2.4 Social responsibility and Environmental dimension of management.	05
Unit: 3 Organizational Management	3.1 Organization :- - Definition -Steps in organization 3.2 Types of organization - Line - Line & staff - Functional - Project 3.3 Departmentation - Centralized & Decentralized -Authority & Responsibility - Span of Control 3.4 Forms of ownership - Proprietorship -Partnership - Joint stock - Co-operative Society - Govt. Sector	06
Unit: 4 Human Resource Management	4.1 Personnel Management - Introduction - Definition -Objectives -Functions 4.2 Staffing - Introduction to HR Planning -Recruitment Procedure 4.3 Personnel– Training & Development - Types of training - Induction -Skill Enhancement 4.4 Grievance handling 4.5 Leadership, Leadership quality, Leadership style -Motivation - Maslow's Theory of Motivation 4.6 Introduction to -ESI Act -Workmen Compensation Act	08

Unit: 5 Financial Management	5.1. Financial Management - Objectives & Functions 5.2. Break Even Analysis -Introduction -Graphical representation -Significance -Limitations 5.3. Introduction to – -Excise Tax - Income Tax -GST -Custom Duty	06
Unit: 6 Materials Management	6.1 Objectives and function of Materials Management 6.2. Purchase Procedure - Objects of Purchasing - Functions of Purchase Dept. - Steps in Purchasing 6.2 Economic Order Quantity(EOQ) - Introduction & Graphical Representation 6.3 Inventory Management. -Meaning & Objectives 6.4 ABC Analysis, VED Analysis 6.5 Stores function, -BIN card, -Pricing of materials -Store verifications	08
Unit: 7 Sales and Marketing Management	7.1 Introduction 7.2 Difference between Selling and Marketing 7.3 Functions of Marketing 7.4 Market Survey 7.5 Sales promotions 7.6 Recent trends	04
Unit: 8 Safety Engineering	8.1 Accidents -causes of accidents 8.2 Need for safety 8.3 Organization for safety 8.4 Safety committee 8.5 Safety programmes 8.6 Safety measures	04
Sub Total :	**Total Lecture Classes**	45
No. of classes required for conducting Internal Assessment		06
	Grand Total :	51

Assignments: (any five)-

1. Preparation of chart for fire safety.
3. Preparation of chart for personal, Tools & Equipment and products safety.
4. Preparation of chart to avoid accident.
5. Preparation of chart to show the different financial ratios.
6. Preparation of chart to show the different types of organization.
7. **Preparation of EOQ model.**
8. **Preparation of beak even analysis model**
9. **Prepare charts for showing steps of recruitment, training and performance appraisal**

Suggested scheme for question paper design for conducting internal assessment examination:
(Duration:45minus)

Questions to be set as per Bloom's Taxonomy				
	Distribution of Theory Marks			
	Level 1(Remember)	Level 2(understand)	Level3 (Apply &above)	Total
Class Test -1	4	8	8	20
Class Test -2	4	8	8	20

4. Suggested Scheme for End Semester Examination[duration: 2 hours 30 minutes]

A: Multiple Choice Type Questions(Carrying 1mark each)				
Group	Unit	To be Set	To be Answered	Total Marks
A1	1 & 2	07	20	20x01=20
A2	3,4 &5	10		
A3	6,7 & 8	08		
	Total:	25	20	20
B: Subjective Type Questions (Carrying 8 marks each)				
Group	Unit	To be Set	To be Answered	Total Marks
B1	1 & 2	02	05	08x05=40
B2	3,4 &5	04		
B3	6,7 & 8	03		
	Total:	09	05	40
			Sub-Total[A]:	20
			Total[A+B]:	60

6. Suggested Learning Resources:

Sl. No.	Title of Book	Author	Publication
1.	Industrial Engineering and Management	O.P. Khanna	Dhanpat Rai & Sons
2	Management Principles, Processes & Practices	A.Bhattaraya & A.Kumar	Oxford University Press
3	The process of Management	W.H. Newman E.Kirby Warren Andrew R. McGill	Prentice-Hall of India, New Delhi 2004.
4	Industrial Engineering & Management,	V.Arun Viswanath, Anoop. S. Nair, S.L.Sabu	SCITECH Publication(s) Pvt. Ltd
5	Industrial Management	Rustom S. Davar	Khanna Publication
6.	Industrial Engg & Management	N V S Raju	Cengage
7.	Industrial Management	Jhamb & Bokil	Everest Publication , Pune