Final year B.Tech Plastics & Polymer Engineering (Revised Syllabus)

**PLASTICS MOULD & PRODUCT DESIGN**

| Periods/week | | | Evaluation Scheme | | | | | Credits |
|---|---|---|---|---|---|---|---|---|
| | | | Sessional Exam | | | ESE | Total | |
| L | T | P | TA | CT | PR | | | |
| 4 | - | - | - | 25 | - | 80 | 105 | 4 |

**ESE** (End Semester Examination) duration : Three Hours

**OBJECTIVE:**

- To get a basic understanding in design of moulds
- To learn physical properties of polymers required for product design
- To design polymer products with knowledge of polymer properties and end use

**A. THEORY:**

| Unit | Content | Duration | Remarks |
|---|---|---|---|
| | **Mould Design** | | |
| 1. | **Classification of Compression Moulds** – Factors that Influence Thermoset Moulding – Materials Selection in Relation to Moulding Conditions, Design of Mould Cavity – Advantages and Disadvantages of Compression moulds. | 3Hrs. | Descriptive |
| 2. | **Transfer Moulding** – Types, principles, Design of Pot and Plunger, Feed System, Economic determination of the number of cavities, Technological determination of the number of cavities, design of mould cavity, design of loading chamber, Heat losses and energy requirement to heat the mould – Advantages and disadvantages of Transfer mould. | 4Hrs. | Descriptive & Numericals |
| 3. | **Blow Mould Design** – Materials Selection, Mould Cooling, Clamping Force, Mould Venting, Pinch-off, Head die design, Parison Diameter Calculation, Wall Thickness, Vertical-load strength, Blow ratio, Base pushup, Highlights, Rigidizing, Shapes, Design based consideration – Shrinkage, Neck and Shoulder Design, Thread and beads, Bottom Design. | 5Hrs. | Descriptive & Numericals |
| 4. | **Classification of Injection Moulds** – Methodical Mould Design – Number of Cavities, Selection of Injection Moulding Machine, Layout of Cavities in multi-impression Mould, Feed Systems – Design of Runners & gate, Ejection Systems, Cooling Systems, Venting – Other aspects in Injection Mould Design. | 5Hrs. | Descriptive |
| 5. | Mould materials and their selection criteria. | 3Hrs. | Descriptive |
| 6. | Plastics materials selection for products based the properties, function. | 5Hrs. | Descriptive |
| 7. | Product Design methods using deformation data, effect of temperature. | 5Hrs. | Descriptive |

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| | | | |
|---|---|---|---|
| | **Plastics Product Design** | | |
| 8. | **Plastics Product Design:**<br>Mechanical properties and thermal behavior of plastics, Component design, Control over product stiffness composite shapes and structures<br>Design of thermoplastics and thermosetting type of polymers under static and dynamic loads, Design of sandwich panels and reinforced plastics parts<br>PVC piping: Raw materials, pipe design, specification and test procedure, manufacturing process.<br>Tribological properties of polymers, abrasion and wear, design of abrasion and wear resistant products.<br>Designing with sample composites.<br>Product characterization, Product faults and optimum processing.<br>Effect of processing on product performance, product characterization and service behavior.<br>Computer application for moulds, dies & products.<br>Computer aided design- illustrations. | 30 Hrs. | Descriptive & Numericals |

**Section A** -1, to 7
**Section B** -8

**B. SUGGESTED TEXT BOOKS & REFERENCES:**

| Sr.no | Title | Author | Publication |
|---|---|---|---|
| 01 | Plastics Product Design | R.D Beck | Van Nostrand Reinhold Co |
| 02. | Plastics Engineering | R.J.Crawford, Pergamon Press | |
| 03. | Injection mould Design | R.G.W.Pye | |
| 04 | Blow Molding Handbook | Rosato | |
| 05 | Designing with Plastics & Composites | Rosato & Rosato | |
| 06 | Plastics Products Design Hand Book | Edward Miller | Marcel Dekker |
| 07 | Plastic Part Design for Injection Moulding | Robert A. Malloy | Hanser Pub., Munich Vienna NY, 1994 |
| 08 | Plastics Product Design and Process Engineering | H. Belofsky | SPE, Hanser Publication, Munich Vienna NY, 1995. |
| 09 | Plastic Product Design Engineering Hand Book | S.Levy & J.H.Dubois | Van Nostrand Reinhold Co., New York, 1977 |

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**PATTERN OF QUESTION PAPER**

Faculty of Engineering and Technology

Final Year (B.Tech) **Plastics & Polymer** (Revised Course) Examination

November/December, May/June 200__

**Plastics Mould & Product Design**

**Time: 3 hrs** **Maximum Marks:80**

"Please check whether you have got the right question paper"

N.B. :- i. All questions are compulsory

ii. Use separate answer book for each section

iii. …….

iv……..

**SECTION A**

Question no 1 **16 marks**

This question will consists of questions from all the chapters under section A mentioned in the syllabus.

This will consists of objective type, multiple choice type, short questions, concept oriented problems.

Question no 2 **12 marks**

OR

Question no 2

Question no 3 **12 marks**

OR

Question no 3

**Note:** 1. The questions will be memory based, application based and understanding type.

2. There should be intermixing in the questions.

**SECTION B**

Question no 4 **16 marks**

This question will consists of questions from all the chapters under section B mentioned in the syllabus.

This will consists of objective type, multiple choice type, short questions, concept oriented problems.

Question no 5 **12 marks**

OR

Question no 5

Question no 6 **12 marks**

OR

Question no 6

**Note:** 1. The questions will be memory based, application based and understanding type.

2. There should be intermixing in the questions.

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Final year B.Tech Plastics & Polymer Engineering (Revised Syllabus)

**RUBBER TECHNOLOGY - II**

**STRUCTURE**

| Periods/week | | | Evaluation Scheme | | | ESE | Total | Credits |
|---|---|---|---|---|---|---|---|---|
| | | | Sessional Exam | | | | | |
| L | T | P | TA | CT | PR | | | |
| 4 | - | 2 | 25 | 25 | 50 | 80 | 180 | 5 |

**ESE** (End Semester Examination) duration : Three Hours

**OBJECTIVE**:
To learn about the chemistry, manufacture, and applications of various elastomers.
To understand the manufacturing technology of various elastomeric products.

**A) THEORY:**

| Unit | Content | Duration | Remarks |
|---|---|---|---|
| 1. | **Specialty Rubbers:**<br>**a) Silicones (Q):** Introduction, Manufacturing- structure and its influence on properties, compounding, fabrication, curing, general properties and applications. | 4 hrs | Descriptive |
| 2. | **b) Epichlorohydrin:** Introduction, Manufacturing- structure and its influence on properties, compounding, curing, general properties and applications. | 4 hrs | Descriptive |
| 3. | **c) Fluoro Elastomers:** Introduction, Manufacturing- structure and its influence on properties, compounding, curing, general properties and applications. | 4 hrs | Descriptive |
| 4. | **d) Polysulphides:** Introduction, Manufacturing- structure and its influence on properties, compounding, curing, general properties and applications. | 4 hrs | Descriptive |
| 5. | **e) Polyurethane Rubbers:** Introduction, Manufacturing- structure and its influence on properties, compounding, curing, general properties and applications. | 4 hrs | Descriptive |
| 6. | **f) Acrylic Rubbers:** Ethylene Acrylic copolymer, Introduction, Manufacturing- structure and its influence on properties, compounding, curing, general properties and applications. | 4 hrs | Descriptive |
| 7. | **Tyre**:<br>Introduction to tyre, nomenclature of tyres, function of tyres and their components, construction of tyres, function of the tyre components<br>Types of tyres; as per their tread pattern, Construction (Beltings), Application and others.<br>Intelligent or smart tyres, Eco-friendly tyres, Solid tyres.<br>Manufacturing Techniques of Various tyres and Automotive tubes; Principle of designing formulation for various tyre components. Green tyre and their curing method (Bladder Curing), Post Cure Inflation<br>Quality Control test and Performance test of tyre; Plunger Test, Endurance | 16 hrs | Descriptive |

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| | | | |
|---|---|---|---|
| | Test, Rolling resistance, Traction and wet skid performance test, Noise test, etc. | | |
| 8. | **Latex product manufacturing:** Introduction, compounding, Manufacturing, properties and formulation of Household and surgical gloves, electrical gloves, Coir Foam and Mattresses, Latex thread, Latex toys and balloons.<br>Dunlop and Talalay process for Latex foam manufacturing, Latex Allergies. | 8 hrs | Descriptive |
| 9. | **Dry Rubber Products:** Manufacturing and properties of different components of Footwear, Tennis balls, Golf ball, Seals and gaskets. | 6 hrs | Descriptive |
| 10. | **Manufacturing of transmission systems**: Manufacturing process, Properties and formulations of Different components of Cables, V-belts, Conveyor belts and Hoses/ | 6 hrs | Descriptive |

**Section A** -1, 2, 3, 4,5,6,9
**Section B** – 7,8,10

**TERM WORK:**
Term work shall consist of laboratory works / assignments based on the list of experiments given.

**B. LIST OF EXPERIMENTS:**

1. Synthesis of silicone rubbers
2. Study of different properties of silicone rubbers
3. Synthesis of polysulphides
4. Synthesis of acrylic rubbers
5. Compounding and dispersion preparation of Latexes with different ingredients
6. Product manufacturing of compounded latex
7. Testing of latex and their products
8. Study of different types of tyres and their physical and mechanical properties
9. Study of different applications of rubbers
10. Laboratory work/ assignments on any topics related to the subjects

Any other experiments related to above topics can be performed.

**The assessment of term work shall be done on the following.**

1. Continuous assessment.
2. Performing the experiments in the laboratory.
3. 13. Oral examination conducted (internal) on the syllabus and term work mentioned.

**PRACTICAL EXAMINATION:**
The practical examination shall consist of performing an experiment based on the practical work done during the course, the record of the experiment submitted by the candidate and viva-voce based on the syllabus. The assessment will be based on

1. Performing an experiment.
2. Records of the experiments submitted by the candidate.
3. Viva – voce on the syllabus.

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**C. SUGGESTED TEXT BOOKS & REFERENCES**

| Sr.no | Title | Author | Publication |
|---|---|---|---|
| 1. | Rubber Product Manufacturing Technology | A K Bhowmik, M M Hall and H A Benaney | Marcel Dekker Inc, Newyork, 1994 |
| 2. | Rubber Technology | A S Chraig, Oliver, Boyd | Edinburgh, 1982 |
| 3. | Rubber Technology Handbook | C.Hoffman | Hanser Pub |
| 4. | Synthetic rubbers – Chemistry & Technology | D.C.Blakley | Applied science Publishers, 1979 |
| 5. | Hose Technology | C W Evans | Elsevier Applied Science Publisher, 1979 |
| 6. | Handbook of Elastomers, new developments and technology | A K Bhowmik, H L Stephens | Marcel Dekker Inc., Newyork, 1988 |

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**PATTERN OF QUESTION PAPER**

Faculty of Engineering and Technology

Final Year (B.Tech) **Plastics and Polymer** (Revised Course) Examination

November/December, May/June 20__

**Rubber Technology - II**

**Time: 3 hrs** **Maximum Marks:80**

"Please check whether you have got the right question paper"

N.B. :- i. All questions are compulsory

ii. Use separate answer book for each section

iii. …….

iv……..

**SECTION A**

Question no 1 **16 marks**

This question will consists of questions from all the chapters under section A mentioned in the syllabus.

This will consists of objective type, multiple choice type, short questions, concept oriented problems.

Question no 2 **12 marks**

OR

Question no 2

Question no 3 **12 marks**

OR

Question no 3

**Note:** 1. The questions will be memory based, application based and understanding type.

2. There should be intermixing in the questions.

**SECTION B**

Question no 4 **16 marks**

This question will consists of questions from all the chapters under section B mentioned in the syllabus.

This will consists of objective type, multiple choice type, short questions, concept oriented problems.

Question no 5 **12 marks**

OR

Question no 5

Question no 6 **12 marks**

OR

Question no 6

**Note:** 1. The questions will be memory based, application based and understanding type.

2. There should be intermixing in the questions.

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Final year B.Tech Plastics & Polymer Engineering (Revised Syllabus)

**PLANT DESIGN**

**STRUCTURE**

| Periods/week | | | Evaluation Scheme | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | Sessional Exam | | | ESE | Total | Credits |
| L | T | P | TA | CT | PR | | | |
| 4 | - | 2 | 25 | 25 | 50 | 80 | 180 | 5 |

**ESE** (End Semester Examination) duration : Three Hours

**OBJECTIVE:** To get a basic understanding of design of various chemical plants.

**A. THEORY:**

| Unit | Content | Duration | Remarks |
|---|---|---|---|
| 1. | **Process Development:**<br>Process selection, literature survey, study of alternate process, development of project from laboratory & pilot plant data, scale up methods for important equipments, MOC selection procedure, fabrication methods and testing<br>Methods, flow sheet synthesis & development, software in process design.. | 12hrs | Descriptive |
| 2. | **Plant Design:**<br>Major steps in plant design, selection & design of equipments like heat transfer equipments, mass transfer equipments, material handling equipments, size reduction equipments, pumps etc, material of construction, plant location, site selection and preparation, plant layout and installation, piping, selection of piping, nominal pipe size, criterion for selection of materials, process steam piping, piping layout | 18hrs | Descriptive & Numericals |
| 3. | Plant design considerations for large scale production of some polymers such as polystyrene, PVC, HDPE , PP,Nylon-6,PET, Water pollution, air pollution, solid waste | 14 hrs | Descriptive |
| 4. | Project organization, project scheduling, PERT & CPM techniques, Taxes and insurances, type of taxes: federal income taxes, insurance-types of insurance, self insurance, Depreciation: types of depreciation, services life, salvage value, present value, methods for determining depreciation, single unit and group depreciation. Interest, time value of money, taxes & fixed charges | 16hrs | Descriptive & Numericals |

**Section A -** 1, 2,
**Section B –** 3, 4.

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**TERM WORK:**
Term work shall consist of detailed drawing sheets containing assignment problems.

**B. LIST OF ASSIGNMENTS:**
1. Design of 1-2 pass shell & tube heat exchanger
2. Design of distillation column for binary system
3. Humidification Equipments (cooling Towers).
4. Various pipe fittings & bends.
5. Plant layout of at least one polymer industry
6. Different instrumentation diagrams showing measurement & control of various parameters like temperature, pressure level, flow etc

Any other assignment related to above topics can be performed.

The assessment of term work shall be done on the following.
1. Continuous assessment.
2. Performing the experiments in the laboratory.
3. Oral examination conducted (internal) on the syllabus and term work mentioned.

**PRACTICAL EXAMINATION**
The practical examination shall consist of practical work done during the course, the record of the experiment submitted by the candidate and viva-voce based on the syllabus. The assessment will be based on
1. Records of the drawing sheets submitted by the candidate.
2. Viva – voce on the syllabus.

**C. SUGGESTED TEXT BOOKS & REFERENCES**

| Sr.no | Title | Author | Publication |
|---|---|---|---|
| 01 | Chemical Engineering Plant Design | Vibrandt & Dryden E.E. | McGraw Hill |
| 02 | Plant Design & Economics for Chemical Engineers | Peter M.S. & Timmerhaus K.D. | McGraw Hill |
| 03 | Process Design of Equipments | Dawande, S.D. | Central Techno Publications |
| 04 | Perry's Chemical Engg. Handbook | R.H. Perry & Don W. Gress | 7th Edition McGraw Hill Company |
| 05 | Chemical Engineering: Vol.6 | Coulson J.M. and Richardson J.F | Pergamon Press |
| 06 | Process Equipment Design | M.V. Joshi and V.V. Mahajan | MacMillan India Ltd |
| 07 | Mass Transfer Operations | Treybal, R | McGraw Hill |

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**PATTERN OF QUESTION PAPER**

Faculty of Engineering and Technology

Final Year (B.Tech) **Plastics & Polymer** (Revised Course) Examination

November/December, May/June 20__

**Plant Design**

**Time: 3 hrs** **Maximum Marks:80**

"Please check whether you have got the right question paper"

N.B. :- i. All questions are compulsory

ii. Use separate answer book for each section

iii. …….

iv……..

**SECTION A**

Question no 1 **16 marks**

This question will consists of questions from all the chapters under section A mentioned in the syllabus.

This will consists of objective type, multiple choice type, short questions, concept oriented problems.

Question no 2 **12 marks**

OR

Question no 2

Question no 3 **12 marks**

OR

Question no 3

**Note:** 1. The questions will be memory based, application based and understanding type.

2. There should be intermixing in the questions.

**SECTION B**

Question no 4 **16 marks**

This question will consists of questions from all the chapters under section B mentioned in the syllabus.

This will consists of objective type, multiple choice type, short questions, concept oriented problems.

Question no 5 **12 marks**

OR

Question no 5

Question no 6 **12 marks**

OR

Question no 6

**Note:** 1. The questions will be memory based, application based and understanding type.

2. There should be intermixing in the questions.

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Final year B.Tech Plastics & Polymer Engineering (Revised Syllabus)

**POLYMER RECYCLING AND WASTE MANAGEMENT**

**STRUCTURE**

| Periods/week | | | Evaluation Scheme | | | | | Credits |
|---|---|---|---|---|---|---|---|---|
| | | | Sessional Exam | | | ESE | Total | |
| L | T | P | TA | CT | PR | | | |
| 4 | - | 2 | 25 | 25 | 50 | 80 | 180 | 5 |

**ESE** (End Semester Examination) duration: Three Hours

**OBJECTIVE**:

- To learn the various methods employed for recycling of polymers.
- To learn need for polymer recycling, plastic and rubber waste management, various methods of recycling technologies and the applications of recyclates.

**A. Theory**

| Unit | Content | Duration | Remarks |
|---|---|---|---|
| 1. | **Need for recycling**<br>Sorting and segregation of waste, Plastics identification, Plastics production and composition, Plastics waste: Composition, quantities and disposal, alternative types of recycle methods. | 09 hrs | Descriptive |
| 2. | **Primary Recycling**<br>Equipments for primary recycling, Specific recycling technique for PE films, PP battery cases, Crushing and separation of PET films and bottles. | 09 hrs | Descriptive |
| 3. | **Recycling of plastics from urban waste:**<br>Rheology, density ,mechanical behavior, Secondary recycling, Plastics waste containing paper- hydrolytic treatment, processing of mixed plastics waste, household waste, industrial sector, TPO based materials | 10 hrs | Descriptive |
| 4. | **Use of recyclable plastics in motor vehicles:**<br>Recoverable materials, disposal of residuals, recyclable plastic components, virgin and recycled HDPE, Flourinated and unflourinated HDPE fuel tanks, Tertiary recycling-Reactors used, use of recyclable plastics in automobiles. | 12 hrs | Descriptive |
| 5. | **Types of rubber products:**<br>Ground rubber tyre, recycling of rubber tyres, polymer composites, use of r rubber products | 08 hrs | Descriptive |
| 6. | **Waste Management:**<br>Medical Plastic generation, medical waste handling methods, Waste management of plastics packaging, effective management of plastics woven sacks, Solid waste generation, municipal solid waste management, infectious waste management, emerging processing technologies for waste reusage | 12 hrs | Descriptive |

**Section A** -1,2,3

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**Section B** -4,5,6.

**TERM WORK**
Term work shall consist of laboratory works / assignments based on the list of experiments given.

**B- LIST OF EXPERIMENTS**
1. Study of physical properties of different plastic materials collected.
2. Study of different equipments/processes used for recycling.
3. Study of rheological and mechanical properties of waste material.
4. Comparative study of chemical and mechanical processes of plastics recycling.
5. Laboratory work/Assignments on any topic related to the subject.

Any other experiments related to above topics can be performed.

The assessment of term work shall be done on the following.
1. Continuous assessment.
2. Performing the experiments in the laboratory.
3. Oral examination conducted (internal) on the syllabus and term work mentioned.

**PRACTICAL EXAMINATION**
The practical examination shall consist of performing an experiment based on the practical work done during the course, the record of the experiment submitted by the candidate and viva-voce based on the syllabus. The assessment will be based on
1. Performing an experiment.
2. Records of the experiments submitted by the candidate.
3. Viva – voce on the syllabus.

**C. SUGGESTED TEXT BOOKS & REFERENCES**

| Sr.no | Title | Author | Publication |
|---|---|---|---|
| 01 | Plastics Waste Management | Nabil Mustafa | 1st Edition, Marcel Decker, NY,1993 |
| 02. | Polymer Recycling | John Schiles | - |
| 03. | Recycling and Plastics Waste Management | Dr .J.S. Anand | CIPET Journal of India,1997 |
| 04. | Medical,Muncipal and Plastic Waste Management Handbook | NIIR Board of Consultant and Engineers | National Institute of Industrial Research |

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**PATTERN OF QUESTION PAPER**

Faculty of Engineering and Technology

Final Year (B.Tech) **Plastics & Polymer** (Revised Course) Examination

November/December, May/June 20__

**Polymer Recycling and Waste Management**

**Time: 3 hrs** **Maximum Marks:80**

"Please check whether you have got the right question paper"

N.B. :- i. All questions are compulsory

ii. Use separate answer book for each section

iii. …….

iv……..

**SECTION A**

Question no 1 **16 marks**

This question will consists of questions from all the chapters under section A mentioned in the syllabus.

This will consists of objective type, multiple choice type, short questions, concept oriented problems.

Question no 2 **12 marks**

OR

Question no 2

Question no 3 **12 marks**

OR

Question no 3

**Note:** 1. The questions will be memory based, application based and understanding type.

2. There should be intermixing in the questions.

**SECTION B**

Question no 4 **16 marks**

This question will consists of questions from all the chapters under section B mentioned in the syllabus.

This will consists of objective type, multiple choice type, short questions, concept oriented problems.

Question no 5 **12 marks**

OR

Question no 5

Question no 6 **12 marks**

OR

Question no 6

**Note:** 1. The questions will be memory based, application based and understanding type.

2. There should be intermixing in the questions.

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Final year B.Tech Plastics & Polymer Engineering (Revised Syllabus)

**Elective III**

**FIBRE TECHNOLOGY**

**STRUCTURE:**

| Periods/week | | | Evaluation Scheme | | | ESE | Total | Credits |
|---|---|---|---|---|---|---|---|---|
| | | | Sessional Exam | | | | | |
| L | T | P | TA | CT | PR | | | |
| 4 | - | 4 | 50 | 25 | 50 | 80 | 205 | 6 |

**ESE** (End Semester Examination) duration : Three Hours

**OBJECTIVE:**

To understand the production and technology of fibre manufacture.

To learn production technologies of synthetic fibres.

To learn Melt spinning, wet spinning, dry spinning methods.

**A. THEORY:**

| Unit | Content | Duration | Remarks |
|---|---|---|---|
| 1. | **Introduction:**<br>Classification and sources of vegetable fibres, Protein fibre, silk, wool their structure & properties.<br>Essential properties of textile fibres, Characteristics of fibre forming polymer.<br>Method of fibre formation: Melt, Dry, Wet Spinning & Drawing. | 8 Hrs. | Descriptive |
| 2. | **Fibre Structure:**<br>Arrangement of chain molecules & crystallites in fibre. Measurement of Crystallinity by density, X-Ray Diffraction, Thermal, IR & Chemical methods.<br>Orientation & its measurement by different methods. | 10 Hrs. | Descriptive |
| 3. | **Regenerated Cellulose Fibres:**<br>Spinning process, purification, analysis of spinning process, structure development, Properties.<br>Modification of viscous rayon & their properties.<br>Cuprammonium rayon, Cellulose acetate, manufacturer of fibre ,properties & applications. | 10 Hrs. | Descriptive |
| 4. | **Polyamide Fibre:**<br>Fibre formation, Spinning, Stretching, Staple fibre properties.<br>Aromatic Polyamide fibre.<br>Polyester fibre: Spinning process, manufacture of spinning melt & its spinning, fibre formation below the spinnerets, winding of spun filament & drawing, Properties of fibre. Polyolefin fibre: LDPE, PP, Spinning process & properties of fibre. | 9 Hrs. | Descriptive |

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| | | | |
|---|---|---|---|
| 5. | **Vinyl Fibre:**<br>PAN- Methods of spinning, Stretching, Advantages & Disadvantages.<br>Modacrylic Fibre: Properties of acrylic & modacrylic fibre.<br>PVC, Polyvinyl alcohol: Fibre formation, Structure & properties of fibre.<br>Elastomeric Fibre: Spandex, Perlon U, lycra, vyrene, fibre formation & their | 9 Hrs. | Descriptive |
| 6. | **Post processing of fibre:**<br>Twisting, Texturisation & its process, Staple fibre formation. | 6 Hrs. | Descriptive |
| 7. | **Fibre Optics:**<br>Introduction, preparation of optical fibre, optical fibre material, principle of operation of optical fibre. Types of optical fibres, Losses in optical fibres, Concept of numerical<br>Operture (NA). Advantages of optical fibre communication. | 8 Hrs. | Descriptive |

**Section A** -1, 2, and 3
**Section B** -4, 5, 6, 7.

**TERM WORK:**
Term work shall consist of laboratory works / assignments based on the list of experiments given.

**B. LIST OF EXPERIMENTS:**

1. To prepare viscose rayon fibre.
2. To prepare tetra amine copper II viscose fibre.
3. Dry spinning of acetate rayon.
4. To prepare nylon 6, 10 fibre.
5. To study the effect of bleach, alkali and temperature on wool.
6. Identification of fibre.
7. Any other experiment related to above topics.

**Term work shall be done on the following.**
1. Continuous assessment.
2. Performing the experiments in the laboratory.
3. Oral examination conducted (internal) on the syllabus and term work mentioned.

**PRACTICAL EXAMINATION:**
The practical examination shall consist of performing an experiment based on the practical work done during the course, the record of the experiment submitted by the candidate and viva-voce based on the syllabus. The assessment will be based on

1. Performing an experiment.
2. Records of the experiments submitted by the candidate.
3. Viva – voce on the syllabus.

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**C. SUGGESTED TEXT BOOKS & REFERENCES:**

| Sr.no | Title | Author | Publication |
|---|---|---|---|
| 01 | Applied Fibre Science | F Happey | Academic Press |
| 02. | Cellulose- Structure, Modification & Hydrolysis | R.A.Young & Rowell | Wiley International |
| 03. | Chemical Technology of Fibrous Material | F. Sadov, M Korchagin | Mir Publication |
| 04 | Fundamentals of fibre formation | A Ziabicki | Jon Wiely & Sons |
| 05 | Man made fibres | R.W Moncrieff | Jon Wiley |
| 06 | Man made fibres science & Technology | H.Mark, S.M.Atlas | Wiley Interscience |

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**PATTERN OF QUESTION PAPER**

Faculty of Engineering and Technology

Final Year (B.Tech) **Plastics and Polymer** (Revised Course) Examination

November/December, May/June 20__

**Elective-III (Fibre Technology)**

**Time: 3 hrs** **Maximum Marks:80**

"Please check whether you have got the right question paper"

N.B. :- i. All questions are compulsory

ii. Use separate answer book for each section

iii. …….

iv……..

**SECTION A**

Question no 1 **16 marks**

This question will consists of questions from all the chapters under section A mentioned in the syllabus.

This will consists of objective type, multiple choice type, short questions, concept oriented problems.

Question no 2 **12 marks**

OR

Question no 2

Question no 3 **12 marks**

OR

Question no 3

**Note:** 1. The questions will be memory based, application based and understanding type.

2. There should be intermixing in the questions.

**SECTION B**

Question no 4 **16 marks**

This question will consists of questions from all the chapters under section B mentioned in the syllabus.

This will consists of objective type, multiple choice type, short questions, concept oriented problems.

Question no 5 **12 marks**

OR

Question no 5

Question no 6 **12 marks**

OR

Question no 6

**Note:** 1. The questions will be memory based, application based and understanding type.

2. There should be intermixing in the questions.

Final year B.Tech Plastics & Polymer Engineering (Revised Syllabus)

**Elective III**

**POLYMER NANO COMPOSITES**

**STRUCTURE:**

| Periods/week | | | Evaluation Scheme | | | ESE | Total | Credits |
|---|---|---|---|---|---|---|---|---|
| | | | Sessional Exam | | | | | |
| L | T | P | TA | CT | PR | | | |
| 4 | - | 4 | 50 | 25 | 50 | 80 | 205 | 6 |

**ESE** (End Semester Examination) duration : Three Hours

**OBJECTIVE:**

To study the introduction to nano materials and their factors affecting
To study the synthesis methods of nano material
To study the applications of nano materials in polymer composites preparation
To study the different application sectors of nano materials and nano composites

**A. THEORY:**

| Unit | Content | Duration | Remarks |
|---|---|---|---|
| 1. | **Introduction:** Introduction to Nanotechnology, Conventional and nano-material properties, Role of size in properties of nano-materials, Types of Nano-Materials | 8 hrs | Descriptive |
| 2. | **Synthesis:** Bottom-up approach and Top-down Approach for nano materials synthesis<br>Methods: Ball Milling, Chemical vapor deposition, pressure vapor deposition, Solvo-thermal, Photochemical, Electrochemical, Sono-chemical synthesis, Precipitation, sol-gel, Micelles and Micro-emulsion, inert gas condensation, Plasma arc techniques and others | 10 hrs | Descriptive |
| 3. | **Effect of Nano Particles:** Effect on Mechanical properties, chemical properties, electrical properties, Optical Properties, Barrier Properties, flame retardant properties, Scratch and mar properties, Magnetic properties, etc | 10 hrs | Descriptive |
| 4. | **Polymer Nanocomposites preparation and characterization**:<br>Introduction to PNC, Polymer nano material interface, method of preparation of PNC: In-situ Polymerization, Surface chemistry, Melt compounding, dispersion destabilization.<br>Nano particle dispersion and reinforcement by surface modification, particle dispersion and agglomeration.<br>Clay and silica nanoparticles dispersion and their treatments, its effect on mechanical properties<br>Introduction to SEM, TEM, XRD, AFM, Scanning probe Microscopy | 14 hrs | Descriptive |
| 5. | **Rheology of Polymer Nanocomposites**: Rheology of composites, Rheology of Nanocomposites with C-nano tubes,Rheology of Nanocomposites with MMT clay,Rheology of colloidal suspension | 06 hrs | Descriptive |

| | | | |
|---|---|---|---|
| 6. | **Application of Nanomaterials**: Self cleaning materials, self healing materials, Flame Retardant composites using nano materials, Toughened Plastics, Barrier properties of plastic packaging using Nanomaterials, Nanomaterials in Paints application, Nanomaterials in Rubbers, nanodendrimers in Bio-medical applications, Nanomaterials in cosmetics applications | 12 hrs | Descriptive |

**Section A -**1, 2, 3
**Section B -**4, 5, 6

**TERM WORK:**
Term work shall consist of laboratory works / assignments based on the list of experiments given.

**B. LIST OF EXPERIMENTS:**

1. Preparation of $CaCO_3$ nano filler using Precipitation methods
2. Preparation of $BaSO_4$ nano filler using Precipitation methods
3. Preparation of other nano fillers
4. Organic treatment of clay for de-spacing.
5. Preparation of Resins Nanocomposites using fillers and clay prepared in Experiment no. 1,2,3,4
6. Preparation of Plastics Nanocomposites using fillers and clay prepared in Experiment no. 1,2,3,4
7. Preparation of Rubber Nanocomposites using fillers and clay prepared in Experiment no. 1,2,3,4
8. Testing of mechanical properties of Polymer Nanocomposites prepared in experiment no.5, 6, 7
   (Tensile Strength, density, hardness, abrasion resistance, Viscosity)
9. To study the XRD curves for characterization of materials prepared in experiment No. 1,2,3,4

Any other experiments related to above topics can be performed.

**The assessment of term work shall be done on the following**
1. Continuous assessment.
2. Performing the experiments in the laboratory.
3. Oral examination conducted (internal) on the syllabus and term work mentioned.

**PRACTICAL EXAMINATION:**
The practical examination shall consist of performing an experiment based on the practical work done during the course, the record of the experiment submitted by the candidate and viva-voce based on the syllabus. The assessment will be based on

1. Performing an experiment.
2. Records of the experiments submitted by the candidate.
3. Viva – voce on the syllabus.

**C. SUGGESTED TEXT BOOKS & REFERENCES:**

| Sr.No. | Title | Author | Publication |
|---|---|---|---|
| 1. | Encyclopedia of Nanoscience and Nanotechnology | Hari singh Nalwa | American Scientific publishers |
| 2. | Nanoparticle Technology Handbook | M Hosokawa, K Nogi, M Naito, T Yokoyama | Elsevier |
| 3. | The Science of Nanotechnology: An introductory text | LUANNE TILSTRA et al | Nova Science Publishers, Inc. |
| 4. | Polymer-Layered Silicate and Silica Nanocomposites | Y.C. Ke, P. Stroeve | ELSEVIER, 2005 |
| 5. | Polymer Nanocomposites Handbook | R K Gupta, E Kennel, K Kim | CRC Press |
| 6. | Polymer/Layered Silicate Nanocomposites | Masami Okamoto | Rapra Review reports: 163 ISBN 1-85957-391-6 |

**PATTERN OF QUESTION PAPER**

Faculty of Engineering and Technology

Final Year (B.Tech) **Plastics & Polymer** (Revised Course) Examination

November/December, May/June 20__

**Elective-III (Polymer Nano Composites)**

**Time: 3 hrs** **Maximum Marks:80**

"Please check whether you have got the right question paper"

N.B. :- i. All questions are compulsory

ii. Use separate answer book for each section

iii. …….

iv……..

**SECTION A**

Question no 1 **16 marks**

This question will consists of questions from all the chapters under section A mentioned in the syllabus.

This will consists of objective type, multiple choice type, short questions, concept oriented problems.

Question no 2 **12 marks**

OR

Question no 2

Question no 3 **12 marks**

OR

Question no 3

**Note:** 1. The questions will be memory based, application based and understanding type.

2. There should be intermixing in the questions.

**SECTION B**

Question no 4 **16 marks**

This question will consists of questions from all the chapters under section B mentioned in the syllabus.

This will consists of objective type, multiple choice type, short questions, concept oriented problems.

Question no 5 **12 marks**

OR

Question no 5

Question no 6 **12 marks**

OR

Question no 6

**Note:** 1. The questions will be memory based, application based and understanding type.

2. There should be intermixing in the questions.

Final year B.Tech Plastics & Polymer Engineering (Revised Syllabus)

**PROJECT**

| Periods | | | | Evaluation Scheme | | | | | Credit |
|---|---|---|---|---|---|---|---|---|---|
| | | | | Sessional Exam | | ESE | | Total | |
| L | T | P | Total | TA | CT | TH | PR | | |
| ----- | ----- | 04 | 04 | 50 | ----- | ----- | 100 | 150 | 2 |

**OBJECTIVE:**

The practical implementation of theoretical knowledge gained during your study to till date is important for Engineering Education. The student should be able implement their ideas/real time industrial problem/ current application of their engineering branch which they have studied in curriculum. This will definitely help in building the confidence in the student what he has learnt theoretically. The dependent study of the state of the art topics in a broad area of his/her specialization.

**GUIDELINES FOR STUDENTS AND FACULTY:**

1. Students have to finalize their project title based on Industrial Assignments.
2. The projects selected should be such so as to ensure the satisfaction of the urgent need to establish a direct link between education, national development and productivity and thus reduce the gap between the world of work and the world of study. The term work will consist of a report prepared by the student on the project allotted to them.
3. Project topics may be chosen by the student or group of students (maximum 3 students) with advice from the faculty members.
4. To design a project at adequate scale level for the following applications- It may be based (i) Entirely on study and analysis of a typical Instrumentation and Control System, (ii) Experimental verification, or (iii) Design, fabrication, testing and calibration of an Instrumentation system. The software based project can be considered based on its application for instrumentation and control purpose. The students are required to submit the report based on project work done.
5. Use appropriate tools for the preparation of the report.
6. Each student/group is required to-
   a. Submit a one page synopsis before the project talk for display on the notice board in the first week of their academic semester.
   b. Give a 10 minutes presentation through OHP, PC, and Slide projector followed by a 10 minute discussion in the second week of their academic semester.
   c. Submit a report on the project topic with a list of required hardware, software or other equipment for executing the project in the third week of their academic semester.
   d. Start working on the project and submit initial development and CPM/PERT planning drawing in the fourth week of their academic semester.
   e. Preparation of PCB layout, wiring diagram, purchase of components, software demo, flowchart, algorithm, program/code, assembling, testing, etc. should be submitted by student/s within next five/Six weeks and minimum one page report should be there for each major activity.
   f. Overall assembling, wiring, code writing, testing, commissioning, should completed within next two weeks.
   g. At the last but one week of end of academic semester the internal assessment of project will be done by panel of internal faculties and they will decide marks out 25 marks for term work (TA).

h. In the last week, student/group will submit final project report to guide and thereafter guide will finalize marks out of the remaining 25 marks for term work (TA).

7. Projects are to be scheduled in the weekly scheduled time-table during the semester and any change in schedule should be discouraged.
8. Every assigned faculty/s should maintain separate file for evaluating progress of each student or group.
9. Award 50 TA, Sessional marks based on the assessment done by internal guide and panel during semester and the involvement of student/group in the work assigned related to the topic and its application.

10. The format and other guidelines for the purpose of the Project Submission in hard bound copies should be as follows,

**REPORT STRUCTURE**

Index/Contents/Intent
List of Abbreviations
List of Figures
List of Graphs
List of Tables
and List of if any other inclusion
1. Introduction
2. Literature survey
3. System development
4. Performance analysis
5. Conclusions
References
Appendices
Acknowledgement

1. INTRODUCTION
1.1 Introduction
1.2 Necessity
1.3 Objectives
1.4 Theme
1.5 Organization
2. LITERATURE SURVEY
Literature Survey
Related information available in standard Books, Journals, Transactions, Internet Websites *etc.* till date (More emphasis on last three to five years)
3. SYSTEM DEVELOPMENT
Model Development

- Analytical
- Computational
- Experimental
- Mathematical
- Statistical

(out of above methods at least one method is to be used for the model development) Some mathematical treatment or related information is required to be embodied
4. PERFORMANCE ANALYSIS

- Analysis of system developed either by at least two methods depending upon depth of standard
- These methods normally used are Analytical /Computational/Statistical/Experimental/ or Mathematical
- Results at various stages may be compared with various inputs
- Output at various stages with same waveforms or signals or related information/parameters
- Comparison of above results by at least two methods and justification for the differences or error in with theory or earlier published results

5. CONCLUSIONS
5.1 Conclusions
5.2 Future Scope
5.3 Applications

Contributions (if any,)
The innovative work/invention/new ideas generated from the analysis of the work which can be taken from the conclusions

**REFERENCES**

- Author, "Title", Name of Journal/Transactions/ Book, Edition/Volume, Publisher, Year of Publication, page to page (pp.__).

These references must be reflected in text at appropriate places in square bracket
In case of web pages complete web page address with assessing date has to be enlisted
List of references should be as per use in the text of the report

**APPENDICES**
Related data or specifications or referred charts, details computer code/program, *etc*.

(1 Page)

Expression of gratitude and thankfulness for helping in completion of the said task with name
Signed by the candidate

- General Guidelines
  Text should be printed on front and correct side of the watermark on quality bond paper
  Paper size- A4, 75 to 85 gsm paper
  Left Margin-1.5"
  Right Margin-3/4"
  Top Margin-1"
  Bottom Margin-1"
- First page of first chapter need not be printed anywhere ,second page onwards at right hand corner at ½ inch from right and top side from second chapter onwards starting page number of chapter should be printed at bottom center place report total pages –around.
  All Greek words must be italic

  Report Heading -All Capital—16 Font
  Chapter heading -All Capital—14 Font
  Subchapter –title case-12 Font
  Sub-Subchapter –First Alphabet Capital case-12 Font
  Page numbers for Index/Contents/Intent should be in roman
  Title of the Report should not be more than two lines

Text pages should be in times new roman
The page of the Index/Contents/Intent heading should be below the words for appropriate sub chapter or sub-sub chapter as shown in sample copy
Cover page should have (Mission statement of Institute) in inverted commas, Symbol of Institute, Name of Department, and Institute

Suitable flap with name of the candidate, Department and Institute name and symbol can be used with nylon strip.

*For more information and sample of hard copy please contact the respective Head of the Department*

Final year B.Tech Plastics & Polymer Engineering (Revised Syllabus)

**Semester VIII**

**IN PLANT TRAINING**

| | |
|---|---|
| (a) | **Rationale:**<br>The techniques and processes of production of goods and services do not demand only technical skills, but also a cluster or conglomerate of skills. A significant part of which is related to the total humanistic growth of the man. Such conglomerate skills technical and humanistic can not obviously be acquired through pure academic learning of concepts in formalized and institutional courses and in isolation of the actual work situation. It, therefore, naturally follows that no technical education will be complete till it has two components, one learning of concepts vis-a vis acquiring conceptual skill and other application of the concepts in real work situation vis-a vis acquiring manipulative or practicing skills. Technical education needs to have a complement of learning of the techniques of applying the concepts within the industry and business. |
| (b) | **Objective:**<br>1) The students of B.Tech course shall get an opportunity to work on live problems of the industry.<br>2) He/She shall apply his leaving concepts in the real work situation.<br>3) He/She shall get an exposure to the industrial environment and thereby enable himself/herself to appreciate the other related aspects of industry vis, human, economic, commercial and regulatory.<br>4) He/She shall identify career paths taking into account their individual strengths and aptitude.<br>5) He/She shall contribute for the achievement of economic goals and aspirations of the industry and our country as a whole. |
| | The curriculum for B.Tech students of final Year Course of Part-II shall consist of;<br>1) In plant training for a period of one full term, and the period of the term shall be as prescribed by the university from time to time.<br>2) A project on live problems of the industry shall be undertaken by the student/group of students undergoing atraining in the same establishment.<br>3) The term work shall consist of the in plant training record-daily diary, work diary, progress report, a record containing the literature survey in the field of appropriate branch of Engineering, a preliminary report related to project work etc.<br>4) Seminars will be arranged after successful completion of period specified in the scheme of semester VIII of B.Tech. The date and times will be decided according to the convenience of guide and student. |
| | **General Provisions, Rules And Regulation Of In-Plant Training**<br>**1. Definition**<br>• In-plant training means a course of training in any industry or establishment undergone in pursuance of memorandum of understanding between industry and institute and under the prescribed terms and conditions of Dr. Babasaheb Ambedkar Marathwada University, Aurangabad.<br>• Institution means an academic Institution of higher learning associated and admitted under the privileges of university, I.e. Maharashtra Institute of Technology, affiliated to Dr. Babasaheb Ambedkar Marathwada University, Aurangabad.<br>• Industry means any industry or business in which any trade, occupation or subject field in engineering or technology may be specified as a designated trade.<br>• Establishment includes any place where any industry is carried on.<br>• University means any of the universities mentioned in the schedule of Maharashtra |

| | |
|---|---|
| | University Act, 1994 i.e. Dr. Babasaheb Ambedkar Marathwada University, Aurangabad.<br>• Collaboration means collaborative academic activity of the Institute with industry.<br>• Student means a B Tech Course student. |
| | **2. Memorandum of understanding:**<br>Maharashtra Institute of Technology, Aurangabad will enter into an agreement with the industry through 'Memorandum of Understanding' for creating facilities of in-plant training in the appropriate branch of Engineering according to the Course Curriculum and keep this agreement for a period of 10 years to foster a healthy industry- institute interaction for mutual benefits of both. |
| | **3. Admission to in-plant training:**<br>No student will be deputed for in-plant training unless he produces testimonial of having kept one term for the subject under B Tech Semester –VIII of final year course satisfactorily in Maharashtra Institute of Technology after passing the TY B Tech Examination (in the appropriate branch). |
| | **4. Period of in-plant training:**<br>The period of in-plant training will be the period of one term for the subject under B Tech course semester-VIII, which will be notified by Dr. Babasaheb Ambedkar Marathwada University, Aurangabad. |
| | **5. Contract of In-plant Training :**<br>• The student of Maharashtra Institute of Technology shall enter into a contract of in-plant training with the employing industry.<br>• The in-plant training shall be deemed to have commenced on the date, on which the contract of in-plant training has been entered into.<br>• Every contract of in-plant training will contain the Terms and Conditions to be agreed by both the parties.<br>• Every contract of in-plant training shall be registered with the Maharashtra Institute of Technology within 15 days from entering into the contract. |
| | **6. Violation of contract:**<br>Where an employer, with whom a contract for in-plant training has been entered into, is for any reason, unable to fulfill his obligation under the contract, the contract end with the consent of Maharashtra Institute of Technology. It is agreed between the employer, the student and any other employer that the student shall be engaged as an "in-plant trainee" under the other employer till the expiry period of the in-plant training. The agreement on registration with Maharashtra Institute of Technology shall be deemed to be the contract of in-plant training between the student and other employer, and from the date of such registration, the contract of in-plant training with the first employer shall terminate and no obligation under that contract shall be enforceable at the instance of any party to contract against the other party thereto. |

| | |
|---|---|
| | **7. Termination of Contract:**<br>The contract of in-plant training shall terminate on the expiry of the period of in-plant training.<br>Either party to the contract of in-plant training make an application to Maharashtra Institute of Technology, Aurangabad for the termination of the contract.<br>After considering the content of the application, and objection, Maharashtra Institute of Technology by order in writing, will terminate the contract, if it is satisfied that the parties to the contract have/has failed to carry out the Terms and Conditions of the contract.<br>Provided that where a contract is terminated-<br>• For the failure on the part of the Employer, Maharashtra Institute of Technology will depute students to another Employer for providing facilities of in-plant training to the remaining period of training.<br>• For the failure on the part of the student, the student will not be allowed to continue his/her in-plant training in that term. The student shall be deputed for in-plant training in the next coming term. |
| | **8. Expectation from the Employer/Industry:**<br>The following expectations are derived for effective in-plant training.<br>• To provide legitimate facilities for the training and learning of all the processes.<br>• To guide the student for understanding a project of immense importance to industry and to help him/her for his/her career advancement. |
| | **9. Obligation of Students:**<br>• To learn his/her subject field in Engineering or Technology conscientiously and diligently at his place of training.<br>• To carry out all orders of his Employer and the Superior in the establishment.<br>• To abide by the Rules and Regulations of the Industry/Establishment in all matters of conduct and discipline.<br>• To carry out the obligation under the contract of in-plant training.<br>• The student shall maintain a report of his work during the period of his in-plant training in a proforma Annexure.<br>• Except in case of extreme urgency, the B.Tech student shall submit an application for all other leaves except the medical leave to the Manager/Gen. Manager (Personnel) of the concerned industry, where he is undergoing an in-plant training and obtain sanction before the leave is taken. In case of Medical Leave, he shall submit an application to Maharashtra Institute of Technology, Aurangabad. The shortage in attendance will be subjected to extending the period of in-plant training in which case, the student may not be allowed to appear for the test, project seminar and assessment of term work etc. which will be held immediately after successful completion of the in-plant training. |
| | **10. Maintenance of Record:**<br>Every student of B.Tech course shall maintain a daily record of the work done by him/her relating to the in-plant training in the proforma (Annexure). |

| | |
|---|---|
| | **11. Industry Sponsored Student Projects:**<br>The scheme envisages working out suitable programme for B.Tech students. They are required to complete their in-plant training in a given period. During this period, they shall be familiar with the understanding of the shop process and activities. The students can be asked to solve the mini-shop problem, which will make them think and try out short experiments as an improvement in the process, tools and equipment.<br>The student here is not expected to acquire the skills in operating machines values. He should appreciate the application of theory learnt.<br>The students in a group alone can undertake a project of immense importance for the benefit of the industry and also useful for the students for their advancementof career. Industry staff and Maharashtra Institute of Technology facultycan plan in advance to effectively complete the practical training with the project for preliminary studies on the floor.<br>The projects should aim mainly-<br>• Cost reduction<br>• Reducing cycle time<br>• Enhancing productivity<br>• Energy conservation measures<br>• Process Improvement technique<br>• Inventory control<br>• Quality control Technique<br>• Improvement in Material handling system<br>• Bottlenecks in material flow system and so on. |
| | **12. What will form a good project?**<br>Through the project, it is hoped to provide the students an exciting experience in solving line problems under practical constraints. Hence it is desired that the project should be a well defined problem, which can be completed and implemented within the project period. It may be a problem, evolving analysis, design, fabrication and/or testing. |
| | **13. Time Schedule for the Project:**<br>The following time schedule should be planned by each student or groups of students, who undertake the project.<br>• Proposal to be received before specifies date.<br>• Project acceptance before.<br>• Commencement of the project.<br>• Completion of the project. |
| | **14. Commitment on the part of the Institute:**<br>• Providing a faculty member to supervise the project.<br>• Providing the Institute facilities to complete the project.<br>• Coordinator from industry will be invited to participate in the stage wise assessment of the students performance. |
| | **15. Assistance for completion of the Project:**<br>All the projects undertaken by the students are time bound. Although, every attempt results may not be achieved within the period available for the student. In such cases, the services of the associated faculty members can be sought for the completion of the same on mutually agreed terms. |

| | |
|---|---|
| | **16. Monitoring of In-Plant Training:**<br>The B.Tech students are expected to follow all the rules and discipline of the industry. However, because of other academic requirements and the nature of the project, the student may have to work in other places outside the industry. The faculty and Industry supervisor will work out a suitable arrangement to review the progress of the work from time to time. Maharashtra Institute of Technology, Aurangabad will monitor the progress of in-plant training in association with industry authority. |
| | **17. Conduct and Discipline:**<br>In all matters of the conduct and discipline, B.Tech student shall be governed by the rules and regulations (applicable to employees of the corresponding category) in the Establishment, where he/she is undergoing a training. |
| | **18. B.Tech Students are Trainees and not Workers:**<br>• Every B.Tech student undergoing an in-plant training in the respective branch of Engineering & Technology in any Establishment shall be treated as a trainee and not a worker and-<br>• The provision of any law with respect to labour will not apply to such a trainee. |
| | **19. Settlement of Disputes:**<br>Any disagreement or dispute between an industry and a B.Tech student trainee arising out of the contract of in-plant training shall be resolved both by Maharashtra Institute of Technology and the industry with mutual cooperation. The decision of both Maharashtra Institute of Technology and the industry shall be final. |
| | **20. Holding of Test and Grant of Certificate:**<br>The progress in in-plant training of every student shall be assessed by the industry and Maharashtra Institute of Technology faculty from time to time.<br>Every B.Tech student undergoing an in-plant training shall be issued a certificate of Proficiency on completion of his training to the satisfaction of the industry. |
| | **21. Offer of Stipend / Other Welfare Activities and Employment:**<br>It shall not be obligatory on the part of the Employer / Industry to offer any stipend and other welfare amenities available, if any, to the students of B.Tech courses undergoing an in-plant training. However, if the industry desirous to do so, at will be a privilege for the students and also for Maharashtra Institute of Technology in view of the bonding of better understanding and cooperation forever. |
| | **PRACTICAL EXAMINATION**<br>The Practical examination will be conducted after successful completion of the in-plant training for which guide will be internal examiner and external examiner will be appointed by the university. The date of practical examination will be same for the students of a branch and will be notified by the university. The assessment of the practical examination shall consist of<br>1. Seminar Performance<br>2. An oral on the project work done.<br>3. Assessment of the term work.<br><br>**Note:** A 'Guide Note' on In-Plant training approved by the University is prepared and made available in each faculty of B.Tech course. |

**Revised Syllabus Structure for Final Year B tech.(Plastice & Polymer Engineering )**

**Part-I**

| Sr. No. | Course Code. | Subjects | Periods | | | Evaluation Scheme | | | | | Credits |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | L | T | P | TA | PR | CT | ESE | Grand Total | |
| 1 | | Plastics Mould & Product Design | 4 | -- | -- | -- | -- | 25 | 80 | 105 | 4 |
| 2 | | Rubber Technology-II | 4 | -- | 2 | 25 | 50 | 25 | 80 | 180 | 5 |
| 3 | | Plant Design | 4 | -- | 2 | 25 | 50 | 25 | 80 | 180 | 5 |
| 4 | | Polymer Recycling & Waste Management | 4 | -- | 2 | 25 | 50 | 25 | 80 | 180 | 5 |
| 5 | | Elective -III | 4 | -- | 4 | 50 | 50 | 25 | 80 | 205 | 6 |
| 6 | | Project | -- | -- | 4 | 50 | 100 | -- | -- | 150 | 2 |
| | | **Total of Semester - VII** | **20** | **--** | **14** | **175** | **300** | **125** | **400** | **1000** | **27** |
| **Part-II** | | | | | | | | | | | |
| 1 | In plant Training and Project Seminar (After completion of training of @ 8 weeks) | | | | | 75 | 75 | -- | -- | 150 | -- |
| 2 | In plant Training and Project Seminar (After completion of training of @ 14 weeks) | | | | | 75 | 75 | -- | -- | 150 | -- |
| 3 | In plant Training and Project Seminar (After completion of training of @ 20 weeks) | | | | | 100 | 200 | -- | -- | 300 | -- |
| | | **Total of Semester VIII** | | | | **250** | **350** | **--** | **--** | **600** | **--** |
| | | **Grand Total of VII & VIII** | | | | **425** | **650** | **125** | **400** | **1600** | **27** |

L : Lecture Hours per week
T : Tutorial Hours per week
P : Practical Hours per week

TA : Teachers Assessment
CT : Class Test
PR: Practical Exam
ESE : End Semester Examination

Class Test Duration : 1 Hour

Choices for Elective- III

1 Polymer Nano Composite
2 Fibre Technology