DR. BABASAHEB AMBEDKAR MARATHWADA UNIVERSITY, AURANGABAD.

B.Sc. SECOND YEAR (POLYMER CHEMISTRY)

(REVISED SYLLABI BASED ON UGC MODEL)

Semester System

(Effective from – June - 2010)

Dr. Babasaheb Ambedkar Marathwada University,
Aurangabad.
Subject: Polymer chemistry.
Course Structure in semester system
B. Sc. Second Year

Semester	Course code	Paper No.	Title of paper	Credits	Marks
III	PCH – 301	IX	Physico chemical Aspects of polymer – I	03	50
	PCH – 302	X	Chemistry of polymer material – I	03	50
	PCH – 303	XI	Lab Course – V	1.5	50
	PCH – 304	XII	Lab course – VI	1.5	50
IV	PCH – 401	XIII	Physico chemical Aspects of polymer – II	03	50
	PCH – 402	XIV	Chemistry of polymer material – II	03	50
	PCH – 403	XV	Lab Course – VII	1.5	50
	PCH – 404	XVI	Lab course – VIII	1.5	50

Note: for theory paper one credit = 15 periods and
For practical one credit = 30 periods

Polymer Chemistry
Second Year
Semester – III
Paper IX

Physico chemical Aspects of polymer – I 3 Credits (45 Hrs.)
3Hrs/ Week
50 Marks

1. Polymer Solution: 20 Hrs.

The process of polymer dissolution, thermodynamics of polymer dissolution, theories of polymer solution, nature of polymer molecules in solution, size and shape of polymer molecules in solution, solubility of crystalline and amorphous polymer, effect of molecular weight on solubility, viscosity of dilute and concentrated polymer solution.

2. Experimental methods: 10 Hrs.

Monomer purification, isolation and purification by polymer fractionation, fractionation technique, methods of fractionation, gel permeation chromatography, gradient elution technique, partial dissolution technique.

3. Morphology and Crystallinity: 15 Hrs.

Introduction, Development of Crystallinity, morphology and order of crystalline polymer, factors affecting Crystallinity, relation of morphology with structure and chemical properties, morphology of single crystal, crystallization from melt, during flow and from dilute solution.

Semester – III

Paper X

Chemistry of polymer material – I — 3 Credits (45 Hrs.)
3Hrs/ Week
50 Marks

1. Polyamide: 15Hrs.

Introduction, history, nomenclature, raw material of nylon 6 and 66 and their preparation, polymerization reaction, properties and application.

2. Polyvinyl Chloride: 10 Hrs.

Preparation of vinyl chloride monomer, polymerization methods, solution and suspension polymerization and application of PVC.

3. Poly Urethanes : 10 Hrs.

Raw material and their preparation, polymerization reaction, PU foam, elastomer and fibers, properties and application.

4. Poly Carbonates: 10 Hrs.

Raw material and their preparation, polymerization reaction, preparation by direct phosgenation, ester interchange method, properties and application.

Semester III

Practical Paper XI

Lab course – V — 1.5 Credits (45 Hrs.)
3Hrs/ Week
Marks: 50

1. Fractional distillation. — 3 Experiments
   Distillation of phenol, benzene, toluene.
2. Preparation of phenoplasts. — 2 Experiments
3. Preparation of Aminoplasts. — 2 Experiments
4. Analysis of monomers styrene, methylmetacrylate, vinyl chloride, Malamine. — 3 Experiments

Record book

Viva-voce

Practical Paper XII

Lab course – VI — 1.5 Credits (45 Hrs.)
3Hrs/ Week
Marks: 50

1. Identification of engineering plastic. — 4 Experiments
2. Identification of cellulose polymer. — 4 Experiments.
3. Analysis of plasticizers and fillers. — 4 Experiments.

Fourth Semester

Paper XIII

Physico chemical Aspects of polymer - II — 3 Credits (45 Hrs.)
3Hrs/ Week
50 Marks.

1. Kinetics of polymerization: 20 Hrs.

Basic Concepts of theory of polymer solution, deviation of polymer solution from ideal solution, true solution. Cohesive energy density, Headle brand theory – Flory Huggins theory and its modifications.Kinetics of free radical chain, cationic, anionic polymerization.

2. Compounding ingredients: 15 Hrs.

Introduction to compounding ingredients, plasticizers, stabilizers, fillers, colorants. Additives, their effects on processing and cost.

3. Transitions in polymers: 10 Hrs.

Glass transition temperature, determination of glass transition temperature and factors affecting glass transition temperature, glassy solids.

Paper XIV

Chemistry of polymer material – II — 3 Credits (45 Hrs.)
3Hrs/ Week
50 Marks

1. Poly Methacrylate: 10Hrs.

Introduction, monomer preparation, polymerization by bulk and suspension polymerization, properties and application.

2. Bisphenol A epoxide: 10 Hrs.

Raw material and their preparation, types of polymerization reaction, resin preparation liquid and solid epoxies their properties and application.

3. Poly ethylene Terphthalate: 10 Hrs.

Raw material and their preparation, polymerization reaction, properties and application.

4. Synthetic polymer: 15 Hrs.

Phenolic resin, introduction, raw material, preparation of novolacs, resols, resin manufacture and moulding powder. UF resin introduction, raw material theories of resinification, resin manufacture, adhesive, properties and application.

Practical Paper XV

Lab course – VII — 1.5 Credits (45 Hrs.)
3Hrs/ Week
Marks: 50

1. End group analysis by conduct metrically.	2 experiments.
2. End group analysis by pH metrically.	2 experiments.
3. Preparation of PF resin.	2 experiments
4. Preparation of monoglyceride.	2 experiments.
5. Preparation of Nylon salt.	2 experiments

Record book

Viva-voce

Practical Paper XVI

Lab course –VIII — 1.5 Credits (45 Hrs.)
3Hrs/ Week
Marks: 50

1. Depolymerization of PS/ PMMA.	2 experiments.
2. Pyrolytic degradation of PVC.	1 experiment.
3. Testing of compound/ resin and product.	1 experiment.
4. Degradation of Nylon 6 and Nylon 66	2 experiments.
5. To determine formaldehyde content in a sample.	2 experiments.
6. To determine carboxyl and amino potentiometrically.	2 experiments

Record book

Viva-voce

Reference Books:

i) Introductory polymer chemistry – G. S. Misra

ii) Text book of polymer science – P. L. Nayak and S. Lenka

iii) Polymer chemistry – M. G. Arora and M. Singh

iv) Polymer science and Technology – J. R. Fried

v) Text book of polymer sciences – F. W. Billmeyer

vi) Polymer science – V. R. Gowarikar and N. V. Vishwanathan.

vii) Polymer science and technology – A. Ghosh

viii) Organic polymer chemistry – K J Saunders

ix) Physical chemistry of polymer – A Tager

x) Principles of polymerization – George Odian

xi) Physical chemistry of macromolecules – D D Deshpande

xii) Polymer technology – D C Miles and J H Briston

xiii) Introduction to plastic technology – Vishu Shah

xiv) Principles of polymer chemistry – P J Floory