# SARDAR PATEL UNIVERSITY VALLABH VIDYANAGAR

**Course: M.Sc. (Materials Science)** 

## **IV**<sup>th</sup> Semester

Structure with effect from: 2018-19

#### SARDAR PATEL UNIVERSITY

#### (M. Sc.) Programme : Materials Science

(Under Choice Based Credit Scheme)

Structure with effect from: 2018-19

#### Semester:-IV

	Course		Theory			Fyam		Marks	
Course Type	Code	Name of Course	(T) / Practical	Credit	Contact Hrs/week	Duration in	Internal	External	Total
-500	(10 Digit)	Course	( <b>P</b> )			hrs	Total/Passing	Total/Passing	Total/Passing
	PS04CMTS21	Engineering Polymers	Т	4	4hrs	3hrs	30/10	70/28	100/40
Core Courses	PS04CMTS22	Selected Topics in Nanoscience and Nanotechnology	Т	4	4hrs	3hrs	30/10	70/28	100/40
	PS04CMTS23	Optical, Magnetic and Dielectric Properties of Materials	Т	4	4hrs	3hrs	30/10	70/28	100/40
Elective courses	PS04EMTS21	Materials and Environment	Т	4	4hrs	3hrs	30/10	70/28	100/40
(Any one)	PS04EMTS22	Ceramic Technology	Т	4	12hrs	3hrs	30/10	70/28	100/40
	PS04CMTS24	PROJECT WORK	Р	8	12hrs	3hrs	60/24	140/56	200/80
	PS04CMTS25	Comprehensive Viva		1	1hrs	-	-	50/20	50/20

#### SARDAR PATEL UNIVERSITY VALLABH VIDYANAGAR



#### SYLLABUS EFFECTIVE FROM: 2018-19 Course: M.Sc. Subject: Materials Science Semester : IV

#### Subject Code: PS04CMTS21

#### **Total Credit: 04**

#### Subject Name: ENGINEERING POLYMERS

I mit	Unit Title	Weight-
Unit	Unit Title	age (%)
1	Introduction, types and methods for preparation, characterization and applications of polyblends, alloys and IPN.	25%
2	Adhesive bonding, theories of adhesion, requirements for a good bond, mechanism of bond failure, surface preparation, primers and adhesion promotors,role of surfactants and other additives in adhesives, coatings, paints, commercial adhesives based on casein, starch, polyvinyl alcohol, rubber based adhesives, high temperature adhesives, hot melt adhesive, pressure sensitive adhesives.	25%
3	Structures, synthesis, properties and applications of selected engineering plastics such as, polyphenylene, poly (Phenylene oxide)s, poly (ether ketone)s, polyimides, polyamide-imide, poly(phenylene sulfide)s, polysulfones, poly ether-imides, Polycarbonates, Polybutylene terephthalates, polyacetals, polymeric adsorbents, polymer electrolyte membrane	25%
4	Polymers for miscellaneous applications: Action of ion exchange resins, ion exchange chromatography, ion exchange in organic and aqueous organic solvents, chelating ion exchange resins, liquid ion exchange resins. Insulating polymers, semiconducting polymers, semiconducting and metallic conjugated polymers, other highly conductive polymers, applications of conducting polymer. classes of biomedical materials, biocompatibility tests, selected polymer based bio-implants, recycling of polymers.	25%

#### **Reference Books :**

- Fundamentals of plastics and Elastomers by C. A. Happers.
- Plastic Materials by J. A. Brydson.
- Handbook of adhesive tech by Pizzi, A, Mittal K. A.
- Textbook of quantitative chemical analysis by A.I. Vogel
- Electrochemistry of conducting polymers by J.Plocharski and S. Roth.
- Biomaterials Science & Engineering by John Bupark.
- Surfactants in polymers, coatings, inks and adhesives, vol 1 by david R. Karsa

• Advances in polymeric science by Sinha Pandey Kumar Kumar

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#### SARDAR PATEL UNIVERSITY Course: M.Sc. Subject: Materials science Structure with effect from: 2018-19 Semester : IV

#### Subject Code: PS04CMTS22

Total Credit: 04

#### Subject Name: SELECTED TOPICS IN NANO SCIENCE AND NANOTECHNOLOGY

Unit	Unit Title	Weight- age (%)
1	Nano science, Nanotechnology, nanomaterials , nanostructure and bulk materials	
	zerodimensional . one dimensional , two dimensional and three dimensional nano structures	25%
	nano fabrication, characterisation techniques for nano materials	
2	Thermal techniques ,PVD, CVD , Lithography, template method , mechanical properties ,	25.07
	thermal properties, surface properties, and optical properties or nanomaterials	25%
3	Carbon nanomaterials , third allotrope of carbon - fullerenes ,graphene ,carbon nano	
	tubes -structure properties and application	25%
4	Fabrication of nano materials, nanofibers and their composites, introduction to nanoclays	
	and their composites, preparation, characterization and industrial applications, smart	25%
	composites, polymer nano composite coatings, current topics	

#### **Reference Books :**

Handbook of Nanophase Materials by Avery N. Goldstein

Nanotechnology by Gregory Timp

Nanostructured Materials by Carl C Koch

Introduction to Nanotechnology- Chrles P. Poole & F.J. Owens

Smart composites by rani elhajjar

Polymer nanocomposites coatings by vikasmittal

#### SARDAR PATEL UNIVERSITY **Subject: Materials Science** Course: M.Sc. Structure with effect from: 2018-19 Semester : IV

Subject Code: PS04CMTS23

#### **Total Credit: 04**

Subject Name: OPTICAL, MAGNETIC AND DIELECTRIC PROPERTIES OF MATERIALS

<ol> <li>Electromagnetic radiation, interaction of light with matter, atomic and electronic interactions, optical properties of metals and non-metals, reflection, refraction, transmission and absorption, dark and photo conductivity.</li> <li>Introduction, classification of materials based on electrical conductivity, dielectric properties of materials, dielectric constant, strength and loss factor, capacitance and capacitors, field vector and polarization, types of polarization. Concept of symmetry, classification of materials based on symmentry, piezoelectric and converse effect, piezoelectric materials, pyroelectricity and pyroelectric materials, ferroelectricity.</li> <li>Introduction and basic concepts, magnetic dipoles and field vectors, magnetic induction, magnetization and magnetic susceptibility. Origin of magnetic moments, magnetic</li> </ol>	Unit	Unit Title	Weight -age (%)
<ul> <li>Introduction, classification of materials based on electrical conductivity, dielectric properties of materials, dielectric constant, strength and loss factor, capacitance and capacitors, field vector and polarization, types of polarization. Concept of symmetry, classification of materials based on symmentry, piezoelectric and converse effect, piezoelectric materials, pyroelectricity and pyroelectric materials, ferroelectricity.</li> <li>Introduction and basic concepts, magnetic dipoles and field vectors, magnetic induction, magnetization and magnetic susceptibility. Origin of magnetic moments, magnetic</li> </ul>	1	Electromagnetic radiation, interaction of light with matter, atomic and electronic interactions, optical properties of metals and non-metals, reflection, refraction, transmission and absorption, dark and photo conductivity.	25%
<b>3</b> Introduction and basic concepts, magnetic dipoles and field vectors, magnetic induction, magnetization and magnetic susceptibility. Origin of magnetic moments, magnetic	2	Introduction, classification of materials based on electrical conductivity, dielectric properties of materials, dielectric constant, strength and loss factor, capacitance and capacitors, field vector and polarization, types of polarization. Concept of symmetry, classification of materials based on symmentry, piezoelectric and converse effect, piezoelectric materials, pyroelectricity and pyroelectric materials, ferroelectricity.	25%
moments of body, magnetic moments of atoms, calculation of atomic magnetic moments, Bohr magnetron.	3	Introduction and basic concepts, magnetic dipoles and field vectors, magnetic induction, magnetization and magnetic susceptibility. Origin of magnetic moments, magnetic moments of body, magnetic moments of atoms, calculation of atomic magnetic moments, Bohr magnetron.	25%
4 Classification of magnetic materials, magnetic domains and walls, hysteresis, soft and hard magnetic materials, applications, influence of temperature on magnetic behavior. 25%	4	Classification of magnetic materials, magnetic domains and walls, hysteresis, soft and hard magnetic materials, applications, influence of temperature on magnetic behavior.	25%

Materials Science and Engineering,	– William D. Callister Jr.
An Introduction	
Materials Science for Engineering,	- J.C.Anderson, ,K.D.Leaver, R.D.Rawllings
	and P.Leaver
Materials Science	- Manas Chandra

#### SARDAR PATEL UNIVERSITY

#### Course: M.Sc. Subject: Materials Science Structure with effect from: 2018-19 Semester : IV

#### Subject Code: PS04EMTS21

#### Total Credit: 04

#### Subject Name: MATERIALS AND ENVIRONMENT

Unit	Unit Title	Weight -age (%)
1	Introduction to Environmental pollution, atmospheric pollutants, source of air pollutions, water pollution. Industrial effluents, pollution due to sewage and sludge, pesticides pollution, solid waste problems, metal pollutants, Environmental carcinogens, control of pollution.	25%
2	Weathering, Air and Moisture, Radiation and heat, Pollutants, Microbial degradations, Control of deterioration, thermal protection, Optical properties, solar cells, lubrication, sublimation/ evaporation, loss of materials, Thermal Shock. Electrochemical nature of corrosion, Concepts of reaction at an electrodes. Nernst equation. Tafel equation and polarisation. Corrosion velocities, Bimetallic effects. Differential aeration, Pourbaix diagrams, Formulation of stainless steels. Corrosion of Iron, Zinc, Aluminium, Co- operation and selected alloys. Protection against corrosion.	25%
3	Packing, Insect proof packaging, Rodent proof packing, Air Conditioning, Constant damp heat and cyclic damp heat, humidity and cycles of humidity, Isolation from environment radiations.	25%
4	Trends in waste generation, maximum energy recovery from furnaces, recovery of waste Materials and raw materials from plants components, waste commission for energy recovery, economic refractory, control and Instrumentation, measuring and measuring devices.	25%

**Reference Books :** 

Theory of corrosion and protection of metals, Tomashov N. D.

Corrosion engineering - M. G. Fontana

Science of Engineering Materials - Manas Chanda

Waste recycling for energy conservation – Davidkut and Gerard Nare

#### SARDAR PATEL UNIVERSITY Course: M.Sc. Subject: Materials Science Structure with effect from: 2018-19 Semester : IV

#### Subject Code: PS04EMTS22

Total Credit: 04

#### Subject Name: CERAMIC TECHNOLOGY

Unit	Unit Title	Weight -age (%)
1	Processing of traditional ceramics, ball milling, dry and wet, spray drying, cake forming, pressing :Dry and wet, Isostatic Pressing, Extrusion, Injection moulding , sintering	25%
2	Glass processing, melting , fluxing, ball milling , casting , blow moulding	25%
3	Advanced non oxide , oxide ceramics processing, CVD, CVR, CVI, Polymer pyrolysis, plasma processing , thermal processing , pyrolysis and carbonization	25%
4	Characterization and applications of ceramics and glass , optical properties, mechanical properties, tribological properties, density bio ceramics, Applications of ceramics, applications of glass.	25%

#### **Reference Books:**

Science of Engineering Materials – Manas Chanda

Ceramic Science for Materials Technologists - I. J. McColm.

An Introduction to carbon science – Herry Marsh

Industrial Ceramic – F. Singer, S. Singer.

Hand Book of Ceramics , S, Kumar.

#### SARDAR PATEL UNIVERSITY Course: M.Sc. Subject: Materials Science Structure with effect from: 2018-19 Semester : IV

#### Subject Code: PS04CMTS24

Subject Name: PROJECT WORK

UnitUnit TitleWeight<br/>-age<br/>(%)1The students are assigned an individual/group research project. Under the project the<br/>students have to carry out thorough literature survey using library, internet and available<br/>literature in the department. They have to carry out various experiments including testing<br/>and characterization using various sophisticated instruments. These findings are compiled<br/>in the form of a dissertation to be evaluated by the External examiner for the partial<br/>fulfillment of M.Sc. degree.100%

#### **Total Credit: 08**

SARDAR PATEL UNIVERSITY Page 39 of 40

#### Course: M.Sc. Subject: Materials Science Structure with effect from: 2018-19 Semester : IV

#### Subject Code: PS04CMTS25

#### **Total Credit: 01**

### Subject Name: Comprehensive Viva

Unit	Unit Title	Weight -age (%)
1		100%