Sr. No.	Grade	Requirement
1.	A+	Publication in SCI/SCIE Indexed Journal
2.	A	Scopus/ESCI Indexed Journal
3.	B+	Paper presented in International/National conference

* Practical marks are for continuous and end semester evaluation

**Student can choose one elective subject in second and third semester.

Course Code	**MT-102**
Course Title	**Quantum Physics in Atoms and molecules**
Type of Course	Core
Course Assessment Methods End Semester Assessment(University Exam) Continuous Assessment (Sessional, Assignments, Quiz)	 50 50

Overview of Density Functional Theory:

Fundamental background of DFT, Hartree Fock Theory, Practical Difficulties in solving many electron problems, Thomas Fermi Model, Hohenberg Kohn Theorem, Kohn Sham Equations, Effective exact single particle method to the many body problem, Exchange and correlation energies, Approximation to Functionals,

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RECOMMENDED BOOKS			
S.No.	**NAME**	**AUTHOR(S)**	**PUBLISHER**
1.	Introduction to the Thermodynamics of Materials	David R. Gaskell	4th

Course Code	**MT-104**
Course Title	**Synthesis of Materials**
Type of Course	Core

Course Assessment Methods
End Semester Assessment(University Exam)

Arc discharge method, Inert gas condensation, RF- plasma, Plasma arc technique, Ion sputtering, Laser ablation, Laser pyrolysis, Ball milling and mechanical attrition, Molecular beam epitaxy (MBE), Thermal and electron beam evaporation, Chemical vapour deposition (CVD) method, Catalytic chemical vapour deposition (CCVD), Metal organic chemical vapour deposition (MOCVD). Electro-deposition, Lithography, Thin film growth by sputtering, pulsed laser technique, grain oriented and polycrystalline thin films.

Text Books:

1. Nanochemistry: A Chemical Approach to Nanomaterials Royal Society of Chemistry, Cambridge UK 2005.
2. Chemistry of Nanomaterials : Synthesis, properties and applications by CNR Rao et.al., Royal Society of Chemistry, Cambridge UK 2006.
3. Active Metals: Preparation, characterization, applications A. Furstner, Ed., VCH, New York 1996.
4. Characterization of Nanophase materials Z.L Wang (ed), Wiley-VCH, New York 2000.
5. Nanoparticles: From theory to applications G. Schmidt, Wiley Weinheim 2004.
6. Solidification and Crystallization Processing in Metals and Alloys, Hasse Fredriksson; Wiley, 2012.
7. Electron Beam Analysis of Materials by Loretto, M. H., Chapman and Hall, 1984.
8. Handbook of Crystal Growth, K. Byrappa and T. Ohachi, Springer-Verlag (2003).

Course Code	**MT-105**
Course Title	**Material Characterization**
Type of Course	Core
Course Assessment Methods End Semester Assessment(University Exam) Continuous Assessment (Sessional, Assignments, Quiz)	 50 50
Course Prerequisites	
Course Objectives (CO)	
Course Outcome	

SYLLABUS

Note for Examiner*: Total of 7 questions will be set with first question compulsory, three questions from part A and three questions from part B. Candidate will be required to attempt 5 questions in all, with first question compulsory and selecting two from each of the part A and part B. The time allowed is 3 hours.*

SECTION-A

Vacuum Technology and Materials Deposition: Basics of vacuum technology, Rotary Pump, Diffusion pump, Turbo Molecular Pump, Cryopumps and ionization pumps Gauges for measuring high vacuum (pirani, penning and ionization gauge).

Physical vapor deposition, sputtering, chemical vapour deposition, molecular beam epitaxy

Crystallography: X- **,**

Examples of X-Ray diffraction in applications, Determination of particle size, influence of particle size on XRD peaks.

Thermal Analytical Techniques: Principles of differential thermal analysis, differential scanning calorimetry and thermo-gravimetric analysis (Instrumentation, determination of transition temperature, heats of transition of plastics, metals and alloys and other materials).

SECTION-B

Optical and X-Ray Spectroscopy:

cle size, and size distribution) and applications.

ence: X-ray absorption in materials, Basic principles, Instrumentation, elemental quantification.

ED BOOKS			
	AME	**AUTHORS**	**PUBLISHER**
1.	Thermal Analysis	W. W. Wendlandt	John Wiley and sons (1986)

Course Code	**MT-203**
Course Title	**Polymers**
Type of Course	Core
Course Assessment Methods End Semester Assessment(University Exam) Continuous Assessment (Sessional, Assignments, Quiz)	 50 50
Course Prerequisites	
Course Objectives (CO)	
Course Outcome	

SYLLABUS

Note for Examiner*: Total of 7 questions will be set with first question compulsory, three questions from part A and three questions from part B. Candidate will be required to attempt 5 questions in all, with first question compulsory and selecting two from each of the part A and part B. The time allowed is 3 hours.*

Basics: Basic concepts, classification of polymers, nomenclature of polymers, concepts such as monomers

Problems with the Polymers: Thermoxidative degradation, polymer reactions, fire hazards, toxicity, effluent disposal, feedstock scarcity.

RECOMMENDED BOOKS			
S.No.	**NAME**	**AUTHORS**	**PUBLISHER**
1.	A textbook of Polymers	Ferd W Billmeyer	John Wiley and Sons, New York (1990)
2.	Polymer Science	V.R. Gowariker, N.V. Vishwanathan and Jayadev Shereedhar	Wiley Eastern Ltd, New Delhi (1986).
3.	Analysis of Polymers-An Introduction	T.R. Cromton	Smithers Rapra Pvt. Ltd. SY4 4NR, UK (2008)
4.	Experimental Methodsin polymer chemistry	J F Rabek	John Wiley and Sons New York (1980)
5.	Polymer Science	P L Nayak	KalyaniPublishers, New Delhi (2005)
6.			

Course Code	**MT-204**
Course Title	**Computational Tools and Techniques**
Type of Course	Core
Course Assessment Methods End Semester Assessment(University Exam) Continuous Assessment (Sessional, Assignments, Quiz)	 50 50
Course Prerequisites	
Course Objectives (CO)	
Course Outcome	

SYLLABUS

Note for Examiner*: Total of 7 questions will be set with first question compulsory, three questions from part A and three questions from part B. Candidate will be required to attempt 5 questions in all, with first question compulsory and selecting two from each of the part A and part B. The time allowed is 3 hours.*

Part A

Resume of

Course Code	**MT-205**
Course Title	**Ceramics and Biomaterials**
Type of Course	Core
Course Assessment Methods End Semester Assessment(University Exam) Continuous Assessment (Sessional, Assignments, Quiz)	 50 50

Course Prerequisites

RECOMMENDED BOOKS			
S.No.	**NAME**	**AUTHORS**	**PUBLISHER**
1.	Introduction to Ceramics	W. D. Kingery	Wiley NY
2.	Modern Ceramics Engineering properties, processing and use in design	D. W. Richerson,	Marcel Dekker, Inc. N. Y.
3.	Ceramic Materials for Advanced Heat Engines	Larsen ,D.C., C.W. Adams., L.R. Johnson, A.P.S. Teotia and L.G.Hill	1985,Noyes Pub., New Jersey, USA.
4.	Alumina Processing, Properties and Applications	Dorre, E., and H.Hibner	1984, Springer-Verlag, NY Stevens, R.,Zirconia and Zirconia Ceramics, 1986,Magnesium Elektron Ltd
5.	Advanced Ceramics 3	Somiya, S.	1990, Elseivr Applied Science, NY
6.	High-Tech. Ceramics	Gernot Kostorz	

Course Code	**MT-251**
Course Title	**Nanomaterials (Practical)**
Type of Course	Core
Course Assessment Methods End Semester Assessment(University Exam) Continuous Assessment (Sessional, Assignments, Quiz)	50
Course Prerequisites	
Course Objectives (CO)	
Course Outcome	

List of Experiments

Course Duration: Two laboratory sessions of 3 hours per week.

1. To synthesize metal nanoparticles by chemical route.
2. Synthesis of nanoparticles of different sizes using sol-gel technique.
3. Preparation of nano-composites using chemical method.

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Course Prerequisites	

Course Objectives (CO)

Course Assessment Methods End Semester Assessment(University Exam) Continuous Assessment (Sessional, Assignments, Quiz)	 50 50
Course Prerequisites	
Course Objectives (CO)	
Course Outcome	

SYLLABUS

Note for Examiner*: Total of 7 questions will be set with first question compulsory, three questions from part A and three questions from part B. Candidate will be required to attempt 5 questions in all, with first question compulsory and selecting two from each of the part A and part B. The time allowed is 3 hours.*

Review of Semiconductor device Physics: Energy bands in solids, the E-k diagram, Density of states, Occupation probability, Fermi level and quasi Fermi levels, p-n junctions, Schottky junction and Ohmic contacts. Optoelectronic materials, Bandgap modification, Heterostructures and Quantum Wells.

Electronic Properties of Semiconductors: Boltzmann Transport Equation, Scattering Mechanicsms, Velocity field relation in semiconductors, Generation and Recombination of charge carriers, Electronic and Ionic conductivity of semiconductors, Linear Dielectrics, Properties of dielectric materials.

Optical Properties of Semiconductors: Interaction of photons with electrons and holes in a semiconductor: Rates of emission and absorption, Condition for amplification by stimulated emission, the laser amplifier.

Semiconductor Photon sources: Light emitting diodes, optical and electrical properties of LEDs, Semiconductor Lasers. Organic light emitting diodes, Liquid crystal displays, Organic electroluminescent dispalys, 3-D display systems.

Reference Books:

1.

RECOMMENDED BOOKS			
S.No.	**NAME**	**AUTHORS**	**PUBLISHER**
1.	Physics of Semiconductor devices	S. M. Sze	2nd Edition Wiley, NY
2.	Optoelectronics	J. Wilson and JFB Hawkes	PHI New Delhi
3.	Semiconductors	R. A. Smith	Academic Publishers, Calcutta(1989)
4.	Physics of Semiconductor Devices	M Shur	Prentice Hall(1990)
5.	Chemistry of Glasses	A. Paul	Champman, Chapman hall, London.
6.	Fundamentals of Fibre Optics in Telecommunication and Sensor systems	Bishnu P. Pal	Wiley Eastern Ltd., New Delhi
7.	Dielectric Phenomena in solids	Kwan Chi Kao	Elsevier Publications
8.	Optoelectronics: An introduction	Wilson Hawkes	
9.	The Physics and Applications of Photoreferactive Materials	Laszlo Solymar David J. Webb	Clarendon Press
10.	Introduction to Ferro materials ic	Vinod K. Vadhawan	Gordan and Breach 2000
11.	Optoelectronics	Emmanuel Rosencher and Broge Vinter	Cambridge University Press

S.No.	NAME	AUTHORS	PUBLISHER
1.	Introduction toMagnetic Materials	B. D. Cullity	Addison-Wesley Publications, California, London, 1972
2.	Magnetism andMagnetic Materials	J. P. Jakubovics	Institute of Materials, London, 1994
3.	Introduction to Magnetism and Magnetic Materials	D. Jiles	Chapman & Hall, 1991
4.	Introduction to Superconductivity	A. C. Rose-Innes and E. H. Rhoderick	Pergamon Press, Oxford, 1969
5.			

Course Code	**MT-351**

Course Title

Course Assessment Methods End Semester Assessment(University Exam) Continuous Assessment (Sessional, Assignments, Quiz)	 50 50
Course Prerequisites	
Course Objectives (CO)	
Course Outcome	

Procedure for Writing a Research Proposal and Report: Purpose, types and components of research proposal, Audiences and types of research reports, Format of Research report and journal.

RECOMMENDED BOOKS			
S.No.	**NAME**	**AUTHOR(S)**	**PUBLISHER**
1.	Research Methodology: Methods and Techniques	C.R. Kothari	Wiley Eastern Ltd2009.
2.	Educational Research	L. R . Gay	Ohio: Charles E. Merril Publishing Company 2000
3.	Statistics for Management	R.I. Levin and D.S. Rubin	Pearson Education.
4.	Marketing Research- An Applied Orientation Science	N.K. Malhotra	Pearson Education

Course Code	**MT-402**
Course Title	**Major Project (Thesis)**
Type of Course	Core
Course Assessment Methods Internal Assessment : 100 External Assessment : 100	200
Course Prerequisites	
Course Objectives (CO)	
Course Outcome	