

2018.1.12

शैक्षिक सत्र 2017-18 के इवेन सेमेस्टर के समस्त B.Tech. पाठ्यक्रमों हेतु बोर्ड आफ स्टडीज द्वारा अनुमोदित परीक्षकों की सूची का अवलोकन एवं विभिन्न स्नातक पाठ्यक्रमों के सैलेबस में आंशिक संशोधन सहित सत्र 2018-19 से प्रभावी किये जाने एवं बी0टेक0 केमिकल इंजी0 के पंचम सेमेस्टर के सैलेबस का अनुमोदन।

शैक्षिक सत्र 2017-18 के इवेन सेमेस्टर के समस्त B.Tech. पाठ्यक्रमों हेतु विभागीय बोर्ड आफ स्टडीज द्वारा संस्तुत लिखित एवं प्रायोगिक परीक्षा का पैनल प्राप्त किया गया, जिसे मा0 कुलपति महोदय के अनुमोदनोपरान्त परीक्षा नियंत्रक को अग्रिम कार्यवाही हेतु प्रेषित किया जायेगा।

विद्या परिषद के अनुमोदनार्थ निम्न प्रस्ताव प्रस्तुत है:-

1. रासायन अभि0 विभाग के पंचम सेमेस्टर का पाठ्यक्रम विद्या परिषद के अवलोकनार्थ निम्नवत् पृष्ठ संख्या 126 से पृष्ठ संख्या 135 पर संलग्न है:-

विषय कोड	विषय का नाम	प्रभावी होने का सत्र
BCT - 25	Chemical Technology	2018-19
BCT - 26	Mass Transfer - I	
BCT - 27	Suger Production	
BCT - 28	Chemical Engineering Thermodynamics - II	

2. निम्न विभागों द्वारा पाठ्यक्रमों में किये गये संशोधन पृष्ठ संख्या 136 से पृष्ठ संख्या 147 पर संलग्न है। पाठ्यक्रमों का विवरण निम्नवत् है:-

विभाग	विषय कोड	विषय का नाम	प्रभावी होने का सत्र
विद्युतकण एवं संचार अभि0 विभाग	BEC-28 A	Principles of Communication	2018-19
	BEC-32 A	Microprocessors & Applications	
	BEC-31 A	Digital Communication	
	BEC-26 A	Control Systems	
	BEC-67 A	RFICs	
विद्युत अभि0 विभाग	BEE - 14 A	Network Analysis and Synthesis	2018-19
	BEE - 15 A	Microprocessor: Architecture, Programming and Interfacing	
	BEE - 20 A	Simulation Techniques Lab	
प्रयुक्त विज्ञान विभाग	BAS -11 A	Human Values & Professional Ethics	2018-19

- 3- विद्युत अभि0 विभाग के बी0टेक0 चतुर्थ वर्ष, अष्टम सेमेस्टर के विषय BEE-44 (Utilization & Traction) जो लिपिकीय त्रुटिवश बी0टेक0 विद्युत अभि0 के क्रेडिट स्ट्रक्चर में 4 क्रेडिट के स्थान पर 5 क्रेडिट का अंकित हो गया है, संशोधन हेतु पृष्ठ संख्या 147a से पृष्ठ संख्या 147e पर संलग्न है।

विद्या परिषद के माननीय सदस्यों से अनुरोध है कि कृपया उक्त का अनुमोदन प्रदान करने की कृपा करें।

2018.1.13

शैक्षिक सत्र 2017-18 के इवेन सेमेस्टर के समस्त M.Tech., MCA एवं MBA के पाठ्यक्रमों हेतु बोर्ड आफ स्टडीज द्वारा अनुमोदित परीक्षकों की सूची का अवलोकन, विभिन्न परास्नातक पाठ्यक्रमों के सैलेबस में आंशिक संशोधन सहित सत्र 2018-19 से प्रभावी किये जाने एवं M.Sc. Physics (Specialization in Electronics) के प्रथम वर्ष के सैलेबस का अनुमोदन।

शैक्षिक सत्र 2017-18 के इवेन सेमेस्टर के समस्त M.Tech., MCA एवं MBA. पाठ्यक्रमों हेतु विभागीय बोर्ड आफ स्टडीज द्वारा संस्तुत लिखित एवं प्रायोगिक परीक्षा का पैन्ल प्राप्त किया गया, जिसे मा0 कुलपति महोदय के अनुमोदनोपरान्त परीक्षा नियंत्रक को अग्रिम कार्यवाही हेतु प्रेषित किया जायेगा।

विद्या परिषद के अनुमोदनार्थ निम्न प्रस्ताव प्रस्तुत है:-

1. प्रयुक्त विज्ञान विभाग के परास्नातक पाठ्यक्रम M.Sc. Physics with seccialization in electronics के प्रथम वर्ष का पाठ्यविवरण (Syllabus) विद्या परिषद के अवलोकनार्थ पृष्ठ संख्या 166 से पृष्ठ संख्या 188 पर संलग्न है।
2. निम्न विभागों द्वारा पाठ्यक्रमों में किये गये संशोधन पृष्ठ संख्या 189 से पृष्ठ संख्या 203 पर संलग्न है। पाठ्यक्रमों का विवरण निम्नवत् है:-

विभाग	विषय कोड	विषय का नाम	प्रभावी होने का सत्र
प्रबन्ध अध्ययन केन्द्र	MBA – 103 A	Managerial Economics	2018-19
	MBA – 109 A	Research Methodology	
	MBA MK1 A	Marketing of Services	
	MBA MK7 (Elect.)	Digital Marketing	
	MBA MK8 (Elect.)	Integrated Marketing Communication	
	MBA FM7 (Elect.)	Financial Derivatives	
	MBA IT7 (Elect.)	Cyber Security for Business	
विद्युत अभि0 विभाग	MEE – 104 A	Cloud Computing for Business	2018-19
		Modeling, Simulation & Evolutionary Techniques	
प्रयुक्त विज्ञान विभाग	BAS – 11 A	Human Values & Professional Ethics	2018-19

विद्या परिषद के माननीय सदस्यों से अनुरोध है कि कृपया उक्त का अनुमोदन प्रदान करने की कृपा करें।

DEPARTMENT OF APPLIED SCIENCE
M. M. M. UNIVERSITY OF TECHNOLOGY
GORAKHPUR

Credit Structure for M. Sc. Physics with specialization in Electronics
 (For newly admitted students from Session 2018-2019)

Category	I	II	III	IV	Total
Programme Core (PC)	18	11	11	9	49
Programme Electives (PE)	-	7	3	3	13
Dissertation (D)			4	8	12
Audit (AC)					
Total	18	18	18	20	74

Curriculum for M. Sc. Physics with specialization in Electronics
 (For newly admitted students from Session 2018-2019)

Junior Year, Semester I

S. N.	Category	Paper Code	Subject Name	L	T	P	Credits
1.	PC	MPC-101	Mathematical Physics and Electromagnetic Theory	3	1	0	4
2.	PC	MPC-102	Computational Technique and programming	3	1	2	5
3.	PC	MPC-103	Quantum Mechanics	2	1	0	3
4.	PC	MPC-104	Semiconductor Devices and Integrated Circuit	3	1	0	4
5.	PC	MPC-105	Electronics Laboratory	0	0	4	2
6.	AC	Audit	Audit Subject				-
			Total	11	4	6	18

Junior Year, Semester II

S. N.	Category	Paper Code	Subject Name	L	T	P	Credits
1.	PC	MPC-201	Advanced Quantum Mechanics	3	1	0	4
2.	PC	MPC-202	Condensed Matter Physics	3	1	2	5
3.	PC	MPC-203	Spectroscopy and Laser	0	0	4	2
4.	PE1	MPE*	Program Elective-1	2	1	0	3
5.	PE2	MPE**	Program Elective-2	3	1	0	4
6.	AC		Audit Subject				-
			Total	11	4	6	18

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Senior Year, Semester III

S. N.	Category	Paper Code	Subject Name	L	T	P	Credits
1.	PC	MPC-301	Analogue and Digital Communication	3	1	2	5
2.	PC	MPC-302	Optoelectronics and Optical Communication System	3	1	0	4
3.	PC	MPC-303	Communication and Optoelectronics Lab	0	0	2	2
4.	PE-3	MPE***	Program Elective-3	2	1	0	3
6.	D		Dissertation Part-I	0	0	8	4
Total				8	3	10	18

Senior Year, Semester IV

S. N.	Category	Paper Code	Subject Name	L	T	P	Credits
1.	PC	MPC-401	Microprocessor and Application	3	1	2	5
2.	PC	MPC-402	Quantum Electronics	3	1	0	4
3.	PE-4	MPE****	Program Elective-IV	2	1	0	3
4.	D		Dissertation Part-II	0	0	16	8
Total				8	3	18	20

Programme Core for M. Sc. Physics with Specialization in Electronics

S. N.	Paper Code	Subject Name	L	T	P	Credits
1.	MPC-101	Mathematical Physics and Electromagnetic Theory	3	1	0	4
2.	MPC-102	Computational Technique and programming	3	1	2	5
3.	MPC-103	Quantum Mechanics	2	1	0	3
4.	MPC-104	Semiconductor Devices and Integrated Circuit	3	1	0	4
5.	MPC-105	Electronics Laboratory	0	0	4	2
6.	MPC-201	Advanced Quantum Mechanics	3	1	0	4
7.	MPC-202	Condensed Matter Physics	3	1	2	5
8.	MPC-203	Spectroscopy and Laser Laboratory	0	0	4	2
9.	MPC-301	Analogue and Digital Communication	3	1	2	5
10.	MPC-302	Optoelectronics and Optical Communication System	3	1	0	4
11.	MPC-303	Communication and Optoelectronics Lab	0	0	4	2
12.	MPC-401	Microprocessor and Application	3	1	2	5
13.	MPC-402	Quantum Electronics	3	1	0	4
Total			29	10	20	49

* Programme Electives (PE-I)

S. N.	Paper Code	Subject Name	L	T	P	Credits
1.	MPE-201	Classical Electrodynamics	3	1	0	4
2.	MPE-202	Solar and Astrophysics	3	1	0	4
3.	MPE-203	Methods in Theoretical Physics	3	1	0	4
4.	MPE-204	Mobile Communication	3	1	0	4
Total			12	4	0	16

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Programme Electives (PE-II)

S. N.	Paper Code	Subject Name		L	T	P	Credits
1.	MPE-205	Atomic, Molecular Physics and Laser		3	1	0	4
2.	MPE-206	Instrumentation Technology		3	1	0	4
3.	MPE-207	Physics of Materials		3	1	0	4
4.	MPE-208	Satellite Communication and Remote Sensing		3	1	0	4
			Total	12	4	0	16

Programme Electives (PE-III)

S. N.	Paper Code	Subject Name		L	T	P	Credits
1.	MPE-301	Thermodynamics and Statistical Mechanics		3	1	0	4
2.	MPE-302	Particle Physics		3	1	0	4
3.	MPE-303	Fiber Optics and Nonlinear Optics		3	1	0	4
4.	MPE-304	Wireless Communication		3	1	0	4
			Total	12	4	0	16

Programme Electives (PE-IV)

S. N.	Paper Code	Subject Name		L	T	P	Credits
1.	MPE-401	Nuclear Technology		3	1	0	4
2.	MPE-402	Theory of Relativity and Space Science		3	1	0	4
3.	MPE-403	Advanced Semiconductor Devices		3	1	0	4
4.	MPE-404	Science and Technology of Nanostructured Materials		3	1	0	4
			Total	12	4	0	16

MCP-101: MATHEMATICAL PHYSICS AND ELECTROMAGNETIC THEORY

4 Credits (3-1-0)

Unit-I: Theory of Functions of a Complex Variable

9

Complex Variables: Introduction, Cauchy-Riemann conditions, Cauchy's Integral formula, Laurent expansion, singularities, calculus of residues, evaluation of definite integrals, Dispersion relation, Hermite, Bessel, Laguerre and Legendre functions.

Unit-II: Fourier and Laplace Transforms

9

Fourier transform, Sine, Cosine and Complex transforms with examples, Definition, Properties and Representations of Dirac Delta Function, Laplace transform, Properties and examples of Laplace Transform, Convolution theorem and its applications,

9

Unit-III: Introduction to Electromagnetic Theory

Gauss's law and its applications, Laplace and Poisson equations, boundary value problems. Magnetostatics: Biot-Savart law, modification in Ampere's law concept of displacement current. Electromagnetic induction, Maxwell's equations in free space and linear isotropic media; boundary conditions on the fields at interfaces. Scalar and vector potentials, gauge invariance. Dynamics of charged particles in static and uniform electromagnetic fields.

Unit-IV: Propagation of Electromagnetic Waves

9

Wave equation, plane waves in free space and isotropic dielectrics, energy transmitted by a plane wave, Poynting theorem for a complex vector field, waves in conducting media, skin depth, Reflection and refraction of e.m. waves at plane interface, Fresnel's amplitude relations, Reflection and Transmission coefficients, polarization by reflection, Brewster's angle, Total internal reflection, Stoke's parameters, EM wave guides, Cavity resonators.

Books & References:

1. Mathematical Methods for Physicists -G. Arfken, Elsevier Academic Press
1. 30 Corporate Drive, Suite 400, Burlington, MA 01803, USA
2. Mathematics for Physicists and Engineers- Pipes, -MC Graw Hill Publishing Company, New York
3. Mathematical Methods for Physics- Wyle, McGraw-Hill 1995
4. S.M. R. Spiegel -Theory and Problems of Complex Variables, Schaum's outline series
5. Mathematical Methods of Physics- J. Mathews and R. I. Walker -W.A. Benjamin
6. Saroj K. Dash & Smruti R. Khuntia-Fundamentals of Electromagnetic Theory, PHI
7. David J. Griffith-Introduction to Electrodynamics, Fourth Edition, Prentice Hall, 2013
8. L.D. Landau & E.M. Lifshitz- Electrodynamics of Continuous Media (Volume 8 of A Course of Theoretical Physics), Pergamon Press 1960
9. Electromagnetic Waves and Radiating System- Edward C. Jordan, Prentice Hall Electrical Engineering Series.

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Abhishek

Sanjay
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MPC-102: COMPUTATIONAL TECHNIQUE & PROGRAMMING Credit 05 (3-1-2)

Unit I: Interpolation

09

Methods of interpolation, least square curve fitting, Methods of equal intervals, unequal intervals, Central Difference method, Inverse interpolation: Iteration of successive approximation, exchange of dependent and independent variables and reversion of series

Unit II: Numerical integration

09

Simpson's one-third and three-eighth rule, Euler-Maclaurin formula, Quadrature formulae, Numerical Solution to ordinary differential equation by Euler's and Runge-Kutta methods, Solution of algebraic and transcendental equations: Convergence, Newton-Raphson method, Iterative methods.

Unit III: Elements of Programming in Languages-C++ & Fortran

09

Flow Charts, Integer and Floating points, Logical and Arithmetic Expressions, Built in functions, Executable and Non- Executable statements, Assignments, Control and Input and Output Statements, Looping, Function and Subroutines, Operation with files.

Unit IV: Simulation Techniques

09

Monte Carlo methods, molecular dynamics, simulation methods for the Ising model and atomic fluids, simulation methods for quantum-mechanical problems, time-dependent Schrödinger equation, discussion of selected problems in percolation, nonlinear dynamics, traffic problems, diffusion-limited aggregation etc.

Books & References:

- 1: Introductory Methods of Numerical Analysis by S. S. Sastry (PHI Learning Pvt. Ltd)
- 2: Numerical methods by Balguruswamy (Tata McGraw-Hill Education)
- 3: Fortran 77 and Numerical Methods by C. Xavier (New Age International)
- 4: Let US C++ by Yashavant Kanetkar (BPB Publication)
- 5: Numerical Recipes in FORTRAN 90 by W. Press et al. (Cambridge university Press)
- 6: Computer Programming in Fortran 90 & 95 by V. Rajaraman (Prentice Hall of India)
- 7: Computer Simulation Methods in Theoretical Physics by D.W. Heermann (Springer-verlag)
- 8: Computer Simulation of Liquids by M. P. Allen and D. J. Tildesley (Oxford Science Publication)
- 9: The Art of Molecular Dynamic Simulation by D. C. Rapoport (Cambridge University Press)

LABORATORY EXPERIMENT LIST

STUDENTS WILL HAVE TO PERFORM ANY FIVE EXPERIMENTS FROM THE FOLLOWING LIST.

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- Q2
- Abhinav
- Ri
- S. S. Singh
- Pranav
- 3/1/18
- 30/1/18
- Ami

- 1: Jacobi Method for Matrix Diagonalization
- 2: Solution of Transcendental or Polynomial Equations by Newton Raphson Method
- 3: Least Square Fitting of Straight Line and Quadratic Curve.
- 4: Summation, Subtraction and Multiplication of Matrices
- 5: Matrix Inversion and Solution of Simultaneous Equation
- 6: Interpolation Using Lagrange' Method.
- 7: Numerical Integration Using Gaussian Quadrature Method
- 8: Solution of First Order Differential Equations Using Rung-Kutta Method
- 9: Numerical First Order Differentiation Of A Given Function
- 10: Fast Fourier Transform
- 11: Generation of Random Numbers.
- 12: Exercises on Monte Carlo and Molecular Dynamic Simulation

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MPC-103: QUANTUM MECHANICS

Credit 03 (2-1-0)

Unit I: Mathematical Preliminaries

06

Concept of Hilbert Space, Dirac's bra and ket notations, Orthonormality and completeness relations (discrete and continuous), linear and real operators, eigenvalue equations and related theorems, projection operators and measurement, application to Harmonic Oscillator, equivalence of wave and matrix mechanics.

Unit II: Schrödinger Equation and Spherically Symmetric Potential

06

Schrodinger Equation: Free-particle solution, wave packets, particle in a square well potential, transmission through a potential barrier, simple harmonic oscillator by wave equation and operator methods, charged particle in a uniform magnetic field, coherent states, Schrodinger picture, Heisenberg picture, Spherically Symmetric Potentials: Separation of variables in spherical polar coordinates, orbital angular momentum, parity, spherical harmonics, free particle in spherical polar coordinates, square well potential, hydrogen atom.

Unit III: Theory of Angular momentum

06

Orbital, spin and total angular momentum operators: eigen value equations and matrix representations, Ladder operators, commutation relations, Addition of angular momenta, Rotation operators, angular momentum algebra, eigenvalues of J^2 and J_z , Clebsch-Gordon coefficients

Unit IV: Identity of Particles

06

Distinguishability of identical particles, exchange degeneracy and operator, construction of symmetric and antisymmetric wave functions, Pauli's exclusion principle and Slater's determinant, Electron spin hypothesis, Pauli's spin matrices and eigen value equations, Symmetric and antisymmetric wave functions for hydrogen molecule.

Books & References:

- 1: Modern Quantum Mechanics by J. J. Sakurai (Pearson Education India)
- 2: Quantum Mechanics by Ajoy K Ghatak (McMillan Co. of India)
- 3: Quantum Mechanics, Vol. (I) by Albert Messiah (North Holland Publishing Company, Amsterdam, 1961)
- 4: Concepts in Quantum Mechanics by V. S. Mathur and Surendra Singh (CRC Press, 2009)
- 5: Quantum Mechanics by L.I. Schiff (Mc-Graw Hill Inc.)
- 6: Quantum Mechanics by B. K. Agarwal and Hari Prakash (Prentice-Hall of India Pvt Ltd, New Delhi, 2005)

Handwritten signatures and dates:
 A. K. Singh 30/1/18
 S. C. Singh 30/1/18
 Abhishek Singh 30/1/18
 P. R. Singh 30/1/18
 Anil Kumar 30/1/18

MPC-104: SEMICONDUCTOR DEVICES AND INTEGRATED CIRCUIT

4 Credits (3-1-0)

Unit-I: Semiconductor Physics

9

Bandgaps in semiconductors, Fermi distribution and density of states, Scattering Mechanism: electron - electron and electron - phonon scattering. Carrier transport by drift and diffusion. Electron - hole pair generation and recombination: band to band (direct and indirect band gap transitions) and intra band (impurity related) transitions, free - carrier & phonon transitions. Excitons. Continuity equations.

Unit-II: Semiconductor Devices

9

Light emitting diodes, Varactor diode, Zener diode, Schottky diode, Switching diodes, Tunnel diode, Semiconductor laser, Photodiodes, Solar cell, UJT, Gunn diode, IMPATT devices, pnpn devices and applications. Liquid crystal displays, MOSFET, Enhancement and depletion mode, FET as switch and amplifier configurations.

Unit-III: Op-Amp Circuits

9

Characteristics and parameters of Op-Amp, Frequency response, Current mirror and current loading biasing, Concept of ideal op-amp, Differential amplifiers, IC 741 circuits - amplifiers, Scalar, Summer, Subtractor, Comparator, Logarithmic amplifiers, Active filters, Multiplier, Divider, Differentiator, Integrator, wave shapers, Oscillators. Schmitt trigger; 555 Timer: Astable, monostable and bistable multivibrators, Voltage controlled oscillators, Voltage regulator ICs.

Unit-IV: Digital Circuits

9

Survey of number systems, Logic simplification using K-maps, SOP and POS design of logic circuits. Logic Families: RTL, DTL, ECL, TTL, MOS and CMOS; Combinational Circuits: Adders, subtractors, Encoder, Decoder, Comparator, Multiplexer, De-multiplexers, Parity generator and checker; Sequential Circuits: Flip-flops, Registers, Counters, Memories; A/D and D/A conversion.

Books & References :

1. Semiconductor Physics and Devices by D.A. Neamen, (3rd Ed., Tata McGraw-Hill), 2002.
2. Semiconductor Devices - Physics and Technology by S.M. Sze (John Wiley), 2002.
3. Electronic Principles by A.P. Malvino (Tata McGraw, New Delhi), 7th edition, 2009.
4. Electronic Devices and Circuits Theory : Boylested and Nashelsky, (Pearson Education) 10th ed. 2009.
5. OPAMPS and Linear Integrated circuits : Ramakant A Gayakwad (Prentice Hall), 1992.
6. Operational amplifiers and Linear Integrated circuits, R.F. Coughlin and F.F. Driscoll, (Prentice Hall of India, New Delhi), 2000.
7. Digital Design by M. Morris Mano, Michael D. Ciletti, (Prentice Hall of India Pvt. Ltd.), 2008.

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MPC-105: ELECTRONICS LABORATORY

2 Credits (0-0-4)

List of Experiments

1. Volt-Ampere Characteristics of Zener Diode and Zener Voltage regulator characteristics.
2. To obtain the V-I Characteristics of LED for different LEDs (Red, Blue, Green, Yellow etc.) and find the LED voltages of different LEDs
3. To obtain Frequency response characteristics and bandwidth of Common Source FET and MOSFET amplifiers.
4. Use of timer IC 555 in astable and monostable modes and applications involving relays, LDR.
5. To study the frequency response of an operational amplifier & to use operational amplifier for different mathematical operations
6. To configure various shift registers and digital counters. Configure seven segment displays and drivers.
7. To verify the truth table for Logic Gates and flip flops.
8. To verify A/D and D/A converter

Books & References:

1. Semiconductor Physics and Devices by D.A. Neamen, (3rd Ed., Tata McGraw-Hill), 2002.
2. Semiconductor Devices - Physics and Technology by S.M. Sze (John Wiley), 2002.
3. Electronic Principles by A.P. Malvino (Tata McGraw, New Delhi), 7th edition, 2009.
4. Electronic Devices and Circuits Theory: Boylested and Nashelsky, (Pearson Education) 10th ed. 2009.
5. OPAMPS and Linear Integrated circuits: Ramakant A Gayakwad (Prentice Hall), 1992.
6. Operational amplifiers and Linear Integrated circuits, R.F. Coughlin and F.F. Driscoll, (Prentice Hall of India, New Delhi), 2000.
7. Digital Design by M. Morris Mano, Michael D. Ciletti, (Prentice Hall of India Pvt. Ltd.), 2008.

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 Ramakant A. Gayakwad
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MPC-201: ADVANCE QUANTUM MECHANICS

Credit 04 (3-1-0)

Unit I: Formulation of Relativistic Quantum Theory

09

Klein-Gordon equation, Plane wave solution and Physical interpretation, Inadequacy of Klein-Gordon equation; Dirac equation, α and β matrices and related algebra, Representation and arbitrariness of α and β , Probabilistic interpretation.

Unit II: Covariance of Dirac Equation

09

Covariant form of Dirac equation, Dirac (γ) matrices, Representation and algebra, Linearly independent set of composite γ - matrices; Infinitesimal and Finite proper Lorentz transformation, Proof of covariance, Plane wave solution and negative energy states; Two component Pauli spin theory, Non relativistic correspondence.

Unit III: Quantization

09

Introduction to quantization theory, Quantization of Klein-Gordon field: Lagrangian and Hamiltonian formalism for field, canonical commutation relations and quantization; Hamiltonian and Normal ordering in Fock space, Complex scalar field.

Unit IV: Approximate methods

09

Time independent perturbation theory and anharmonic oscillator, Application to Zeeman effect, isotopic shift and Stark effect, Variational method and Helium atom, Time dependant theory and Transition probability (Fermi-Golden Rule-2), WKB method and beta decay, Variational method and its applications.

Books & References:

- 1: Advance Quantum Mechanics by J. J. Sakurai (Pearson Education India)
- 2: Relativistic Quantum Mechanics by James D. Bjorken and Sidney D. Drell (McGraw-Hill Book Company; New York, 1964).
- 3: An Introduction to Relativistic Quantum Field Theory by S.S. Schweber (Harper & Row, New York, 1961).
- 4: Quantum Field Theory by F. Mandl & G. Shaw (John Wiley and Sons Ltd, 1984)
- 5: A First Book of Quantum Field Theory by A. Lahiri & P.B. Pal (Narosa Publishing House, New Delhi, 2000)

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 S.V. Singh
 Abhishek
 P. Singh
 30/1/18
 30/1/2018
 Amul

MPC-203: Spectroscopy and Laser Laboratory

2 Credit (0-0-4)

List of Experiments

1. Spectroscopy of iodine vapor.
2. Laser diffraction by a thin wire
3. Measurement of Planck's constant using photoelectric effect
4. To study Zeeman effect using Na lamp.
5. Experiment with liquid/solid using UV/Fluorescence spectroscopy
6. Measurement of optical spectrum of an alkali atom
7. Laboratory spectroscopy of standard lamps
8. Measurement of FTIR/Raman spectrum of solid/liquid (CCl_4)
9. Ionization potential of Lithium
10. Dissociation Energy of I_2 molecule

Books & References:

1. Physics of Atoms and Molecules: Bransden and Joachain.
2. Lasers - Theory and Applications: K. Thyagrajan and A.K. Ghatak.
3. Introduction to Atomic Spectra: H.E. White.
4. Introduction to Atomic Spectra: HG Kuhn
5. Modern Spectroscopy : J.M. Hollas
6. Fundamentals of Molecular Spectroscopy : C.N. Banwell.

Agushu

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S. V. Singh

Dr. J. Singh

Dr. Singh
30/1/18
b. Singh
30/1/18
Sudhakar . R.

Amal

Pranab

Abhishek

MPE-201: Classical Electrodynamics

4 Credits (3-1-0)

UNIT- I Formulations in Mechanics and Rigid body dynamics

9

Non-inertial frames and pseudoforces. Variational principle. Generalized coordinates. Lagrangian and Hamiltonian formalism and equations of motion, Poisson brackets and canonical transformations. Conservation laws and cyclic coordinates, Central force motions. Periodic motion: small oscillations, normal modes. Special theory of relativity Lorentz transformations, relativistic kinematics and mass-energy equivalence.

UNIT- II Four Potential, Four Field and Gauge Transformations

9

Electromagnetic field Tensor and Maxwell's Equations and Displacement Current; Wave Equation and solution. Gauge Transformations, Lorenz Gauge, Coulomb Gauge, plane waves in free space, conducting, non-conducting media and isotropic dielectrics, Reflection and Refraction of Electromagnetic Waves at a Plane Interface Between two Dielectrics, Reflection and Transmission coefficients, polarization by reflection, Frequency Dispersion Characteristics of Dielectrics and Conductors, Plasmas

UNIT- III Wave Guides

9

Fields at the surface of and within a conductor, Cylindrical cavities and waveguides, Waveguides, Modes in a rectangular waveguide, Energy flow and attenuation in waveguides, Multimode propagation in optical fibers, Modes in dielectric waveguides, Radiating systems, Multipole fields and radiations.

UNIT- IV Charged Particle Dynamics

9

Dynamics of charged particles in E and B Fields, Non-relativistic motion in uniform constant fields, Time varying magnetic field, space varying magnetic field, Acceleration of charged particles: Electric and Magnetic fields due to a uniformly moving charge and an accelerated charge, Relativistic motion of a charged particle in uniform & non-uniform E and B Fields, Time varying E and B Fields, Bremsstrahlung, Synchrotron radiation and Cerenkov radiation, Reaction force of radiation, Electromagnetic mass of the electron.

Books & References

1. Classical Electrodynamics, J.D. Jackson, Wiley
2. Introduction to Electrodynamics: D.J. Griffiths (Prentice Hall India, New Delhi) 4th ed., 2012.
3. H. Goldstein, C.P. Poole and J.F. Safko, Classical Mechanics, Addison-Wesley
4. N.C. Rana and P.S. Joag, Classical Mechanics, Tata McGraw-Hill
5. J.V. Jose and E.J. Saletan, Classical Dynamics: A Contemporary Approach, Cambridge University Press
6. L.D. Landau and E.M. Lifshitz, Mechanics, Butterworth-Heinemann
7. Classical Electrodynamics: S.P. Puri (Narosa Publishing House) 2011.
8. Introduction to Electrodynamics: A.Z. Capri and P.V. Panat (Narosa Publishing House) 2010.

Handwritten signatures and notes at the bottom of the page, including "A. G. S. H.", "D. Singh", "S. Singh", "J. Singh", "b. Singh", "30/1/18", and "M. Singh".

3: Guide to the Sun by Kenneth J. H. Philips, Cambridge University Press, U.K.
4: Introduction to Special Relativity and Space Science by S. P. Singh, Wiley India pvt. Ltd., New Delhi, India
5: Introduction to Modern Astrophysics by W. Carroll & D. A. Ostlie, Addison Wesley
6: Introduction to Cosmology by J V Narlikar, Cambridge University Press.

5: Introduction to Modern Astrophysics by W. Carroll & D. A. Ostlie, Addison Wesley

6: Introduction to Cosmology by J V Narlikar, Cambridge University Press.

7: Astrophysical Concepts by M. Harwit, Springer-Verlag, New York

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MPE-203: METHODS OF THEORETICAL PHYSICS**Credit 04 (3-1-0)****1: Vectors, Tensors, Matrices and Operators****09**

Vector spaces, Linear operators and matrices, Inverse operators and matrices, The dual space, Change of basis, Canonical form of complex matrices, examples, Some consequences of the Jordan decomposition, Functions of operators/matrices, Hermitian Operators, Tensors: Covariant and contravariant vectors, mixed tensor, metric tensor, Manipulating tensors: contraction, raising and lowering indices, Tensor densities, Levi-Civita Tensor and its transformations

2. Complex Variable**09**

Recapitulation: Complex numbers, triangular inequalities, Schwarz inequality, Function of a complex variable : single and multiple-valued function, limit and continuity; Differentiation: Analytic and harmonic function; Complex integrals, Classification of singularities; Branch point and branch cut; Residue theorem and evaluation of some typical real integrals using this theorem.

3. Special Functions**09**

The Gamma function, Definitions, Digamma and Polygamma functions, Stirling's series, The Beta function, Bessel functions, Neumann functions, Hankel functions, Spherical Bessel functions, Legendre functions, Hermite functions, Laplace function and its application, Green's Functions in one dimensions, Dirac δ -function, its specific representations, step-function

4. Ordinary Differential Equation & Fourier Series**09**

Linear ordinary differential equations and their singularities, Sturm-Liouville problem, expansion in orthogonal functions, Series solution of second-order equations, Applications and properties of Fourier Series, Gibbs phenomenon, etc. Integral transformations, Fourier integral, Momentum representation, Laplace transform, Inverse transforms.

Books & References:

- 1: Guide to Mathematical Methods for Physicists: With Problems and Solutions by Michela Petrini, Gianfranco Pradisi, Alberto Zaffaroni, (Essential Textbooks Series in Physics), World Scientific Publishing Europe Ltd 2017
- 2: Mathematical Methods for Physicists by George B Arfken, Hans. J. Weber, Frank E Harris, Elsevier India; 7th edition (2012)
- 3: Matrices and tensors in physics by A. W. Joshi, New Age International, 1995
- 4: Vector Analysis by Murray R Spiegel, Seymour Lipschutz, Schaum's Outlines Series, 2009
- 5: Schaum's Outline of Complex Variables by Dennis Spellman, John J. Schiller, Murray R. Spiegel, and Seymour Lipschutz, 2ed, 2009.
- 6: Methods of Theoretical Physics (Vol. I & II) by P.M. Morse and H. Feshbach, Feshbach Publishing

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MPE-204: MOBILE COMMUNICATION

4 Credits (3-1-0)

UNIT- I

9

Fixed TDM, classical ALOHA, Slotted ALOHA, Carrier Sense Multiple Access, Demand Assigned Multiple Access

UNIT- II

9

Introduction, Fundamental Concepts, pseudo noise sequences, CDMA, FHSS, DSSS, Synchronization of Spread Spectrum, Spread Spectrum applications in cellular communication, PCs, and mobile communication

UNIT- III

9

Mobile Services, System Architecture, Radio interface, Protocols, localization and calling, Handover, Security, New Data Services.

UNIT- IV

9

TCP, UDP, SCTP, Routing & Bridging, Mobile IP, Electronic navigation & surveillance Systems, Blue tooth, GPS, Global Mobile Satellite Systems

Books & References

1. Wireless Digital Communications- Dr. Kamilo Feher, PHI
2. Mobile Communications- Jochen Schiller, Pearson Education
3. Mobile and Personal Communication Systems and Services- Raj Pandya, IEEE Press, PHI

AGS
Ami
S. Singh
Raj
30/1/18
Singh
Manish
Kishor

MPE-205: ATOMIC, MOLECULAR PHYSICS & LASER

Credit 04 (3-1-0)

Unit- I: Many-Electron Atoms

09

Review of H and He atom, ground state and first excited state, quantum virial theorem, Determinantal wave function, Thomas-Fermi method, Hartree and Hartree-Fock method, density functional theory, Hydrogen molecular ion (numerical solution), hydrogen molecule, Heitler-London method, molecular orbital, Born-Oppenheimer approximation, bonding, directed valence, LCAO

Unit-II: Atomic and Molecular Spectroscopy

09

Fine and hyperfine structure of atoms, electronic, vibrational and rotational spectra for diatomic molecules, role of symmetry, selection rules, term schemes, applications to electronic and vibrational problems. Raman spectroscopy, introduction to electron spin, Stern-Gerlach experiment, spin-orbit interaction and fine structure, relativistic correction to spectra of hydrogen atom, Lamb shift, effect of magnetic field on the above spectra, Zeeman and Paschen-Back effect, Spectra of divalent atoms: Singlet and triplet states of divalent atoms, L-S and j-j coupling, branching rule

Unit-III: Basic Principles of Laser

09

Two level, Three and Four level laser system, Rate equations for three and four level system, threshold pump power, Relative merits and de-merits of three and four level system, Solid State and Semi-conductor Lasers, Gas and dye lasers, Application of Laser in Material Processing, Optical resonators, Stability of resonators, Characteristics of Gaussian beam, Transverse and longitudinal modes, mode selection, losses in a resonator

Unit-IV: Lasers in Spectroscopy

09

Broadening of spectral lines, Doppler-free spectroscopy, Excitation spectroscopy, Ionization spectroscopy, Terahertz spectroscopy with innovative applications, Properties of light: interaction between light and matter, Properties of laser radiation, Non-linear phenomena and generation of short pulses, Laser systems for spectroscopy, Instrumentation for detection of optical signals and time-resolved measurements, Time-resolved and ultra-fast laser spectroscopy, Special applications of laser spectroscopy

Books & References:

- 1: Physics of Atoms and Molecules by B.H. Bransden and C.J. Joachain, Pearson
- 2: Quantum Chemistry by I.N. Levine, Prentice Hall
- 3: Quantum Mechanics by L.D. Landau and E.M. Lifshitz, Pergamon Press
- 4: Molecular Quantum Mechanics by P.W. Atkins and R.S. Friedman, Oxford University Press
- 5: Applied Quantum Mechanics by W.A. Harrison, World Scientific
- 6: Atomic Physics by C.J. Foot, Oxford Univ Press
- 7: Elementary Atomic Structure by G. Woodgate, Oxford Univ Press
- 8: Atomic, Laser and Spectroscopy by S. N. Thakur and D. K. Rai, Perntice Hall of India, New Delhi, India

MPE-206: Instrumentation Technology

4 Credit (3-1-0)

UNIT- I Spectroscopic Techniques

9

UV and Visible spectroscopy, FTIR and Raman spectroscopy: Identification of groups, hydrogen bonding and study of conformers. Time-resolved spectroscopy and study of biological samples. Laser as a source of radiation and its characteristics. Laser fluorescence and absorption spectroscopy.

UNIT- II Advanced Spectroscopic and Mechanical Techniques

9

Qualitative and quantitative analysis of trace elements. Basics of nuclear magnetic resonance (NMR) and electron spin resonance (ESR) spectroscopy, X-ray Photoelectron Spectroscopy (XPS/ESCA) for chemical analysis, Viscometry and Rheology.

UNIT- III Structural and Surface Characterization Techniques

9

Micro, meso and macro porous structural characterization, pore parameters and porosity characterization, X-ray diffraction, small angle X-ray scattering and its application in evaluation of shape and size of surface particles: Basics and applications of Scanning electron microscopy (SEM), Transmission electron microscopy (TEM), Atomic Force Microscopy (AFM).

UNIT- IV Thermal and Electrical Characterisation Techniques

9

TGA, DTGA and DSC, Electrochemical impedance spectroscopy, Dielectric relaxation studies, Electrochemical analysis, Energy and power density measurements, Cyclic voltametry, Charge-discharge characterization.

Books and Reference:

1. Spectroscopy Volume 1, 2 and 3: B.P. Straughan and S. Walker.
2. Modern Spectroscopy: J.M. Hollas.
3. Transmission Electron Microscopy of Metals: Gareth Thomas
4. Elements of X-ray Diffraction: Bernard Dennis Cullity.
5. Atomic Force Microscopy/Scanning Tunneling Microscopy: M.T. Bray, Samue
6. Electron Microprobe Analysis: S.J. B. Reed.
7. Physical Chemistry of Macromolecules: S.F. Sun, Basic Principles and Issues, Wiley
8. Analytical Techniques for Thin Film Treatise on Material Science and Technology, Vol. 27: K.N. Tu and R. Rosenberg (ed.).

Tu and R. Rosenberg (ed.).

MPE-207 Physics of Materials**4 Credit (3-1-0)****UNIT- I**

9

Physics of Liquid crystals and Ionic Liquids: Definition, Classification, Characteristic features; Thermotropic and Lyotropic Liquid Crystals, Application of liquid crystal, importance of ionic liquids, synthesis and characterisations, thermal, electrical, optical and structure behaviour, Ionogels, solid electrolytes based on ionic liquids, Application of ionic liquid in solid devices.

UNIT- II

9

Physics of Polymers: Definition, Structure, properties and methods of Polymerization, Molecular weights, Degradation of polymers, Viscoelastic state, Glass transition temperature, Electro active polymers, Classification and Applications.

UNIT- III

9

Physics of super ionic solids or fast ion conductors: Definition, Classification, Conduction in fast ion conductors, synthesis, Characteristic features and properties, Importance and application,

UNIT- IV

9

Physics of Nano materials and Semiconducting materials: Definition, Types and characteristic features; Quantum size effect; density of states, Synthesis and characterization; Nanocomposites, Application in devices, Semiconducting materials and devices.

Books and Reference:

1. Liquid Crystals by S. Chandrasekhar, (Cambridge Univ. Press, London)
2. Fundamentals of Polymer Physics and Molecular Biophysics, H. Bohidar, Cambridge Uni. Press
3. An Introduction to Polymer Physics by I. I. Perepechko (Mir Publishers)
4. Fast Ion Transport in solids, W. Van Gool (Ed.), North Holland publishing Company (1973). 2. S. Geller (Ed.), Solid Electrolytes, Springer-Verlag, Berlin (1977).
5. Super ionic Solids: Principles and Application, S. Chandra, North Holland Publishing Company (1981).
6. The Physics of Amorphous Solids, Richard Zallen, John Wiley & Sons Inc., New York (1983).
7. Introduction to Nanotechnology - C.P. Poole Jr and F.J. Owens, Wiley India, New Delhi
8. Handbook of Nanostructured Materials & Nanotechnology, vol.-5, Academic Press, 2000

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- ABASH
- S. Singh
- Amal
- S. S. S. S.
- 30/11/18
- Abhishek

MPE-208: SATELLITE COMMUNICATION AND REMOTE SENSING

4 Credits (3-1-0)

UNIT-1

9

Principle of Satellite Communication: General and Technical characteristics, Active and Passive satellites, Modem and Codec.

Communication Satellite Link Design: General link design equation. Atmospheric and Ionospheric effect on link design. Earth station parameters.

UNIT- II

9

Satellite Analog Communication: Baseband analog signal, FDM techniques, S/N and C/N ratio in FM in satellite link.

Digital Satellite Transmission: Advantages, Elements of Digital satellite communication, Digital base band signal, Digital modulation Technique, Digital link Design, TDM, TDMA, Some Applications (VSAT, GPS, LEO mobile communication).

UNIT- III

9

Concept and Foundations of Remote Sensing: Electromagnetic Radiation (EMR). Interaction of EMR with Atmosphere and Earth surface. Application areas of Remote Sensing.

Characteristics of Remote Sensing Platforms & Sensors: Ground, Air & Space platforms, Return Beam Vidicon, Multi-spectral Scanner.

UNIT- IV

9

Microwave Remote Sensing: Microwave sensing, RADAR: SLAR & applications, LIDAR: basic components & applications.

Earth Resource Satellites: Brief description of Landsat and Indian Remote Sensing (IRS) satellites.

Books and Reference

1. Satellite Communication - D.C. Agrawal & A. K. Maini, Khanna Publications; 4th Edition (1996)
2. Satellite Communication -T. Pratt and C. W. B Ostiern-, John Wiely and Son.
3. Satellite Communication Systems- M. Richharia, MacGraw Hill.
4. Introduction to Remote Sensing -J. B. Campbell, 72 Spring Street, New York (NY), 10012.
5. Manual of Remote Sensing, Vol I & II, Edited by R. N. Colwell, American Society of Photogrammetry.

मदन मोहन मालवीय प्रौद्योगिकी विश्वविद्यालय
गोरखपुर - 273010 (उ० प्र०) भारत



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2019/02 बैठक (संख्या षष्ठदश) की
कार्यसूची

निर्धारित तिथि : शनिवार दिनांक 25 मई, 2019 : पूर्वान्ह 11:00 बजे

निर्धारित बैठक स्थल : विश्वविद्यालय स्वर्ण जयंती सभागार, गोरखपुर *

विद्या परिषद के माननीय सदस्यों की सूची

क्र०	नाम/पदनाम	
1.	प्रो० श्री निवास सिंह, कुलपति, मदन मोहन मालवीय प्रौद्योगिकी विश्वविद्यालय, गोरखपुर	अध्यक्ष
2.	प्रो० एस० सी० श्रीवास्तव, प्रोफेसर, विद्युत अभि० विभाग, आई०आई०टी०, कानपुर	सदस्य
3.	प्रो० दिनेश कुमार सिंह, आचार्य, जूलोजी विभाग, दीन दयाल उपाध्याय गोरखपुर विश्वविद्यालय, गोरखपुर	सदस्य
4.	प्रो० पंकज चांदना, मैकेनिकल इंजीनियर, एन०आई०टी०, कुरुक्षेत्र, हरियाणा	सदस्य
5.	श्री ज्योति प्रकाश मसकरा, उद्योगविद्, प्रबन्ध निदेशक, दी महावीर जूट मिल्स लि०, सहजनवाँ, गोरखपुर	सदस्य
6.	श्री आर० एन० सिंह, वाइस प्रेसिडेंट, चैम्बर आफ इंडस्ट्रीज, गीडा, गोरखपुर	सदस्य
7.	डा० मनोज कुमार तिवारी, रीजनल आफिसर एण्ड असिस्टेंट डायरेक्टर, नार्देन रीजनल आफिस, अभातशिप, कानपुर	सदस्य
8.	प्रो० डी० के० सिंह, अधिष्ठाता, संकाय मामलें एवं विभागाध्यक्ष, यांत्रिक अभि० विभाग, म०मो०मा० प्रौद्योगिकी विश्वविद्यालय, गोरखपुर	सदस्य
9.	प्रो० के० जी० उपाध्याय, अधिष्ठाता, परास्नातक अध्ययन एवं शोध व विकास, मदन मोहन मालवीय प्रौद्योगिकी विश्वविद्यालय, गोरखपुर	सदस्य
10.	प्रो० एस० के० श्रीवास्तव, अधिष्ठाता नियोजन, श्रोत जनन व एल्युमिनी संबंध, मदन मोहन मालवीय प्रौद्योगिकी विश्वविद्यालय, गोरखपुर	सदस्य
11.	प्रो० डी० के० द्विवेदी, अधिष्ठाता, स्नातक अध्ययन एवं उद्यमिता, मदन मोहन मालवीय प्रौद्योगिकी विश्वविद्यालय, गोरखपुर	सदस्य
12.	प्रो० ए० एन० तिवारी, अधिष्ठाता, छात्र मामलें, मदन मोहन मालवीय प्रौद्योगिकी विश्वविद्यालय, गोरखपुर	सदस्य
13.	प्रो० उदय शंकर, परीक्षा नियंत्रक, मदन मोहन मालवीय प्रौद्योगिकी विश्वविद्यालय, गोरखपुर	सदस्य
14.	प्रो० राकेश कुमार, आचार्य, कम्प्यूटर साइंस एण्ड इंजी०/अध्यक्ष, सी०एस०ए०, मदन मोहन मालवीय प्रौद्योगिकी विश्वविद्यालय, गोरखपुर	सदस्य
15.	प्रो० पी० के० सिंह, विभागाध्यक्ष, कम्प्यूटर साइंस एण्ड इंजी० विभाग, मदन मोहन मालवीय प्रौद्योगिकी विश्वविद्यालय, गोरखपुर	सदस्य
16.	प्रो० ए० के० पाण्डेय, विभागाध्यक्ष विद्युत अभि० विभाग, मदन मोहन मालवीय प्रौद्योगिकी विश्वविद्यालय, गोरखपुर	सदस्य
17.	प्रो० गोविन्द पाण्डेय, विभागाध्यक्ष, सिविल इंजी० विभाग, मदन मोहन मालवीय प्रौद्योगिकी विश्वविद्यालय, गोरखपुर	सदस्य
18.	प्रो० एस० के० सोनी, विभागाध्यक्ष, विद्युतकण एवं संचार अभि० विभाग, मदन मोहन मालवीय प्रौद्योगिकी विश्वविद्यालय, गोरखपुर	सदस्य
19.	प्रो० एस० पी० सिंह, विभागाध्यक्ष, आई०टी० एण्ड सी०ए० विभाग, मदन मोहन मालवीय प्रौद्योगिकी विश्वविद्यालय, गोरखपुर	सदस्य
20.	डा० बी० के० पाण्डेय, विभागाध्यक्ष, प्रयुक्त विज्ञान विभाग, मदन मोहन मालवीय प्रौद्योगिकी विश्वविद्यालय, गोरखपुर	सदस्य
21.	डा० विठ्ठल एल० गोल, विभागाध्यक्ष, केमिकल इंजी० विभाग, मदन मोहन मालवीय प्रौद्योगिकी विश्वविद्यालय, गोरखपुर	सदस्य
22.	प्रो० ए० के० डैनियल, समन्वयक, प्रबन्ध अध्ययन केन्द्र, मदन मोहन मालवीय प्रौद्योगिकी विश्वविद्यालय, गोरखपुर	सदस्य
23.	डा० बृजेश कुमार, सह आचार्य, विद्युतकण एवं संचार अभि० विभाग, मदन मोहन मालवीय प्रौद्योगिकी विश्वविद्यालय, गोरखपुर	सदस्य
24.	श्रीमती मीनू, सहायक आचार्य, कम्प्यूटर साइंस एण्ड इंजी० विभाग, मदन मोहन मालवीय प्रौद्योगिकी विश्वविद्यालय, गोरखपुर	सदस्य
25.	डा० जीऊत सिंह, कुलसचिव, मदन मोहन मालवीय प्रौद्योगिकी विश्वविद्यालय, गोरखपुर	सदस्य-सचिव

मदन मोहन मालवीय प्रौद्योगिकी विश्वविद्यालय, गोरखपुर

के
विद्या परिषद
की

2019/02 बैठक (संख्या षष्ठदश) की

अनुक्रमणिका

मद संख्या	विवरण	पृष्ठ से	पृष्ठ तक
2019.2.01	अध्यक्ष, विद्या परिषद, मदन मोहन मालवीय प्रौद्योगिकी विश्वविद्यालय, गोरखपुर के प्रारम्भिक अभियुक्ति को अंकित किया जाना।	01	01
2019.2.02	मदन मोहन मालवीय प्रौद्योगिकी विश्वविद्यालय, गोरखपुर की विद्या परिषद की 2019/01 (पंचदश) बैठक के कार्यवृत्त का पुष्टिकरण।	02	10
2019.2.03	विद्या परिषद की 2019/01 (पंचदश) बैठक में लिए गये निर्णयों को क्रियान्वित किये जाने का विवरण।	11	13
2019.2.04	विद्या परिषद की दिनांक 07 फरवरी, 2019 को सम्पन्न पंचदश बैठक के उपरान्त विश्वविद्यालय के शैक्षणिक क्रियाकलाप समिति की अद्यतन बैठकों के कार्यवृत्तों का अवलोकन।	14	22
2019.2.05	विश्वविद्यालय के प्रयुक्त विज्ञान विभाग की Departmental Progress Report का अवलोकन।	23	41
2019.2.06	विश्वविद्यालय के जनपदीय अभियंत्रण विभाग की Departmental Progress Report का अवलोकन।	42	48
2019.2.07	विश्वविद्यालय के विद्युत अभियंत्रण विभाग की Departmental Progress Report का अवलोकन।	49	57
2019.2.08	विश्वविद्यालय के यांत्रिक अभियंत्रण विभाग की Departmental Progress Report का अवलोकन।	58	69
2019.2.09	विश्वविद्यालय के कम्प्यूटर साइंस एण्ड इंजीनियरिंग विभाग की Departmental Progress Report का अवलोकन।	70	75
2019.2.10	विश्वविद्यालय के विद्युतकण एवं संचार अभियंत्रण विभाग की Departmental Progress Report का अवलोकन।	76	89

2019.2.11	विश्वविद्यालय के रसायन अभियंत्रण विभाग की Departmental Progress Report का अवलोकन।	90	96
2019.2.12	विश्वविद्यालय के आईटी0 एण्ड सी0ए0 विभाग की Progress Report का अवलोकन।	97	105
2019.2.13	विश्वविद्यालय के सेन्टर फार मैनेजमेंट स्टडीज की Progress Report का अवलोकन।	106	115
2019.2.14	विभिन्न विभागों से प्राप्त पाठ्यक्रम समिति की संस्तुतियों का अवलोकन एवं अनुमोदन।	116	168
2019.2.15	शैक्षणिक क्रियाकलाप समिति की 34वीं बैठक द्वारा संस्तुत सत्र 2018-19 के सम सेमेस्टर से छात्रहित में बी0टेक0 अध्यादेश की धारा 6.1.5 (Curriculum Structure of the Programme) तथा धारा 6.1.16 (Curriculum for B.Tech. Programme) में किये गये संशोधन का अवलोकन एवं अनुमोदन।	169	171
2019.2.16	शैक्षणिक क्रियाकलाप समिति की 34वीं बैठक द्वारा संस्तुत सत्र 2018-19 के सम सेमेस्टर से छात्रहित में एम0टेक0 अध्यादेश की धारा 6.2.17 (Summer Term Guidelines) में किये गये संशोधन का अवलोकन एवं अनुमोदन।	172	173
2019.2.17	शैक्षणिक क्रियाकलाप समिति की 34वीं बैठक द्वारा संस्तुत सत्र 2018-19 के सम सेमेस्टर से छात्रहित में शोध अध्यादेश की धारा 6.5.12 (Research Progress Assessment) में किये गये संशोधन का अवलोकन एवं अनुमोदन।	174	175
2019.2.18	शैक्षणिक क्रियाकलाप समिति की 34वीं बैठक द्वारा संस्तुत विश्वविद्यालय की परिकल्पना के लक्ष्यों की पूर्ति तथा समय की मांग के दृष्टिगत आगामी भविष्य में प्रयुक्त विज्ञान विभाग द्वारा आरम्भ किये जा रहे परास्नातक पाठ्यक्रमों के सुचारु संचालन के दृष्टिगत प्रयुक्त विज्ञान विभाग को निम्नानुसार 04 विभागों में बँटने के प्रस्ताव का अवलोकन एवं अनुमोदन:- 01. Department of Physics & Material Science (PMS) 02. Department of Mathematics & Scientific Computing (MSC) 03. Department of Chemistry & Environmental Science (CES) 04. Department of Humanities & Management Science (HMS)	176	176
2019.2.19	शैक्षणिक क्रियाकलाप समिति की 35वीं बैठक द्वारा संस्तुत विश्वविद्यालय तथा छात्रहित में हिल एरिया डवलपमेंट इंजीनियरिंग (HADE) प्रोग्राम को सिविल इंजीनियरिंग विभाग (CED) में पूर्ण विलय किये जाने के प्रस्ताव का अवलोकन एवं अनुमोदन।	177	178
2019.2.20	शैक्षणिक क्रियाकलाप समिति की 35वीं बैठक द्वारा संस्तुत छात्रों की संख्या को दृष्टिगत रखते हुए आगामी सत्र 2019-20 से छात्रहित में ट्यूटोरियल कक्षाओं में संशोधन तथा छात्रों को सेक्शनवार विभाजित किये जाने के प्रस्ताव का अवलोकन एवं अनुमोदन।	179	181
2019.2.21	शैक्षणिक क्रियाकलाप समिति की 35वीं बैठक द्वारा संस्तुत सत्र 2019-20 के लिए Co-curricular Activities Calendar का अवलोकन एवं अनुमोदन।	182	183
2019.2.22	विश्वविद्यालय द्वारा विभिन्न संस्थाओं/इंडस्ट्री से किये गये MOUs की अद्यतन स्थिति के विवरण का अवलोकन।	184	186
2019.2.23	दिनांक 24-26 फरवरी, 2019 की तिथियों में आयोजित तृतीय Malaviya Research Conclave - 2019 की रिपोर्ट का अवलोकन।	187	189
2019.2.24	विश्वविद्यालय के विभिन्न स्नातक/परास्नातक पाठ्यक्रमों के एन0बी0ए0 एंकिडिटेशन की अद्यतन स्थिति का अवलोकन।	190	190

2019.2.25	समर टर्म-2019 में पंजीकृत होने वाले छात्रों की मेजर परीक्षा हेतु सभी पंजीकृत विषयों में पृथक-पृथक 75% की उपस्थिति अनिवार्य किये जाने का अनुमोदन।	191	191
2019.2.26	छात्र तथा विश्वविद्यालय हित में आगामी शैक्षणिक सत्र 2019-20 से माइनर परीक्षा की उत्तरपुस्तिका 20 पेज की तथा मेजर परीक्षा की उत्तरपुस्तिका 32 पेज की निर्धारित करते हुए छात्रों को अतिरिक्त (Supplementary Copy) उत्तरपुस्तिका दिये जाने का अनुमोदन।	192	192
2019.2.27	आगामी शैक्षणिक सत्र 2019-20 से विश्वविद्यालय के विभिन्न स्नातक/परास्नातक पाठ्यक्रमों में प्रवेश हेतु 10% EWS (Economically Weaker Sections) कोटा लागू किये जाने का अनुमोदन।	193	198
2019.2.28	मदन मोहन मालवीय प्रौद्योगिकी विश्वविद्यालय, गोरखपुर द्वारा सत्र 2018-19 में अवार्ड किये गये पी0एच0डी0 डिग्री का अवलोकन एवं अनुमोदन।	199	201
2019.2.29	नवम्बर, 2018 में सम्पन्न विश्वविद्यालय के द्वितीय एकैडमिक आडिट के विशेषज्ञों द्वारा दिये गये सुझावों पर विभिन्न विभागों द्वारा की गयी कार्यवाही का अवलोकन।	202	226
2019.2.30	विश्वविद्यालय के छात्र/छात्राओं के सेवायोजन की अद्यतन स्थिति का अवलोकन।	227	228
2019.2.31	दिनांक 10-11 मई, 2019 को सम्पन्न मालवीया इंटेस टेस्ट (MET-2019) की अद्यतन स्थिति की सूचना।	229	231
2019.2.32	मानव संसाधन विकास मंत्रालय के Leap Programme के अन्तर्गत विश्वविद्यालय के वरिष्ठ आचार्य प्रो0 डी0 के0 सिंह तथा प्रो0 उदय शंकर के क्रमशः यू0एस0ए0 तथा सिंगापुर भ्रमण की सूचना।	232	232
2019.2.33	विश्वविद्यालय के विभिन्न छात्रों द्वारा विदेशों में आयोजित कार्यक्रमों में प्रतिभाग किये जाने की सूचना।	233	233
2019.2.34	विश्वविद्यालय के डी0आई0आई0सी0 (DIIC) द्वारा अद्यतन सहायित शोध परियोजनाओं के विवरण का अवलोकन।	234	235
2019.2.35	विश्वविद्यालय के शैक्षणिक सत्र 2014-15 में बी0टेक0 कम्प्यूटर साइंस, द्वितीय वर्ष में प्रवेशित छात्र नित्यानंद, रोल न0 - 2014022022 को अध्यादेश के अनुसार समयावधि समाप्त होने के दृष्टिगत विशेष परिस्थिति में बी0टेक0 छठवें वर्ष में पूर्ण किये जाने हेतु पंजीकरण का अनुमोदन।	236	237
2019.2.36	विश्वविद्यालय के सुचारु संचालन हेतु गठित विभिन्न समितियों के कार्यालय-आदेशों का अवलोकन।	238	246
	अध्यक्ष महोदय की अनुमति से अन्य मद।		

2019.2.14 विभिन्न विभागों से प्राप्त पाठ्यक्रम समिति की संस्तुतियों का अवलोकन एवं अनुमोदन।

निम्न विभागों से प्राप्त पाठ्यक्रमों में संशोधन प्रस्ताव विद्या परिषद के अवलोकनार्थ प्रस्तुत है:-

प्रयुक्त विज्ञान विभाग द्वारा अपने निम्न परास्नातक पाठ्यक्रमों के क्रेडिट स्ट्रक्चर तथा सैलेबस में संशोधन किया है:

क्रमांक	विभाग	पाठ्यक्रम का नाम	प्रभावी	पृष्ठ संख्या
01.	ASD	M.Sc. Physics	2019-20	117-165
		M.Sc. Mathematics		

प्रबन्ध अध्ययन केन्द्र द्वारा सत्र 2019-20 से आरम्भ होने वाले बी0बी0ए0 पाठ्यक्रम हेतु प्रथम वर्ष, प्रथम सेमेस्टर के लिए आडिट कोर्स का सैलेबस निर्धारित किया गया है:

01.	BBA	BBA-01 Human Value & Ethics	2019-20	166-168
		BBA-02 Industrial Safety Engineering		
		BBA-03 Business Simulation Approaches		

विद्या परिषद के माननीय सदस्यों से अनुरोध है कि कृपया उक्त का अनुमोदन प्रदान करने की कृपा करें।

**REVISED CURRICULUM
FOR
MASTER OF SCIENCE
PHYSICS (SPECIALISATION IN ELECTRONICS)
(With effect from 2019-20)**

**APPLIED SCIENCE DEPARTMENT
MADAN MOHAN MALVIYA UNIVERSITY OF
TECHNOLOGY, GORAKHPUR-273010, U.P.**

DEPARTMENT OF APPLIED SCIENCE
M. M. M. UNIVERSITY OF TECHNOLOGY
GORAKHPUR

Credit Structure for M. Sc. Physics with specialization in Electronics
(For newly admitted students from Session 2019-2020)

Category	I	II	III	IV	Total
Programme Core (PC)	19	10	14	6	49
Programme Electives (PE)	-	8	4	-	12
Dissertation (D)			3	12	15
Audit					
Total	19	18	21	18	76

Curriculum for M. Sc. Physics with specialization in Electronics
(For newly admitted students from Session 2019-2020)

Junior Year, Semester I

S. N.	Category	Paper Code	Subject Name	L	T	P	Credits
1.	PC	MPC-101	Mathematical Physics and Classical Mechanics	3	1	0	4
2.	PC	MPC-102	Condensed Matter Physics	3	1	2	5
3.	PC	MPC-103	Quantum Mechanics	3	1	0	4
4.	PC	MPC-104	Semiconductor Devices and Integrated Circuit	3	1	-	4
5.	PC	MPC-105	Electronic Devices and Circuit lab	-	-	04	2
6.	AC	Audit Subject	Audit Subject				-
			Total	12	4	6	19

Junior Year, Semester II

S. N.	Category	Paper Code	Subject Name	L	T	P	Credits
1.	PC	MPC-201	Atomic, Molecular Physics and Lasers	3	1	0	4
2.	PC	MPC-202	Electrodynamics	3	1	0	4
3.	PC	MPC-203	Spectroscopic and Laser Lab	-	-	4	2
4.	PE1	MPE*	Program Elective-1	2	1	2	4
5.	PE2	MPE**	Program Elective-2	2	1	2	4
6.	AC		Audit Subject				-
			Total	10	4	8	18

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Senior Year, Semester III

S. N.	Category	Paper Code	Subject Name	L	T	P	Credits
1.	PC	MPC-301	Thermodynamics and Statistical Mechanics	3	1	0	4
2.	PC	MPC-302	Optoelectronics and Optical Communication System	3	1	0	4
3.	PC	MPC-303	Nuclear and Particle Physics	3	1	0	4
4.	PC	MPC-304	Optoelectronics and Optical Communication Lab	-	-	4	2
5.	PE-3	MPE***	Program Elective-3	3	1	0	4
6.	D		Dissertation Part-I	0	0	6	3
			Total	12	4	10	21

Senior Year, Semester IV

S. N.	Category	Paper Code	Subject Name	L	T	P	Credits
1.	PC	MPC-401	Microprocessor and Application	3	1	0	4
2.	PC	MPC-402	Microprocessor and Microcontroller Lab	-	-	4	2
2.	D		Dissertation Part-II	0	0	24	12
			Total	3	1	28	18




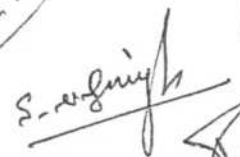
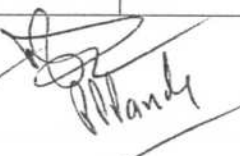



 A collection of handwritten signatures and initials, including "Raj", "S. Singh", "PPR", "Rambh", "Am.", and others, scattered across the bottom of the page.

Programme Core for M. Sc. Physics with Specialization in Electronics

S. N.	Paper Code	Subject Name	L	T	P	Credits
1.	MPC-101	Mathematical Physics and Classical Mechanics	3	1	0	4
2.	MPC-102	Condensed Matter Physics	3	1	2	5
3.	MPC-103	Quantum Mechanics	3	1	0	4
4.	MPC-104	Semiconductor Devices and Integrated Circuit	3	1	0	4
5.	MPC-105	Electronic Device and Circuit lab	-	-	4	2
6.	MPC-201	Atomic, Molecular Physics and Lasers	3	1	0	4
7.	MPC-202	Electrodynamics	3	1	0	4
8.	MPC-203	Laser and Spectroscopy Lab	-	-	4	2
7.	MPC-301	Thermodynamics and Statistical Mechanics	3	1	0	4
8.	MPC-302	Optoelectronics and Optical Communication System	3	1	0	4
9.	MPC-303	Optoelectronics and Optical Communication Lab	-	-	4	2
10.	MPC-303	Nuclear and Particle Physics	3	1	0	4
11.	MPC-401	Microprocessor and Application	3	1	0	4
12.	MPC-402	Microprocessor and Microcontroller Lab	-	-	4	2
			30	10	10	49

Programme Electives (PE-I)

S. N.	Paper Code	Subject Name	L	T	P	Credits
1.	MPE-201	Computational Technique and Programming	2	1	2	4
2.	MPE-202	Physics of Materials	3	1	0	4
3.	MPE-203	Methods in Theoretical Physics	3	1	0	4
4.	MPE-204	Mobile Communication	3	1	0	4
		Total	11	4	2	16

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Programme Electives (PE-II)

S. N.	Paper Code	Subject Name		L	T	P	Credits
1.	MPE-205	Analog and Digital Communication		2	1	2	4
2.	MPE-206	Instrumentation Technology		3	1	0	4
3.	MPE-207	Solar and Astrophysics		3	1	0	4
4.	MPE-208	Satellite Communication and Remote Sensing		3	1	0	4
			Total	11	4	2	16

Programme Electives (PE-III)

S. N.	Paper Code	Subject Name		L	T	P	Credits
1.	MPE-301	Advance Quantum Mechanics		3	1	0	4
2.	MPE-302	Quantum Field Theory		3	1	0	4
3.	MPE-303	Fiber Optics and Nonlinear Optics		3	1	0	4
4.	MPE-304	Wireless Communication		3	1	0	4
			Total	12	4	0	16

*Audit course for M. Sc. Physics with Specialization in Electronics

S. N.	Paper Code	Subject Name		L	T	P	Credits
1.	BCS 01	Introduction to Computer Programming		3	1	0	4
2.	MAS 105	Applied Probability and Statistics		3	1	0	4
3.	MBA 109	Research Methodology		3	1	0	4
4.	BEE 20	Simulation Techniques		3	1	0	4
			Total	12	4	0	16

*The syllabus of above mentioned audit courses recommended for the M. Sc. Physics with Specialization in Electronics during Ist and IInd Semester will be same as recommended by different department and running as the part of different other courses of this university.

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MCP-103: MATHEMATICAL PHYSICS AND CLASSICAL MECHANICS

4 Credits (3-1-0)

Unit-I: Theory of Functions, Matrices and Differential Equations:

9

Vector algebra and vector calculus, matrices, Cayley- Hamilton theorem, Eigen values, Properties of Eigen values, Power of Matrix, Eigen Vectors, Properties of Eigen Vectors, Orthogonal Vectors. Linear differential equations of first order, Linear differential of second order. Special functions, Legendre, Bessel, Hermite and Laguerre functions (Generating functions and recurrence relations).

Unit-II: Complex Variable, Fourier and Laplace Transforms and Probability theory:

9

Elements of Complex analysis, Cauchy-Riemann conditions, Cauchy's Integral formula, Taylor & Laurent Series, singularities, pole and calculus of residues. Fourier Series, Fourier and Laplace Transforms. Elementary Probability Theory, random variables, binomial, Poisson and normal distributions, Central Limit Theorem.

Unit-III: Classical Mechanics : Dynamics of Bodies and relativistic kinematics

9

Newton's laws of motion, Inertial frame, dynamical systems, phase space dynamics, Stability analysis, conditions of equilibrium. Central force motions, Two body collisions- scattering in laboratory and center of mass frames. Generalized coordinates of a rigid body, body and space reference systems, Angular Momentum and Inertia Tensor. Special theory of relativity, Lorentz transformations, relativistic kinematics and mass-energy equivalence

Unit-IV: Classical Mechanics: Lagrangian and Hamiltonian Dynamics

9

Non-inertial frame of reference and pseudoforce, Generalized coordinates, Principle of virtual work and D'Alembert's principle, Lagrange's equation from D'Alembert's principle, Hamiltonian formalism: Generalized momentum and cyclic Coordinates, conservation theorems, conservation of linear and angular momentum, Hamiltonian function H and conservation of Energy: Jacobis integral. Two coupled oscillators, normal coordinates and normal mode.

Books & References:

1. Mathematical Methods for Physicists -G. Arfken, Elsevier Academic Press, USA
2. Mathematics for Physicists and Engineers-Pipes, -MC Graw Hill Publishing Company, New York
3. Mathematical Methods for Physics- Wyle, McGraw-Hill 1995
4. S.M. R. Spiegel -Theory and Problems of Complex Variables, Schaum's outline series
5. Mathematical Methods of Physics-J. Mathews and R. I. Walker -W.A. Benjamin
6. Mathematical Physics by H.K. Dass, B. Chand and Company.
7. Classical Mechanics by J.C. Upadhyaya, Himalaya Publishing House
8. Classical Mechanics by N.C. Rana and P.S. Joia, Mc Graw Hill Education.

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MPC-102: CONDENSED MATTER PHYSICS**5 Credits (3-1-2)****Unit-I: Crystal Structure & Band Theory of Solids**

9

Space lattice and basis; Types of lattice, Bravais lattices, Miller indices, Crystal structures of NaCl and diamond, Reciprocal lattice and Brillouin zones; Laue diffraction: atomic and structure factor, Basic idea of crystal defects and dislocations, Ordered phases of matter: translational and orientational order, Quasi crystals, Bonding in solids, Band theory of solids: metals, insulators and semiconductors, Density of states, Origin of energy bands: Bloch Theorem; Kronig Penney model

Unit-II: Thermal and Optical Properties

9

Elastic properties, Lattice vibrations of mono and diatomic chains, Quantization of lattice vibration, Phonons and its properties, Lattice specific heat: Classical and quantum theory (Dulong-Petit law, Einstein theory, Debye law), Fermi Energy, Drude and Sommerfeld model: electrical and thermal conductivity, Kramers- Kronig relations, Hall effect: classical and quantum theory, Thermoelectric power

Unit-III: Magnetic and Ferro-electric Properties

9

Magnetism and its origin, Paramagnetism in metals and insulators, Magnetic dipoles, ground and excited states, multiplet separation, Ferromagnetism: Weiss Molecular field theory, Heisenberg explanation of internal magnetic field, Landau theory of domain, Bloch $T^{3/2}$ law, Anti-ferromagnetism, ferrimagnetism: Neel's sub-lattice model, Ising model

Ferro-electricity: Ferroelectric materials; their properties and classification, Order-disorder and displacive type ferro electric materials, Occurrence of ferro-electricity due to polarization, Catastrophe and lattice modes, Devonshire theory of ferroelectric phase transition

Unit-IV: Superconductivity

9

Superconductors: Type-I & Type-II superconductors, Meissner effect, Transport currents, Elements of BCS theory: Coherence and phase of electron pair waves, energy gaps, London equation: penetration depth, Ginzburg-Landau theory, Thermodynamics of superconductors: Entropy, specific heat and latent heat, Applications of superconductors: Cooper-pair tunneling (AC & DC Josephson effect), Super conducting quantum interference device (SQUID), Superfluidity in He^3

Books & References:

1. Solid State Physics by A-J.Dekkar (McMillan and Co., London)
2. Introduction to Solid State Physics by C.Kittel (Wiley Eastern, New Delhi)

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MPC-103: QUANTUM MECHANICS**Credit 04 (3-1-0)****Unit I: Mathematical Preliminaries****09**

Concept of Hilbert Space, linearly independent and dependent vectors, Dirac's bra and ket notations, Properties of kets, bras, and bra-kets operators, linear operators, Hermitian Adjoint, Hermitian and skew-Hermitian operators, projection operators, properties of projection operators, matrix representation of kets, bras, and operators, eigenvalue equations and related theorems, equivalence of matrix mechanics and wave mechanics, Schrodinger picture, Heisenberg picture.

Unit II: Schrödinger Equation and Applications**09**

Schrodinger Equation: the free particle solution, wave packets, the potential barrier problem, transmission and reflection through a potential barrier, the tunnelling effect, the finite square well potential, particle in a square well potential, bound state solutions, simple harmonic oscillator, eigen value problems using operator or algebraic methods, occupation number operator, annihilation and creation operators, energy eigen value and eigen states

Unit III: Theory of Angular momentum**09**

Angular momentum, orbital angular momentum, orbital, spin and total angular momentum operators, commutation relations, eigenstates and eigenvalues equations of the angular momentum operator, matrix representations and geometrical representation, Addition of angular momenta, eigenvalues of J^2 and J_z , Clebsch-Gordon coefficients

Unit IV: Identical Particles**09**

Distinguishability of identical particles, exchange degeneracy, construction of symmetric and antisymmetric wave functions, Pauli's exclusion principle and Slater's determinant, Electron spin hypothesis, spin angular momentum, general theory of spin, Pauli's spin matrices and eigen value equations

Books & References:

- 1: Modern Quantum Mechanics by J. J. Sakurai (Pearson Education India)
- 2: Quantum Mechanics: Concept & Applications, Nouredine Zettili, A John Wiley & Sons, Ltd., Publication
- 3: Quantum Mechanics, Vol. (I) by Albert Messiah (North Holland Publishing Company, Amsterdam, 1961)
- 4: Concepts in Quantum Mechanics by V. S. Mathur and Surendra Singh (CRC Press, 2009)
- 5: Quantum Mechanics by L.I. Schiff (Mc-Graw Hill Inc.)
- 6: Quantum Mechanics by B. K. Agarwal and Hari Prakash (Prentice-Hall of India Pvt Ltd, New Delhi, 2005)
7. Quantum Mechanics by Ajoy K Ghatak (McMillan Co. of India)



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MPC-104: SEMICONDUCTOR DEVICES AND INTEGRATED CIRCUIT**4 Credits (3-1-..)****Unit-I: Semiconductor Physics**

9

Bandgaps in semiconductors, Fermi distribution and density of states, Scattering Mechanism: electron - electron and electron - phonon scattering, Carrier transport by drift and diffusion. Electron - hole pair generation and recombination, Excitons, Continuity equations.

Unit-II: Semiconductor Devices

9

Light emitting diodes, Varactor diode, Zener diode, Schottky diode, Tunnel diode, Semiconductor laser, Photodiodes, Solar cell, UJT, Gunn diode, IMPATT devices, Liquid crystal displays, FET and MOSFET.

Unit-III: Op-Amp Circuits

9

Characteristics and parameters of Op-Amp, Frequency response, Current mirror and current loading biasing, Concept of ideal op-amp, Differential amplifiers, IC 741 circuits - amplifiers, Scalar, Summer, Subtractor, Comparator, Logarithmic amplifiers, Multiplier, Divider, Differentiator, Integrator.

Unit-IV: Digital Circuits

9

Survey of number systems, Logic simplification using K-maps, SOP and POS design of logic circuits, Logic Families, Combinational Circuits: Adders, subtractors, Encoder, De-coder, Comparator, Multiplexer, Demultiplexers, Sequential Circuits: Flip-flops, Registers, Counters, Memories; A/D and D/A conversion.

Books &References :

1. Semiconductor Physics and Devices by D.A. Neamen, (3rd Ed., Tata McGraw-Hill), 2002.
2. Semiconductor Devices - Physics and Technology by S.M. Sze (John Wiley), 2002.
3. Electronic Principles by A.P. Malvino (Tata McGraw, New Delhi), 7th edition, 2009.
4. Electronic Devices and Circuits Theory :Boylested and Nashelsky, (Pearson Education) 10th ed. 2009.
5. OPAMPS and Linear Integrated circuits :Ramakant A Gayakwad (Prentice Hall), 1992.
6. Operational amplifiers and Linear Integrated circuits, R.F. Coughlin and F.F. Driscoll, (Prentice Hall of India New Delhi), 2000.
7. Digital Design by M. Morris Mano, Michael D. Ciletti, (Prentice Hall of India Pvt. Ltd.), 2008.

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List of Experiments

1. Volt-Ampere Characteristics of Zener Diode and Zener Voltage regulator characteristics.
2. To obtain the V-I Characteristics of LED for different LEDs (Red, Blue, Green, Yellow etc.) and find the LED voltages of different LEDs
3. To obtain Frequency response characteristics and bandwidth of Common Source FET and MOSFET amplifiers.
4. Use of timer IC 555 in astable and monostable modes and applications involving relays, LDR.
5. To study the frequency response of an operational amplifier & to use operational amplifier for different mathematical operations
6. To configure various shift registers and digital counters. Configure seven segment displays and drivers.
7. To verify the truth table for Logic Gates and flip flops.
8. To verify A/D and D/A converter

Books & References:

1. Semiconductor Physics and Devices by D.A. Neamen, (3rd Ed., Tata McGraw-Hill), 2002.
2. Semiconductor Devices - Physics and Technology by S.M. Sze (John Wiley), 2002.
3. Electronic Principles by A.P. Malvino (Tata McGraw, New Delhi), 7th edition, 2009.
4. Electronic Devices and Circuits Theory: Boylested and Nashelsky, (Pearson Education) 10th ed. 2009.
5. OPAMPS and Linear Integrated circuits: Ramakant A Gayakwad (Prentice Hall), 1992.
6. Operational amplifiers and Linear Integrated circuits, R.F. Coughlin and F.F. Driscoll, (Prentice Hall of India, New Delhi), 2000.
7. Digital Design by M. Morris Mano, Michael D. Ciletti, (Prentice Hall of India Pvt. Ltd.), 2008.


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MPC-201: ATOMIC, MOLECULAR PHYSICS AND LASERS**4 Credits (3-1-0)****Unit- I: Principles of Spectroscopy:****09**

Quantum states of an electron in atom. Origin of one electron atomic spectra, correction for finite nuclear mass, Spectra of H and He^+ . Sommerfeld extension of Bohr's model, Relativistic correction for energy levels of hydrogen atom. Vector atom model and electron spin. Stern-Gerlach Experiment. Hydrogen hyperfine structure and isotopic shift width of spectral lines. Spectra of Helium and alkali atoms.

Unit-II: Atomic Spectroscopy**09**

L-S and j-j coupling, Lande interval rule, Spectral terms for L-S coupling, Selection rules for multi-electron atoms in L-S Coupling and j-j coupling, Zeeman effect, Anomalous Zeeman effect, Paschen- Back effect. Spectra of Helium and alkali atoms. Nuclear spin and hyperfine splitting.

Unit-III: Molecular Spectroscopy, NMR and ESR**09**

Born- Oppenheimer Approximation, Types of Molecular Spectra, Rotational, Vibrational Spectra, Molecule as anharmonic Oscillator, Vibrational frequency and force constant for anharmonic Oscillator. Formation of Electronic Spectra, Franck-Condon Principle, Raman spectra, Experimental arrangement for Raman Spectra, Classical and Quantum theory of Raman Effect, Raman Spectra of Diatomic Molecules and Selection Rules. Magnetic properties of Nuclei, Resonance Condition, NMR Instrumentation, Principles of ESR, ESR spectrometer.

Unit-IV: Basic Principles of Laser**09**

Two level, Three and Four level laser system, Rate equations for three and four level system, threshold pump power, Relative merits and de-merits of three and four level system, Solid State and Semi-conductor Lasers, Gas and dye lasers, Application of Laser in Material Processing, Optical resonators, Stability of resonators, Characteristics of Gaussian beam, Transverse and longitudinal modes, mode selection, losses in a resonator.

Books & References:

- 1: Physics of Atoms and Molecules by B.H. Bransden and C.J. Joachain, Pearson
- 2: Quantum Chemistry by I.N. Levine, Prentice Hall
- 3: Quantum Mechanics by L.D. Landau and E.M. Lifshitz, Pergamon Press
- 4: Molecular Quantum Mechanics by P.W. Atkins and R.S. Friedman, Oxford University Press
- 5: Atomic & Molecular Spectra: Laser by Rajkumar, Kedar Nath and Ram Nath, Meerut.
- 6: Introduction to Spectroscopy by Donald L. Pavia, Gary M. Lampman, George S. Kriz, James R. Vyvyan, Cengage Learning Pvt. Limited.
- 7: Molecular Structure and Spectroscopy by G. Aruldas, PHI, Learning Pvt. Limited.
- 8: Atomic, Laser and Spectroscopy by S. N. Thakur and D. K. Rai, Perntice Hall of India, New Delhi, India

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MPC-202: ELECTRODYNAMICS**4Credits (3-1-0)****UNIT- I Mathematical Preliminaries & Formulations in Electrodynamics with Vector Analysis 9**

Vector Algebra, operations, separation vectors, Differential Calculus, gradient, The operator ∇ . The divergence, the curl, product rule, Integral calculus, Line, Surface and Volume integrals, Curvilinear coordinates, Spherical polar coordinates, cylindrical coordinates

UNIT- II Electrostatics and Magnetostatics 9

Electrostatics: The Electric field, Flux and Gauss's Law, Applications of Gauss's Law, Methods of solving electrostatic problems in cartesian, spherical and cylindrical coordinates, Magnetostatics: Biot-Savart Law, Electromagnetic induction, Faraday's law, Ampere's law, modification in Ampere's law, concept of displacement current

UNIT- III Electrodynamics and Electromagnetic waves 9

Conservation laws, Wave equations, Maxwell's wave equations in free space and physical significance, energy transmitted by a plane wave, Poynting theorem, Electromagnetic waves in free space and isotropic dielectrics, Waves in conducting media, skin depth, Wave Guides, Transmission Line

UNIT- IV Potentials, Field and Relativistic Electrodynamics 9

The potential formulation, Scalar and Vector Potentials, Gauge transformation, Lorentz Gauge, Coulomb Gauge, Retarded potential, Special Relativity: The structure of Spacetime, four vectors and transformations, Lorentz transformation matrix, four-dimensional product, covariant and contravariant vector, transformation of fields, tensor notation, electrodynamics in tensor notation

Books & References

1. David J. Griffith-Introduction to Electrodynamics, Fourth Edition, Prentice Hall, 2013
2. L.D. Landau & E.M. Lifshitz- Electrodynamics of Continuous Media, Pergamon Press 1960
3. J.D. Jackson, Classical Electrodynamics, Wiley
4. Andrew Zangwill, . Modern Electrodynamics, Cambridge University Press, 2013, United Kingdom,
5. Parcell, Edward M., Electricity and Magnetism. 2nd Edition, McGraw-Hill Company, 1985
6. S.P. Puri Classical Electrodynamics, (Narosa Publishing House) 2011.
7. A.Z. Capri and P.V. Panat, Introduction to Electrodynamics, (Narosa Publishing House) 2010
8. Saroj K. Dash & Smruti R. Khuntia-Fundamentals of Electromagnetic Theory, PHI
9. Edward C. Jordan, Electromagnetic Waves and Radiating System, Prentice Hall Electrical Engineering Series.


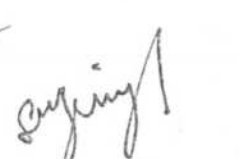
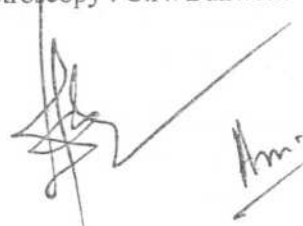



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MPC-203: SPECTROSCOPY AND LASER LAB**2 Credits (0-0-4)****List of Experiments**

1. Spectroscopy of iodine vapor.
2. Laser diffraction by a thin wire
3. Measurement of Planck's constant using photoelectric effect
4. To study Zeeman effect using Na lamp.
5. Experiment with liquid/solid using UV/Fluorescence spectroscopy
6. Measurement of optical spectrum of an alkali atom
7. Laboratory spectroscopy of standard lamps
8. Measurement of FTIR/Raman spectrum of solid/liquid (CCl_4)
9. Ionization potential of Lithium
10. Dissociation Energy of I_2 molecule

Books & References:

1. Physics of Atoms and Molecules: Bransden and Joachain.
2. Lasers - Theory and Applications: K. Thyagrajan and A.K. Ghatak.
3. Introduction to Atomic Spectra: H.E. White.
4. Introduction to Atomic Spectra: HG Kuhn
5. Modern Spectroscopy : J.M. Hollas
6. Fundamentals of Molecular Spectroscopy : C.N. Banwell.

MPE-201: COMPUTATIONAL TECHNIQUE & PROGRAMMING Credit 04 (2-1-2)**Unit I: Interpolation**

06

Methods of interpolation, least square curve fitting, Methods of equal intervals, unequal intervals, Central Difference method, Inverse interpolation: Iteration of successive approximation, exchange of dependent and independent variables and reversion of series

Unit II: Numerical integration

06

Simpson's one-third and three-eighth rule, Euler-Maclaurin formula, Quadrature formulae, Numerical Solution to ordinary differential equation by Euler's and Runge-Kutta methods, Solution of algebraic and transcendental equations: Convergence, Newton-Raphson method, Iterative methods.

Unit III: Elements of Programming in Languages-C++ & Fortran

06

Flow Charts, Integer and Floating points, Logical and Arithmetic Expressions, Built in functions, Executable and Non- Executable statements, Assignments, Control and Input and Output Statements, Looping, Function and Subroutines, Operation with files.

Unit IV: Simulation Techniques

06

Monte Carlo methods, molecular dynamics, simulation methods for the Ising model and atomic fluids, simulation methods for quantum-mechanical problems, time-dependent Schrödinger equation, discussion of selected problems in percolation, nonlinear dynamics, traffic problems, diffusion-limited aggregation etc.

Books & References:

- 1: Introductory Methods of Numerical Analysis by S. S. Sastry (PHI Learning Pvt. Ltd)
- 2: Numerical methods by Balguruswamy (Tata McGraw-Hill Education)
- 3: Fortran 77 and Numerical Methods by C. Xavier (New Age International)
- 4: Let US C++ by Yashavant Kanetkar (BPB Publication)
- 5: Numerical Recipes in FORTRAN 90 by W. Press et al. (Cambridge university Press)
- 6: Computer Programming in Fortran 90 & 95 by V. Rajaraman (Prentice Hall of India)
- 7: Computer Simulation Methods in Theoretical Physics by D.W. Heermann (Springer-verlag)
- 8: Computer Simulation of Liquids by M. P. Allen and D. J. Tildesley (Oxford Science Publication)
- 9: The Art of Molecular Dynamic Simulation by D. C. Rapport (Cambridge University Press)

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MPE-202: SOLAR AND ASTROPHYSICS**Credit 04 (3-1-0)****Unit I: Our Solar System****09**

Origin of our solar system, Sun and its theoretical model, Energy production inside stars: proton-proton chain & CNO cycle, Solar neutrino and its detection, Description of eight planets and their moons with their atmospheric and geographical conditions & vital statistics, Classification of planets, Other planetary bodies: Asteroids, comets and meteorites, Types of asteroids and their properties, Kepler's laws of planetary motion, Newton's law of gravitation from Kepler's law of planetary motion.

Unit II: Solar Phenomena**09**

Solar atmosphere, Photosphere, Chromosphere, Corona; Solar Structures: granules, super granules, giant cells, spicules and plages, Sun spots and their properties, Prominences: structure and theory of generation, Solar Flare: classifications, their phases and flare theory; Solar activity, Solar cycle, Solar magnetic field; Coronal hole, Coronal Mass Ejections (CME), Observed and derived properties of solar wind, Solar wind formation: Spatial configuration of magnetic field frozen into solar wind, Termination of solar wind.

Unit III: Astrophysical Processes**09**

Our galaxy, Types of galaxies: Elliptical, Spiral and SO type of galaxies, Irregular galaxies, their morphology, evolution and contents, Hubble's tuning fork diagram, Cluster of galaxies and their evolution, Collision and merger of galaxies, Types of galaxies, Schwarzschild solution: massive stars, singularity and the black holes, Loss of information from a black hole, Accretion of mass and emission of jets in a binary star system, Theory of compact stars.

Unit IV: Big-Bang Theory**09**

The expanding Universe: Hubble's law and constant, Flaw in Hubble's measurement, Hot big-bang model: arguments in its favor and against, Evolution of the Universe after big-bang: description of different phases, matter, energy and forces, Models of the Universe: the closed, open and flat models and their relevance with observations, Origin of various bands of electromagnetic bands of spectrum in the Universe, COBE: black body spectrum of the Universe, Dark matter and Dark Energy, Cosmic rays.

Books &References :

- 1: Astrophysics of the Sun by Harold Zirin, Cambridge University Press, Cambridge, U.K.
- 2: Solar System Astrophysics by J.C. Brandt & P.W. Hodge
- 3: Guide to the Sun by Kenneth J. H. Philips, Cambridge University Press, U.K.
- 4: Introduction to Special Relativity and Space Science by S. P. Singh, Wiley India Pvt. Ltd., New Delhi, India
- 5: Introduction to Modern Astrophysics by W. Carroll & D. A. Ostlie, Addison Wesley
- 6: Introduction to Cosmology by J V Narlikar, Cambridge University Press.

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MPE-203: METHODS OF THEORETICAL PHYSICS**Credit 04 (3-1-0)****Unit- I: Vectors, Tensors, Matrices and Operators**

09

Vector spaces, Linear operators and matrices, Inverse operators and matrices, The dual space, Change of basis, Canonical form of complex matrices, examples, Some consequences of the Jordan decomposition, Functions of operators/matrices, Hermitian Operators, Tensors: Covariant and contravariant vectors, mixed tensor, metric tensor, Manipulating tensors: contraction, raising and lowering indices. Tensor densities, Levi-Civita Tensor and its transformations

Unit-II: Complex Variable

09

Recapitulation: Complex numbers, triangular inequalities, Schwarz inequality. Function of a complex variable : single and multiple-valued function, limit and continuity; Differentiation; Analytic and harmonic function; Complex integrals, Classification of singularities; Branch point and branch cut; Residue theorem and evaluation of some typical real integrals using this theorem.

Unit-III: Special Functions

09

The Gamma function. Definitions, Digamma and Polygamma functions, Stirling's series, The Beta function., Bessel functions, Neumann functions, Hankel functions, Spherical Bessel functions, Legendre functions, Hermite functions, Laplace function and its application, Green's Functions in one dimensions, Dirac δ -function, its specific representations, step-function

Unit-IV: Ordinary Differential Equation & Fourier Series

09

Linear ordinary differential equations and their singularities. Sturm- Liouville problem, expansion in orthogonal functions. Series solution of second-order equations, Applications and properties of Fourier Series, Gibbs phenomenon, etc. Integral transformations, Fourier integral, Momentum representation, Laplace transform, Inverse transforms.

Books & References:

- 1: Guide to Mathematical Methods for Physicists: With Problems and Solutions by Michela Petrini , Gianfranco Pradisi, Alberto Zaffaroni,, (Essential Textbooks Series in Physics), World Scientific Publishing Europe Ltd 2017
- 2: Mathematical Methods for Physicists by George B Arfken, Hans. J. Weber, Frank E Harris, Elsevier India; 7th edition (2012)
- 3: Matrices and tensors in physics by A. W. Joshi, New Age International, 1995
- 4: Vector Analysis by Murray R Spiegel, Seymour Lipschutz, Schaum's Outlines Series, 2009
- 5: Schaum's Outline of Complex Variables by Dennis Spellman, John J. Schiller, Murray R. Spiegel, and Seymour Lipschutz, 2ed, 2009.
- 6: Methods of Theoretical Physics (Vol. I & II) by P.M. Morse and H. Feshbach, Feshbach Publishing

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MPE-204: MOBILE COMMUNICATION**4 Credits (3-1-0)****UNIT- I****9**

Fixed TDM, classical ALOHA, Slotted ALOHA, Carrier Sense Multiple Access, Demand Assigned Multiple Access

UNIT- II**9**

Introduction, Fundamental Concepts, pseudo noise sequences, CDMA, FHSS, DSSS, Synchronization of Spread Spectrum, Spread Spectrum applications in cellular communication, PCs, and mobile communication

UNIT- III**9**

Mobile Services, System Architecture, Radio interface, Protocols, localization and calling, Handover, Security, New Data Services.

UNIT- IV**9**

TCP, UDP, SCTP, Routing & Bridging, Mobile IP. Electronic navigation & surveillance Systems, Blue tooth, GPS, Global Mobile Satellite Systems

Books & References

1. Wireless Digital Communications- Dr. Kamilo Feher, PHI
2. Mobile Communications- Jochen Schiller, Pearson Education
3. Mobile and Personal Communication Systems and Services- Raj Pandya, IEEE Press, PHI

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MPE-205: ANALOG AND DIGITAL COMMUNICATION**4 Credits (2-1-2)****Unit I-Signal Representation**

6

Time domain and frequency domain representation, Fourier series and Fourier transform, Properties of Fourier transform; Linearity, Symmetry, Folding, Delay, Frequency shift. Cosine and Sine transform, Transforms of derivatives, Convolution theorem, Dirac Delta function, energy signal and Power signal, Energy spectral density, Power spectral, Cross-correlation, Auto-correlation function, Parseval's theorem.

Unit II- Noise

6

External and internal source of noise, Voltage and current models of a noisy resistor, Calculation of thermal noise in RC circuit, Shot noise, Noise figure, Noise temperature, Equivalent noise bandwidth, Calculation of noise figure for the cascaded network. Review of Analog Communication System: Amplitude and Angle Modulation.

Unit III- Digital Modulation System

6

Sampling Theorem, types of analog pulse modulation, method of generation and detection of PAM, PWM and PPM, Linear quantizer, Quantization noise power calculation, Signal to quantization noise ratio. PCM, DM, ADM and DPCM.

Unit IV- Digital Multiplexing

6

Fundamental of TDM, Digital Modulation Technique: Types of Digital Modulation, Waveform for ASK, FSK, and PSK, Differential Phase Shift Keying, QPSK and MSK.

Books and References:

1. Modern Analog and Digital Communication by B.P. Lathi, (Oxford University Press)
2. Principles of Communication System by Taub & Schilling (Mc Graw Hill)
3. Communication System by Haykin,
4. Electronic Communication System by Tomasi,
5. E Digital Communication by Prokis.
6. Electronic Communication System by Kennedy and Davis.
7. Digital Communications, John G. Proakis, 4/e, McGraw-Hill.

List of Experiments:

- 1 Sampling Theorem – verification.
- 2 Time division multiplexing.
- 3 Pulse Code Modulation.
- 4 Delta modulation.
- 5 Frequency shift keying - Modulation and Demodulation.
- 6 Phase shift keying - Modulation and Demodulation.
- 7 Differential phase shift keying - Modulation and Demodulation.
- 8 QPSK - Modulation and Demodulation.

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MPE-206: Instrumentation Technology**4 Credit (3-1-0)****UNIT- I Spectroscopic Techniques**

9

UV and Visible spectroscopy, FTIR and Raman spectroscopy: Identification of groups, hydrogen bonding and study of conformers, Time-resolved spectroscopy and study of biological samples, Laser as a source of radiation and its characteristics, Laser fluorescence and absorption spectroscopy

UNIT- II Advanced Spectroscopic and Mechanical Techniques

9

Qualitative and quantitative analysis of trace elements. Basics of nuclear magnetic resonance (NMR) and electron spin resonance (ESR) spectroscopy, X-ray Photoelectron Spectroscopy (XPS/ESCA) for chemical analysis, Viscometry and Rheology.

UNIT- III Structural and Surface Characterization Techniques

9

Micro, meso and macro porous structural characterization, pore parameters and porosity characterization, X-ray diffraction, small angle X-ray scattering and its application in evaluation of shape and size of surface particles, Basics and applications of Scanning electron microscopy (SEM), Transmission electron microscopy (TEM), Atomic Force Microscopy (AFM).

UNIT- IV Thermal and Electrical Characterisation Techniques

9

TGA, DTGA and DSC, Electrochemical impedance spectroscopy, Dielectric relaxation studies, Electrochemical analysis, Energy and power density measurements, Cyclic voltametry, Charge-discharge characterization.

Books and Reference:

1. Spectroscopy Volume 1, 2 and 3: B.P. Straughan and S. Walker.
2. Modern Spectroscopy: J.M. Hollas.
3. Transmission Electron Microscopy of Metals: Gareth Thomas
4. Elements of X-ray Diffraction: Bernard Dennis Cullity.
5. Atomic Force Microscopy/Scanning Tunneling Microscopy: M.T. Bray, Samuel
6. Electron Microprobe Analysis: S.J. B. Reed.
7. Physical Chemistry of Macromolecules: S.F. Sun, Basic Principles and Issues, Wiley
8. Analytical Techniques for Thin Film Treatise on Material Science and Technology, Vol. 27: K.N. Tu and R. Rosenberg (ed.).

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MPE-207 Physics of Materials

4 Credit (3-1-0)

UNIT- I

9

Physics of Liquid crystals and Ionic Liquids: Definition, Classification, Characteristic features; Thermotropic and Lyotropic Liquid Crystals, Application of liquid crystal, importance of ionic liquids, synthesis and characterisations, thermal, electrical, optical and structure behaviour, Ionogels, solid electrolytes based on ionic liquids, Application of ionic liquid in solid devices.

UNIT- II

9

Physics of Polymers: Definition, Structure, properties and methods of Polymerization, Molecular weights, Degradation of polymers, Viscoelastic state, Glass transition temperature, Electro active polymers, Classification and Applications.

UNIT- III

9

Physics of super ionic solids or fast ion conductors: Definition, Classification, Conduction in fast ion conductors, synthesis, Characteristic features and properties, Importance and application,

UNIT- IV

9

Physics of Nano materials and Semiconducting materials: Definition, Types and characteristic features; Quantum size effect; density of states, Synthesis and characterization; Nanocomposites, Application in devices, Semiconducting materials and devices.

Books and Reference:

1. Liquid Crystals by S. Chandrasekhar, (Cambridge Univ. Press, London)
2. Fundamentals of Polymer Physics and Molecular Biophysics, H. Bohidar, Cambridge Uni. Press
3. An Introduction to Polymer Physics by I. I. Perepechko (Mir Publishers)
4. Fast Ion Transport in solids, W. Van Gool (Ed.), North Holland publishing Company (1973). 2. S. Ge'ler (Ed.), Solid Electrolytes, Springer-Verlag, Berlin (1977).
5. Super ionic Solids: Principles and Application, S. Chandra, North Holland Publishing Company (1981).
6. The Physics of Amorphous Solids, Richard Zallen, John Wiley & Sons Inc., New York (1983).
7. Introduction to Nanotechnology - C.F. Poole Jr and F.J. Owens, Wiley India, New Delhi
8. Handbook of Nanostructured Materials & Nanotechnology, vol.-5, Academic Press, 2000

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MPE-208: SATELLITE COMMUNICATION AND REMOTE SENSING

4 Credits (3-1-0)

UNIT- I

9

Principle of Satellite Communication: General and Technical characteristics, Active and Passive satellites, Modem and Codec.

Communication Satellite Link Design: General link design equation, Atmospheric and Ionospheric effect on link design, Earth station parameters.

UNIT- II

9

Satellite Analog Communication: Baseband analog signal, FDM techniques, S/N and C/N ratio in FM in satellite link.

Digital Satellite Transmission: Advantages, Elements of Digital satellite communication, Digital base band signal, Digital modulation Technique, Digital link Design, TDM, TDMA, Some Applications (VSAT, GPS, LEO mobile communication).

UNIT- III

9

Concept and Foundations of Remote Sensing: Electromagnetic Radiation (EMR), Interaction of EMR with Atmosphere and Earth surface, Application areas of Remote Sensing.

Characteristics of Remote Sensing Platforms & Sensors: Ground, Air & Space platforms, Return Beam Vidicon, Multi-spectral Scanner.

UNIT- IV

9

Microwave Remote Sensing: Microwave sensing, RADAR: SLAR & applications, LIDAR: basic components & applications.

Earth Resource Satellites: Brief description of Landsat and Indian Remote Sensing (IRS) satellites.

Books and Reference

1. Satellite Communication - D.C. Agrawal & A. K. Maini, Khanna Publications; 4th Edition (1996)
2. Satellite Communication - T. Pratt and C. W. B. Ostern, John Wiley and Son.
3. Satellite Communication Systems - M. Richharia, MacGraw Hill.
4. Introduction to Remote Sensing - J. B. Campbell, 72 Spring Street, New York (NY), 10012
5. Manual of Remote Sensing, Vol I & II, Edited by R. N. Colwell, American Society of Photogrammetry.

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