Pre-Revision

Study & Evaluation Scheme

of

Master of Science
(Physics)

[Applicable for Academic Session 2018-19]

[Approved by Hon'ble VC dated August 08, 2017, August 14, 2018, January 23, 2019 & November 29, 2019]

TEERTHANKER MAHAVEER UNIVERSITY

N.H.-24, Delhi Road, Moradabad, Uttar Pradesh-244001

Website: www.tmu.ac.in

Teerthanker Mahaveer University, Moradabad-244001 Registrar

Study & Evaluation Scheme

Semester I

S. No.	Course Code	Subject	Periods			Credit	Evaluation Scheme		
			L	T	P		Internal	External	Total
1	MPH111	Mathematical Physics-I	4	-	-	4	40	60	100
2	MPH112	Classical Mechanics	4	-	-	4	40	60	100
3	MPH113	Quantum Mechanics –I	4	-	-	4	40	60	100
4	MAT115	Research Methodology	3	1	-	4	40	60	100
5	MPH161	Physics Lab-I	-	-	4	2	50	50	100
6	MPH162	Physics Lab-II	-	-	4	2	50	50	100
7	MOOC11	MOOC Program-I (Optional)	-	-	-	1/2	-	100	100
8	MSC111	Discipline & General Proficiency	-	-	-	-	100	-	100
	Total		**15**	**1**	**8**	**20**	**360**	**340**	**800**

Semester-II

S. No.	Course Code	Subject	Periods			Credit	Evaluation Scheme		
			L	T	P		Internal	External	Total
1	MPH211	Mathematical Physics-II	4	-	-	4	40	60	100
2	MPH212	Solid State Physics	4	-	-	4	40	60	100
3	MPH213	Atomic & Molecular Physics	4	-	-	4	40	60	100
4	MPH214	Quantum Mechanics –II	4	-	-	4	40	60	100
5	MPH261	Physics Lab-III	-	-	4	2	50	50	100
6	MPH262	Physics Lab-IV	-	-	4	2	50	50	100
7	MOOC12	MOOC Program-II (Mandatory)	-	-	-	1/2	-	100	100
8	MSC211	Discipline & General Proficiency	-	-	-	-	100	-	100
	Total		**16**	**0**	**8**	**21/22**	**360**	**440**	**800**

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Semester-III

S. No.	Course Code	Subject	Periods			Credit	Evaluation Scheme		
			L	T	P		Internal	External	Total
1	MPH311	Electromagnetic Theory	4	-	-	4	40	60	100
2	MPH312	Thermodynamics & Statistical Physics	4	-	-	4	40	60	100
3	**Departmental Elective-I**								
	MPH313	Material Science	4	-	-	4	40	60	100
	MPH314	Physics & Technology of Semiconductor Devices							
	MPH315	Nano-Science & Technology							
4	**Open Elective**								
	MSC011	Industrial Safety & Health Hazards	4	-	-	4	40	60	100
	MSC012	Elementary Biophysics							
	MSC013	Statistical Techniques in Data Mining							
	MSC014/ ECS411/ 511/611	Database Management System							
5	MPH361	Physics-V (Lab)	-	-	4	2	50	50	100
6	MOOC13	MOOC Program-III (Mandatory)	-	-	-	1/2	-	100	100
7	MSC311	Discipline & General Proficiency	-	-	-	1	100	-	100
	Total		**16**	**0**	**4**	**20/21**	**310**	**390**	**700**

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Semester IV

S. No.	Course Code	Subject	Periods			Credit	Evaluation Scheme		
			L	T	P		Internal	External	Total
1	**Departmental Elective-II**								
	MPH411	Plasma Physics	4	-	-	4	40	60	100
	MPH412	Electronics Communications							
	MPH413	Astro physics							
2	MPH414	Nuclear & Particle Physics	4	-	-	4	40	60	100
3	MPH415	Electronic Instrumentation	4	-	-	4	40	60	100
4	MAT461	MATLAB Programming	-	2	2	2	50	50	100
5	MPH492	Project, Seminar & Viva	-	-	24	12	50	50	100
6	MSC411	Discipline & General Proficiency	-	-	-	1	100	-	100
	Total		**12**	**2**	**26**	**27**	**320**	**280**	**600**

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Post Revision

Study & Evaluation Scheme

of

Master of Science (Physics)

[Applicable for Academic Session 2019-20]

TEERTHANKER MAHAVEER UNIVERSITY

N.H.-24, Delhi Road, Moradabad, Uttar Pradesh-244001

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Teerthanker Mahaveer University, Moradabad-244001

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Study & Evaluation Scheme

Semester I

S. No.		Course Code	Course	Periods			Credit	Evaluation Scheme		
				L	T	P		Internal	External	Total
1	CC	MPH111	Mathematical Physics-I	4	-	-	4	40	60	100
2	CC	MPH112	Classical Mechanics	4	-	-	4	40	60	100
3	CC	MPH113	Quantum Mechanics –I	4	-	-	4	40	60	100
4	AEC	MAT115	Research Methodology	3	1	-	4	40	60	100
5	CC	MPH161	Physics-I (Lab)	-	-	4	2	50	50	100
6	CC	MPH162	Physics-II (Lab)	-	-	4	2	50	50	100
		Total		**15**	**1**	**8**	**20**	**260**	**340**	**600**

Value Added Course: It is an audit course. The performance of the student in this course will not be counted in the overall result however the student has to pass it compulsorily with 45% marks.

1	VAC-1	TMUPA-101	Elementary Arithmetic & Analytical Reasoning	2	1	-	-	40	60	100

MOOC Course:

1	MOOC	MOOC11	MOOC Program-I (Optional)	-	-	-	2	-	100	100

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Semester-II

S. No.		Course Code	Course	Periods			Credit	Evaluation Scheme		
				L	T	P		Internal	External	Total
1	CC	MPH211	Mathematical Physics-II	4	-	-	4	40	60	100
2	CC	MPH212	Solid State Physics	4	-	-	4	40	60	100
3	CC	MPH213	Atomic & Molecular Physics	4	-	-	4	40	60	100
4	CC	MPH214	Quantum Mechanics –II	4	-	-	4	40	60	100
5	CC	MPH261	Physics Lab-III	-	-	4	2	50	50	100
6	CC	MPH262	Physics Lab-IV	-	-	4	2	50	50	100
		Total		**16**	**0**	**8**	**20**	**260**	**340**	**600**

***Value Added Course:**

1	VAC-2	TMUPA-201	Progressive Algebra & Data Management	2	1	-	-	40	60	100

MOOC Course:

1	MOOC-1	MOOC12	MOOC Program –I (Optional)	-	-	-	2	-	100	100

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M.Sc. (Physics)-Semester III

S. No	Category	Course Code	Course		Periods			Credit	Evaluation Scheme		
					L	T	P		Internal	External	Total
1	CC	MPH311	Electromagnetic Theory		4	1	-	5	40	60	100
2	CC	MPH312	Thermodynamics & Statistical Physics		4	1	-	5	40	60	100
3	CC	MPH317	Physics & Technology of Semiconductor Devices		4	1	-	5	40	60	100
4	AECC	MHM320	Human values & Professional Ethics		3	-	-	3	40	60	100
5	DSE		Discipline Specific Elective Courses	Discipline Specific Elective Course-I	4	-	-	4	40	60	100
6	DSE		Discipline Specific Elective Courses	Discipline Specific Elective Course-II	4	-	-	4	40	60	100
7	LC	MPH361	Physics lab-V		-	-	4	2	50	50	100
8	PROJ	MPH 392	Industrial Training & Presentation		-	-	6	3	50	50	100
9	DGP	MGP311	Discipline & General Proficiency		-	-	-	-	100	-	100
			Total		**23**	**3**	**10**	**31**	**340**	**460**	**800**

MOOC Course:

1	MOOC-2	MOOC13	MOOC Program –II (Optional)	-	-	-	2	-	100	100

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M.Sc. (Physics)-Semester IV

S. No	Category	Course Code	Course	Periods			Credit	Evaluation Scheme		
				L	T	P		Internal	External	Total
1	CC	MPH412	Electronic Communications	4	1	-	5	40	60	100
2	CC	MPH414	Nuclear & Particle Physics	4	1	-	5	40	60	100
3	CC	MPH431	Physics and our World	4	1	-	5	40	60	100
4	DSE		Discipline Specific Elective Courses: Discipline Specific Elective Course-III	4	-	-	4	40	60	100
5	SEC	MAT461	MATLAB Programming	-	1	2	2	50	50	100
6	PROJ	MPH492	Project	-		12	6	50	50	100
7	DGP	MGP411	Discipline & General Proficiency	-	-	-	-	100	-	100
			Total	**16**	**4**	**14**	**27**	**260**	**340**	**600**

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ELECTIVE COURSES OFFERED

S. No	Code	Course	L	T	P	Credit
Semester III-Discipline Specific Elective Course-I -(Any one)						
1	MPH313	Material Sciences	4	-	-	4
2	MPH315	Nano-science &Technology	4	-	-	4
Semester III-Discipline Specific Elective Course-II -(Any one)						
3	MSC012	Elementary Biophysics	4	-	-	4
4	MPH319	Electronic Instrumentation	4	-	-	4
Semester IV-Discipline Specific Elective Course-III -(Any one)						
5	MPH411	Plasma Physics	4	-	-	4
6	MPH413	Astrophysics	4	-	-	4

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New Course Added

Course Code: TMUPA-101	VAC (Value Added Course) M.Sc. Physics (Semester-I) **Elementary Arithmetic & Analytical reasoning**	L-2 T-1 P-0 C-0
Course Outcomes:	**On completion of the course, the students will be :**	
CO1.	Operationalizing the inter-related concept of Percentage in Profit Loss and Discount.	
CO2.	Applying the arithmetical concepts in Ratio and Proportion, Mixture and Allegation.	
CO3.	Employing the techniques of Percentage, Ratios and Average in inter related concepts of Time and Work, Time speed and Distance.	
CO4.	Evaluating the different possibilities of various reasoning based problems in series, Direction and Coding-Decoding.	
Course Content:		
Unit-1:	**Percentages** Basic calculation, ratio equivalent, base, change of base, multiplying factor, percentage change, increment, decrement, successive percentages, word problems	**4 Hours**
Unit-2:	**Profit Loss Discount** Basic definition, formula, concept of mark up, discount, relation with successive change, faulty weights	**3 Hours**
Unit-3:	**Ratio, proportions and variations** Concept of ratios, proportions, variations, properties and their applications	**3 Hours**
Unit-4:	**Mixtures and allegations** Mixtures of 2 components, mixtures of 3 components, Replacements	**4 Hours**
Unit-5:	**Time and Work** Same efficiency, different efficiency, alternate work, application in Pipes and Cisterns	**4 Hours**
Unit-6:	**Time Speed Distance** Average speed, proportionalities in Time, Distance, trains, boats, races, circular tracks	**6 Hours**
Unit-7:	**Number and Alphabet Series** Different kind of series and pattern	**2 Hours**
Unit-8:	**Direction sense** Simple statements, shadow type	**2 Hours**
Unit-9:	**Coding and decoding** Sequential coding, reverse coding, abstract coding	**2 Hours**
Reference Books:	• R1:-Arun Shrama:- How to Prepare for Quantitative Aptitude • R2:-Quantitative Aptitude by R.S. Agrawal • R3:-M Tyra: Quicker Maths • R4:-Nishith K Sinha:- Quantitative Aptitude for CAT • R5:-Reference website:- Lofoya.com, gmatclub.com, cracku.in, handakafunda.com, tathagat.mba, Indiabix.com • R6:-Logical Reasoning by Nishith K Sinha	

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New Course Added

Course Code: TMUPS-101	Value Added Course M.Sc. Physics- Semester-I **Managing Self**	L-2 T-1 P-0 C-0
Course Outcomes:	**On completion of the course, the students will be :**	
CO1.	Utilizing effective verbal and non-verbal communication techniques in formal and informal settings	
CO2.	Understanding and analyzing self and devising a strategy for self growth and development.	
CO3.	Adapting a positive mindset conducive for growth through optimism and constructive thinking.	
CO4.	Utilizing time in the most effective manner and avoiding procrastination.	
CO5.	Making appropriate and responsible decisions through various techniques like SWOT, Simulation and Decision Tree.	
CO6.	Formulating strategies of avoiding time wasters and preparing to-do list to manage priorities and achieve SMART goals.	
Course Content:		
Unit-1:	**Personal Development:** Personal growth and improvement in personality Perception Positive attitude Values and Morals High self motivation and confidence Grooming	**10 Hours**
Unit-2:	**Professional Development:** Goal setting and action planning Effective and assertive communication Decision making Time management Presentation Skills Happiness, risk taking and facing unknown	**8 Hours**
Unit-3:	**Career Development:** Resume Building Occupational Research Group discussion (GD) and Personal Interviews	**12 Hours**
Reference Books:	1. Robbins, Stephen P., Judge, Timothy A., Vohra, Neharika, Organizational Behaviour (2018), 18th ed., Pearson Education 2. Tracy, Brian, Time Management (2018), Manjul Publishing House 3. Hill, Napolean, Think and grow rich (2014), Amazing Reads 4. Scott, S.J., SMART goals made simple (2014), Createspace Independent Pub 5. https://www.hloom.com/resumes/creative-templates/ 6. https://www.mbauniverse.com/group-discussion/topic.php 7. Rathgeber, Holger, Kotter, John, Our Iceberg is melting (2017), Macmillan 8. Burne, Eric, Games People Play (2010), Penguin UK 9. https://www.indeed.com/career-advice/interviewing/job-interview-tips-how-to-make-a-great-impression *** Latest editions of all the suggested books are recommended.**	

New Course Added

Course Code: TMUPA-201	VAC (Value Added Course) M.Sc. Physics (Semester-II) **Progressive Algebra & Data Management**	L-2 T-1 P-0 C-0
Course Outcomes:	**On completion of the course, the students will be :**	
CO1.	Applying the concepts of modern mathematics Divisibility rule, Remainder Theorem, HCF /LCM in Number System.	
CO2.	Relating the rules of permutation and combination, Fundamental Principle of Counting to find the probability.	
CO3.	Applying calculative and arithmetical concepts of ratio, Average and Percentage to analyze and interpret data	
CO4.	Employing the concept of higher level reasoning in Clocks and Calendars, Set theory and Puzzle Problems.	
Course Content:		
Unit-1:	**Number theory** Classification of Numbers, Divisibility Rules, HCF and LCM, Factors, Cyclicity (Unit Digit and Last Two digit), Remainder Theorem,Highest Power of a Number in a Factorial, Number of trailing zeroes	**7 Hours**
Unit-2:	**Data interpretation** Data Interpretation Basics, Bar Chart, Line Chart, Tabular Chart, Pie Chart, DI tables with missing values	**4 Hours**
Unit-3:	**Permutations and combinations** Fundamental counting, and or, arrangements of digits, letters, people in row, identical objects, rank, geometrical arrangements, combination: - basic, handshakes, committee, selection of any number of objects, identical and distinct, grouping and distribution, de-arrangements	**4 Hours**
Unit-4:	**Probability** Introduction, Probability based on Dice and Coins, Conditional Probability, Bayes Theorem	**3 Hours**
Unit-5:	**Set theory** Introduction , Venn Diagrams basics, Venn Diagram – 3 sets, 4-Group Venn Diagrams	**3 Hours**
Unit-6:	**Problem Solving** Introduction, Puzzle based on 3 variable, Puzzle based on 4 variable	**5 Hours**
Unit-7:	**Clocks and calendars** Introduction , Angle between hands , Gain and loss of Clock, Interchange of hands, Introduction of Calendars, Leap Year , Ordinary Year, Company Specific Pattern	**4 Hours**
Reference Books:	• R1:-Arun Shrama:- How to Prepare for Quantitative Aptitude • R2:-Quantitative Aptitude by R.S. Agrawal • R3:-M Tyra: Quicker Maths • R4:-Nishith K Sinha:- Quantitative Aptitude for CAT • R5:-Reference website:- Lofoya.com, gmatclub.com, cracku.in, handakafunda.com, tathagat.mba, Indiabix.com	

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New Course Added

Course Code: TMUPS-201	Value Added Course M.Sc. Physics- Semester-II **Managing Work and Others**	L-2 T-1 P-0 C-0
Course Outcomes:	**On completion of the course, the students will be :**	
CO1.	Communicating effectively in a variety of public and interpersonal settings.	
CO2.	Applying concepts of change management for growth and development by understanding inertia of change and mastering the Laws of Change.	
CO3.	Analyzing scenarios, synthesizing alternatives and thinking critically to negotiate, resolve conflicts and develop cordial interpersonal relationships.	
CO4.	Functioning in a team and enabling other people to act while encouraging growth and creating mutual respect and trust.	
CO5.	Handling difficult situations with grace, style, and professionalism.	
Course Content:		
Unit-1:	**Intrapersonal Skills:** Creativity and Innovation Understanding self and others (Johari window) Stress Management Managing Change for competitive success Handling feedback and criticism	**8 Hours**
Unit-2:	**Interpersonal Skills:** Conflict management Development of cordial interpersonal relations at all levels Negotiation Importance of working in teams in modern organisations Manners, etiquette and net etiquette	**12 Hours**
Unit-3:	**Interview Techniques:** Job Seeking Group discussion (GD) Personal Interview	**10 Hours**
Reference Books:	1. Robbins, Stephen P., Judge, Timothy A., Vohra, Neharika, Organizational Behaviour (2018), 18th ed., Pearson Education 2. Burne, Eric, Games People Play (2010), Penguin UK 3. Carnegie, Dale, How to win friends and influence people (2004), RHUK *** Latest editions of all the suggested books are recommended.**	

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New Course Added

Course Code: MPH392	M.Sc. Physics- Semester-III **Industrial Training & Presentation**	L-0 T-0 P-6 C-3
Course Procedure:		
	Students will have to undergo industrial training of six weeks in any industry or reputed organization after the II semester examination in summer. The evaluation of this training shall be included in the III semester evaluation. The student will be assigned a faculty guide who would be the supervisor of the student. The faculty would be identified before the end of the II semester and shall be the nodal officer for coordination of the training. Students will prepare an exhaustive technical report of the training during the III semester which will be duly signed by the officer under whom training was undertaken in the industry/ organization. The covering format shall be signed by the concerned office in-charge of the training in the industry. The officer-in-charge of the trainee would also give his rating of the student in the standard University format in a sealed envelope to the Director/Principal of the college. The student at the end of the III semester will present his report about the training before a committee constituted by the Director/Principal of the College which would comprise of at least three members comprising of the Department Coordinator, Class Coordinator and a nominee of the Director/Principal. The students guide would be a special invitee to the presentation. The seminar session shall be an open house session. The internal marks would be the average of the marks given by each member of the committee separately in a sealed envelope to the Director/Principal. The marks by the external examiner would be based on the report submitted by the student which shall be evaluated by the external examiner and cross examination done of the student concerned. Not more than three students would form a group for such industrial training/ project submission.	
	The marking shall be as follows.	
Internal: **50 marks**	By the Faculty Guide – 25 marks. By Committee appointed by the Director/Principal – 25 marks.	
External: **50 marks**	By Officer-in-charge trainee in industry – 25 marks. By External examiner appointed by the University – 25 marks	
	Technical report will consist five chapter as per given format:	
Chapter 1:	Brief about organization	
Chapter 2:	Detail of business carried out by organization	
Chapter 3:	Specific contribution during the industrial training (not more than 500 words)	
Chapter 4:	Learning during the industrial training (not more than 200 words)	
Chapter 5:	Conclusion	

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New Course Added

Course Code: MHM320	M.Sc. Physics- Semester-V **Human Values & Professional Ethics**	L-3 T-0 P-0 C-3
Course Outcomes:	**On completion of the course, the students will be :**	
CO1.	**Understanding** the importance of value education in life and method of self-exploration.	
CO2.	**Understanding** 'Natural Acceptance' and Experiential Validation- as the mechanism for self-exploration.	
CO3.	**Applying** right understanding about relationship and physical facilities.	
CO4.	**Analysing** harmony in myself, harmony in the family and society, harmony in the nature and existence.	
CO5.	**Evaluating** human conduct on ethical basis.	
Course Content:		
Unit-1:	Understanding of Morals, Values and Ethics; Introduction to Value Education- need for Value Education. Self- Exploration– content and process; 'Natural Acceptance' and Experiential Validation- as the mechanism for self-exploration. Continuous Happiness and Prosperity- basic Human Aspirations. Gender Issues: Gender Discrimination and Gender Bias (home & office), Gender issues in human values, morality and ethics.	**8 Hours**
Unit-2:	Conflicts of Interest: Conflicts between Business Demands and Professional Ethics. Social and Ethical Responsibilities of Technologists. Ethical Issues at Workplace: Discrimination, Cybercrime, Plagiarism, Sexual Misconduct, Fraudulent Use of Institutional Resources. Intellectual Property Rights and its uses. Whistle blowing and beyond, Case study.	**8 Hours**
Unit-3:	Harmony in the Family and Society- Harmony in Human-Human Relationship, Understanding harmony in the Family- the basic unit of human interaction. Understanding values in human-human relationship; meaning of Nyaya; Trust (Vishwas) and Respect (Samman) as the foundational values of relationship. Understanding the meaning of Vishwas; Difference between intention and competence. Understanding the meaning of Samman and other salient values in relationship.	**8 Hours**
Unit-4:	Understanding Harmony in the Nature and Existence – Whole existence as Co-existence. Interconnectedness and mutual fulfillment among the four orders of nature- recyclability and self-regulation in nature. Understanding Existence as Coexistence (Sah-astitva) of mutually interacting units in all pervasive space. Holistic perception of harmony at all levels of existence.	**8 Hours**
Unit-5:	Implications of the above Holistic Understanding of Harmony on Professional Ethics. Natural acceptance of human values. Definitiveness of Ethical Human Conduct. Competence in professional ethics:	**8 Hours**

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New Course Added

Course Code: MPH412	M.Sc. Physics- Semester-IV **Electronic Communications**	L-4 T-1 P-0 C-5
Course Outcomes:	**On completion of the course, the students will be :**	
CO1.	**Understanding** various analog modulation techniques like AM, FM, PM.	
CO2.	**Understanding** the fundamental concepts of Digital communication.	
CO3.	**Understanding** the classification of the elementary particles and their interactions.	
CO4.	**Applying** the Fourier series and transform for signal transmission.	
CO5.	**Applying** the basics of Optical communication.	
Course Content:		
Unit-1:	**Signal Analysis:** Sinusoidal signals (Frequency and time Domain); Fourier series expansion of periodic sequence of impulses; Sampling function; Normalized power; Power Spectral density (of Digital data, sequence of random pulses); Effect of Transfer function on power spectral density; Fourier transform (example v(t) = coswt); Convolution; Power and Energy Transfer through a network.	**8 Hours**
Unit-2:	**Amplitude Modulation:** Amplitude Modulation; Spectrum of the modulated signal; Square law Modulator; Balanced Modulator; DSBSC; SSB and vestigial sideband modulation; Limitations of Amplitude Modulation.	**8 Hours**
Unit-3:	**Frequency Modulation:** Analysis and frequency Spectrum; Generation and Detection of FM; Comparison of AM and FM. Pre-emphasis and De-emphasis; Reactance Modulator; Capture Effect; Varactor Modulator; Amplitude Limiter; FM Receiver; Foster Seeley Discriminator; Ratio Detector.	**8 Hours**
Unit-4:	**Digital Communication:** Digital Line Waveforms: Symbols, Bits and Bauds; Functional Notation for Pulses; Line Codes and Waveforms; Pulse Modulation: Pulse Amplitude, Pulse Code, Pulse Frequency, Pulse Time, Pulse Position and Pulse Width Modulation; Differential PCM; Delta Modulation. Digital Communication Systems; Digital Carrier System; Frequency Shift Keying; Phase Shift Keying; Differential Phase Shift Keying; Digital Multiplexing.	**8 Hours**
Unit-5:	**Fiber Optic Communication:** Principle of light transmission in a fiber; effect of index profile on propagation; modes of propagation; Number of modes in a fiber; Losses in fibers; Dispersion in fiber; Source and detectors for fiber optic; Connectors and splices; Fiber optic communication systems.	**8 Hours**
Text Books:	1. G. Kennedy and B. Davis, Electronic Communication Systems, Tata McGraw Hill.	
Reference Books:	1. Analog & Digital by R.P. Sing and S.D. Sapre, Communication Systems, Tata McGraw Hill. *** Latest editions of all the suggested books are recommended**	

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New Course Added

Course Code: MPH 431	M.Sc. Physics- Semester-IV **Physics and our World**	L-4 T-1 P-0 C-5
Course Outcomes:	**On completion of the course, the students will be :**	
CO1.	**Understanding** the world we inhabit	
CO2.	**Understanding** the hierarchical structuring of the universe in categories of space, time, matter and energy, from the very small to the gigantic.	
CO3.	**Understanding** the bonding from chemical compound to large molecule and living matter.	
CO4.	**Applying** the physical concept in weather forecast.	
CO5.	**Analyzing** physical realities of quantum world	
Course Content:		
Unit-1:	Space and Time A discussion on length scales and dimensions, Galaxies, The solar system and Planet Earth, Rotation and revolution of the Earth, Seasons, Calendars in history and the recording of time. Laws of nature – a discussion of principles, theories and models, Gravitation, Planetary motion and Kepler's laws, The laws of motion in the eyes of Galileo and Newton.	**8 Hours**
Unit-2:	The relationship between space and time: A basic account of the theory of relativity, Does nature differentiate between Left and Right?- The notion of Parity Is there an —arrow of time? Entropy and the laws of thermodynamics The size of the universe - Is the universe expanding?	**8 Hours**
Unit-3:	Matter and Energy Discrete and continuous matter- a brief historical survey, Atoms and molecules: Structure of atoms, the nucleus, Elementary particles, Unification of forces Equivalence of matter and energy, Nuclear energy and thermonuclear power. The Periodic table of elements, Chemical bonds and molecules, Large molecules and living matter.	**8 Hours**
Unit-4:	Waves and oscillations, Electromagnetic radiation and spectrum, Propagation of waves Energy in the atmosphere- Wind and solar energy, Weather predictability and chaos,	**8 Hours**
Unit-5:	Indeterminacy, The quantum world -- an introduction, Debates on the conceptualization of physical realities – is nature unreasonably mathematical?	**8 Hours**
Text Book:	The Evolution of Physics- Einstein and L. Infeld, Toughstone 1967.	
Reference Books:	1. The Ascent of Man- J. Bronowski, Liffle and Brown Company, 1976. 2.Cosmos- Carl Sagan, McDonald and Company, 2003. 3. In search of Schrodinger's Cat- John Gribbin, Random House, 2012 4. Chaos- James Gleick, Viking Penguin, 1987 5. Doubt And Certainty – Tony Rothman and George Sudarshan (Helix books, Cambridge, 1998) *** Latest editions of all the suggested books are recommended**	
Additional electronic reference materials	1. https://www.youtube.com/watch?v=0nHovWsWZTw&list=PLRuWd0sgheSZLMfA9yl_-cYEW_QyRIssD 2. https://www.youtube.com/watch?v=PEXSH8dB-Uk 3. https://www.youtube.com/watch?v=R-x9KdNjQmo&list=PL1955A15B7F282A7F	

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