PEOPLE'S UNIVERSITY, BHOPAL

(Applicable for Admitted from Academic Session 2019-20 onwards)

Programme: Master of Technology **Specialization:** Digital Communication **Semester –I**

Subject Code	Subject Title	Credit			Theory			Practical		
		L	T	P	External (70)	Internal (30)	Total (100)	External (Nil)	Internal (Nil)	Total
MT1101	Research Methodology & IPR	3	1	-			Min: 40 (D Grade)			Nil

Duration of Theory (Externals): 3 Hours

Theory Internal- Max Marks: 30	Best of Two Mid Semester Test – Max Marks: 15	Assignment/Quiz/Attendance – Max. Marks: 15
Practical Internal Max Marks: Nil	Lab work & Sessional – Max Marks: Nil	Assignment/ Quiz/Attendance – Max. Marks: Nil

Pre-Requisite	Nil
Course Outcome	1. Students will be able to understand research problem formulation.
	2. Able to analyze research related information and follow research ethics.
	3. Understand the importance of IPR and its protection for further research work.

Unit	Contents (Theory)	Marks Weightage
I	**Research Methodology**: Meaning; Objective & its types; Research Approaches ; Significance of Research; Research Methods vs. Methodology; Research Process; Criteria of Good Research; Meaning of research problem; Sources of research problem; Errors in selecting a research problem; Scope and objectives of research problem; Effective literature studies approaches; Plagiarism; Research Ethics; Problems Encountered by Researchers in India	**14**
II	**Concept and Importance in Research:** Features of a good research design, Exploratory Research Design: concept types and uses, Descriptive Research Designs: concept, types and uses. Experimental Design: Concept of Independent & Dependent variables. Interpretation : Meaning & Technique; Precaution in Interpretation ; Significance of Report Writing; Layout of the Research Report ; Types of Reports; Precautions for Writing Research Reports ; Effective technical writing; Role of Computer software in report writing.	**14**
III	**Data Collection:** Collection of Primary Data ; Observation Method ; Interview Method ; Collection of Data through Questionnaires; Collection of Data through Schedules; Difference between Questionnaires and Schedules; Collection of Secondary Data.	**14**
IV	**Hypothesis**: Null Hypothesis & Alternative Hypothesis. Basic Concepts Concerning Testing of Hypotheses; Procedure for Hypothesis Testing; Flow Diagram for Hypothesis Testing. Qualities of a good Hypothesis.	**14**
V	**Nature of Intellectual Property:** Patents; Designs; Trade and Copyright. Process of Patenting and Development; technological research; innovation; patenting; development. International Scenario: International cooperation on Intellectual Property. Procedure for grants of patents; Patenting under PCT. **Patent Rights:** Scope. Licensing and transfer of technology. Patent Information and databases. Geographical Indications. New Developments in IPR: Administration of Patent System. IPR of Biological Systems.	**14**

Text Book/References Books/ Websites:-

1. C . R. Kothari; Research Methodology; New Age Publication.
2. Wayne Goddard and Stuart Melville; Research Methodology: An Introduction.
3. Ranjit Kumar; 2 nd Edition ; Research Methodology: A Step by Step Guide for beginners.
4. Robert P. Merges; Peter S. Menell; Mark A. Lemley; Intellectual Property in New Technological Age.
5. T. Ramappa; Intellectual Property Rights Under WTO ; S. Chand; 2008.

Suggested List of Laboratory Experiments :- (Expandable): Nil

PEOPLE'S UNIVERSITY, BHOPAL

(Applicable for Admitted from Academic Session 2019-20 onwards)

Programme: Master of Technology **Specialization:** Digital Communication **Semester –I**

Subject Code	Subject Title	Credit			Theory			Practical		
		L	T	P	External (70)	Internal (30)	Total (100)	External (Nil)	Internal (Nil)	Total
MTDC1102	DSP & Its Applications	3	1	-			Min: 40 (D Grade)			Nil

Duration of Theory (Externals): 3 Hours

Theory Internal- Max Marks: 30	Best of Two Mid Semester Test – Max Marks: 15	Assignment/Quiz/Attendance – Max. Marks: 15
Practical Internal Max Marks: Nil	Lab work & Sessional – Max Marks: Nil	Assignment/ Quiz/Attendance – Max. Marks: Nil

Pre-Requisite	To be able to know about Z-transform & discrete signals.
Course Outcome	1. Review of Discrete time signal
	2. Review of Z-Transform
	3. Properties of DFT

Unit	Contents (Theory)	Marks Weightage
I	**Review of Discrete Time Signals:** sequences, representation. Discrete time systems: linear, time in variant, LTI systems, properties, and constant coefficients difference equations. Frequency Domain representation of discrete time signals and systems.	**14**
II	**Review of Z -Transform** – Properties, ROC, Stability, Causality, Criterion. Inverse Z Transform, Recursive and Non Recursive systems, Realization of discrete time system.	**14**
III	**DFT:** Properties, Linear and Circular convolution, Discrete Cosine Transform, Relationship between DFT and DCT. Computation of DFT: FFT/Decimation in Time and Decimation in Frequency.	**14**
IV	**FIR and IIR Systems:** Basic structure of FIR and IIR, Bilinear Transformation, Design of Discrete time IIR filter-Butterworth, Chebychev, Inverse Chebychev, Elliptic etc. Design of FIR filters by windowing – Rectangular, Bartlett, Hann, Hamming, Kaiser, Window filter, Design method relationship of Kaiser to other window. Application of MATLAB for Design of Digital filter. Effect of Finite register length in filter Design.	**14**
V	**Discrete Time Random Signals:** Discrete time random process, Spectrum Representation of finite energy signals, response of linear systems to random signals. Power spectrum estimation: Basic principles of spectrum estimation, estimate of auto con variance, power spectrum cross con variance and cross spectrum. Advance signal processing technique and transforms: multi rate signal processing- down sampling/up sampling, introduction to discrete Hilberts Transform, Wavelet Transform, Haar Transform etc.	**14**

Text Book/References Books/ Websites:-

1. Opperenheim & Schaffer; Discrete time signal Processing; PHI 2nd Edition.
2. S. Mittra, "Digital Signal Processing using MATLAB", 2nd Edition.
3. Proakis, "Int. to Digital Signal Processing", Maxwell McMillan.

Suggested List of Laboratory Experiments :- (Expandable): Nil

PEOPLE'S UNIVERSITY, BHOPAL

(Applicable for Admitted from Academic Session 2019-20 onwards)

Programme: Master of Technology **Specialization:** Digital Communication **Semester –I**

Subject Code	Subject Title	Credit			Theory			Practical		
		L	T	P	External	Internal	Total (100)	External	Internal	Total
MTDC1103	Advanced Digital Communication	3	1	-	(70)	(30)	Min: 40 (D Grade)	(Nil)	(Nil)	Nil

Duration of Theory (Externals): 3 Hours

Theory Internal- Max Marks: 30	Best of Two Mid Semester Test – Max Marks: 15	Assignment/Quiz/Attendance – Max. Marks: 15
Practical Internal Max Marks: Nil	Lab work & Sessional – Max Marks: Nil	Assignment/ Quiz/Attendance – Max. Marks: Nil

Pre-Requisite	Basic Knowledge of Digital communication system.
Course Outcome	1. Review of probability and Stochastic Processes.
	2. To know about Characterization of Communication Signal and System.
	3. Optimum receiver for Additive White Gaussian Noise.

Unit	Contents (Theory)	Marks Weightage
I	**Digital Modulation Techniques:** Digital modulation formats, Coherent binary modulation techniques, Coherent Quadrature – modulation techniques, Non-coherent binary modulation techniques, Comparison of binary and quaternary modulation techniques, M-ray modulation techniques, Power spectra, Bandwidth efficiency, M-array modulation formats viewed in the light of the channel capacity theorem, Effect of inter symbol interference, Bit verses symbol error probabilities, Synchronization, Applications.	**14**
II	**Coding Techniques:** Convolutional encoding, Convolutional encoder representation, Formulation of the convolutional decoding problem, Properties of convolutional codes: Distance property of convolutional codes, Systematic and nonsystematic convolutional codes, Performance Bounds for Convolutional codes, Coding gain, Other convolutional decoding algorithms, Sequential decoding, Feedback decoding, Turbo codes.	**14**
III	**Linear and Adaptive Equalization:** Linear equalization, Decision -feedback equalization, Reduced complexity ML detectors, Iterative equalization and decoding - Turbo equalization. Adaptive linear equalizer, adaptive decision feedback equalizer, Recursive least square algorithms for adaptive equalization.	**14**
IV	**Spread Spectrum Signals for Digital Communication:** Model of spread spectrum digital communication system, Direct sequence spread spectrum signals, Frequency hopped spread spectrum signals, CDMA, Time hopping SS, Synchronization of SS systems.	**14**
V	**Digital Communication through Fading Multipath Channels:** Characterization of fading multipath channels, The effect of signal characteristics on the choice of a channel model, Frequency non selective, Slowly fading channel, Diversity techniques for fading multipath channels, Digital signals over a frequency selective, Slowly fading channel.	**14**

Text Book/References Books/ Websites:-

1. Proakis J.J.,D Wozencraft J.M. and Jacobs I.M.; Principles of Communication Engineering ;John Wiley.
2. Carison A.; Communication System, 3rd; McGraw Hill.
3. Simon Haykin; Digital Communication; Reprint, Wiley.
4. Van Trees H.L.; Detection Estimation and Modulation Theory, Vol. 1; Wiley.

Suggested List of Laboratory Experiments :- (Expandable): Nil

PEOPLE'S UNIVERSITY, BHOPAL

(Applicable for Admitted from Academic Session 2019-20 onwards)

Programme: Master of Technology **Specialization:** Digital Communication **Semester –I**

Subject Code	Subject Title	Credit			Theory			Practical		
		L	T	P	External (70)	Internal (30)	Total (100)	External (Nil)	Internal (Nil)	Total
MTDC1104	Modern Telephone Switching System	3	1	-			Min: 40 (D Grade)			Nil

Duration of Theory (Externals): 3 Hours

Theory Internal- Max Marks: 30	Best of Two Mid Semester Test – Max Marks: 15	Assignment/Quiz/Attendance – Max. Marks: 15
Practical Internal Max Marks: Nil	Lab work & Sessional – Max Marks: Nil	Assignment/ Quiz/Attendance – Max. Marks: Nil

Pre-Requisite	Basic Knowledge of communication system.
Course Outcome	1. To understand stored program control and different types of switching.
	2. To know about time division space, multiplexed switching & digital PBX Switching.
	3. To understand traffic load, grade of service and different modeling system.

Unit	Contents (Theory)	Marks Weightage
I	**Electronic Space Division Switching:** Stored program control (SPC), switching matrices, multistage switching, enhance services photonic switching.	**14**
II	**Time Division Switching :-** Time division space, and time switching, multiplexed switching, combination switching, T -S, T -S- T, switching n-stage	**14**
III	**Traffic Engg. :-** Traffic load, Grade of service, ErJang's formulas, blocking modeling switching systems, Blocking model.	**14**
IV	**Subscriber Loop, Dialing Systems :-** Switching hierarchy & routing, Transmission plan, numbering plan, charging plan, signaling technique.	**14**
V	**Local Access Techniques :-** Digital subscriber lines, DSL, ADSL etc, WLL, FIL."wireless for local telephone services.	**14**

Text Book/References Books/ Websites:-

1. Thaigrajan; Telecomm. Switching systems & networks;PHI.
2. Taub & Schilling; Communication System; Mc Graw Hill.
3. James Martin; Telecomm. & the Computers; PHI.
4. Annabelz Dodd; The Issential Guide to Telecomm, Pearson Educah.

Suggested List of Laboratory Experiments :- (Expandable): Nil

PEOPLE'S UNIVERSITY, BHOPAL

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Programme: Master of Technology **Specialization:** Digital Communication **Semester –I**

Subject Code	Subject Title	Credit			Theory			Practical		
		L	T	P	External	Internal	Total (100)	External	Internal	Total
MTDC1105	Microcontroller System	3	1	-	(70)	(30)	Min: 40 (D Grade)	(Nil)	(Nil)	Nil

Duration of Theory (Externals): 3 Hours

Theory Internal- Max Marks: 30	Best of Two Mid Semester Test – Max Marks: 15	Assignment/Quiz/Attendance – Max. Marks: 15
Practical Internal Max Marks: Nil	Lab work & Sessional – Max Marks: Nil	Assignment/ Quiz/Attendance – Max. Marks: Nil

Pre-Requisite	Basic Knowledge of 8085/8086 Microprocessor
Course Outcome	1. To understand the review of 8-bit & 16-bit microprocessor.
	2. To understand the concept of single chip microcontrollers.
	3. To be able to understand the software development modular approach.

Unit	Contents (Theory)	Marks Weightage
I	**Introduction:** Review of 8-Bit and 16-bit microprocessor, support chips and interfacing techniques, single chip micro-computers, architecture, program and data memory, ports, input Output interfacing and programming,	**14**
II	**Single Chip Microcontrollers:** INTEL 8051/ 8751, MOTOROLA 68HC0/68HC11 architecture, instruction set and programming, Memory mapping, addressing modes, Registers, expanded modes. Interrupt handling timing and serial I / O.	**14**
III	**8051 Serial Communication:** Connection to RS-232,Serial Communication Programming- Interrupts Programming, Microcontroller Interfacing, Key Board Displays, Pulse Measurement, D / A and A/D conversion	**14**
IV	**Software Development**: Software development Modular approach, integrated software development environment, Object oriented interfacing and programming, Recursion and debugging.	**14**
V	**Controllers:** ATMEL 89C51 / 52 and PIC micro-Controllers- Case studies. Design and application of Micro-Controller in Data acquisition, Embedded controllers, Process control etc. DSP Processor architecture.	**14**

Text Book/References Books/ Websites:-

1. Ayala J.K.; The 8051 Microcontroller: Architecture, programming and applications; Penram International (2005) 3rd ed.
2. Mazidi,E. and Mazidi,F.; The 8051 Microcontroller and Embedded Systems; Prentice-Hall of India (2004) 2nd ed.
3. Peatman J.; Embedded system Design using PIC18Fxxx; Prentice Hall, 2003.

Suggested List of Laboratory Experiments :- (Expandable): Nil

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Programme: Master of Technology **Specialization:** Digital Communication **Semester –I**

Subject Code	Subject Title	Credit			Theory			Practical		
		L	T	P	External	Internal	Total	External	Internal	Total (100)
MTDC1106	Digital Signal Processing Lab	-	-	2	(Nil)	(Nil)	Nil	(70)	(30)	Min: 40 (D Grade)

Duration of Theory (Externals): 3 Hours

Theory Internal- Max Marks: Nil	Best of Two Mid Semester Test – Max Marks: Nil	Assignment/Quiz/Attendance – Max. Marks: Nil
Practical Internal Max Marks: 30	Lab work & Sessional – Max Marks: 15	Assignment/Quiz/Attendance – Max. Marks: 15

Pre-Requisite	Nil
Course Outcome	1. To implement signal processing concepts using DSP Processors.
	2. To conduct the experiments on different digital filters
	3. To compare DCT and DFT for signal analysis

Unit	Contents (Theory)	Marks Weightage
-	With help of MATLAB programming solve the problem related to DSP & its Applications. Representation of basic signals & waveforms, Designing of analog low pass & high pass filter, Designing of digital Butterworth (low pass, high pass. Band pass & band stop) filter, Convolution, z-transform & inverse z-transform.	**100**

Text Book/References Books/ Websites:- Nil

Suggested List of Laboratory Experiments :- (Expandable):

1. To represent Sine & cosine wave.
2. To represent unit step, unit impulse, Exponential & ramp signal.
3. To design analog low pass & high pass filter.
4. To design digital Butterworth (low pass, high pass. Band pass & band stop) filter.
5. To find convolution of two functions.
6. To find the z-transform & its inverse.
7. To draw pole zero diagram for a function in z-domain & display the frequency response of given z- transform.

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Programme: Master of Technology **Specialization:** Digital Communication **Semester –I**

Subject Code	Subject Title	Credit			Theory			Practical		
		L	T	P			Total			Total (100)
MTDC1107	Microcontroller lab	-	-	2	External (Nil)	Internal (Nil)	Nil	External (70)	Internal (30)	Min: 40 (D Grade)

Duration of Theory (Externals): Nil

Theory Internal- Max Marks: Nil	Best of Two Mid Semester Test –Max Marks: Nil	Assignment/Quiz/Attendance – Max. Marks: Nil
Practical Internal Max Marks: 30	Lab work & Sessional – Max Marks: 15	Assignment / Quiz/ Attendance – Max. Marks: 15

Pre-Requisite	Nil
Course Outcome	1. To introduce the basics of microcontroller and its applications.
	2. To provide in depth knowledge of 8051 and 8751 assembly language programming.
	3. Design circuits for various applications using microcontrollers.

Unit	Contents (Theory)	Marks Weightage
-	Write an assembly language program to perform the addition, subtraction & multiplication of two 16-bit numbers, Addition & Subtraction of 8-bit numbers using 8051.	**100**

Text Book/References Books/ Websites:- Nil

Suggested List of Laboratory Experiments :- (Expandable):

1. Write an assembly language program to perform the addition of two 16-bit numbers.
2. Write an assembly language program to perform the subtraction of two 16-bit numbers.
3. Write an assembly language program to perform the multiplication of two 16-bit numbers.
4. Write an assembly language program to find the square of a given number N.
5. Write an assembly language program to count number of ones and zeros in a eight bit number.
6. Addition of 8-bit numbers using 8051.
7. Subtraction of 8-bit numbers using 8051.

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Programme: Master of Technology **Specialization:** Digital Communication **Semester –I**

Subject Code	Subject Title	Credit			Theory			Practical		
		L	T	P	External	Internal	Total (50)	External	Internal	Total
MT 1108	Audit Course -I (Value Education)	2	-	-	(35)	(15)	Min: 20 (D Grade)	(Nil)	(Nil)	Nil

Duration of Theory (Externals): 2 Hours

Theory Internal- Max Marks: 15	Best of Two Mid Semester Test – Max Marks: Nil	Assignment/Quiz/Attendance– Max. Marks: 15
Practical Internal Max Marks: Nil	Lab work & Sessional – Max Marks: Nil	Assignment / Quiz /Attendance – Max. Marks: Nil

Pre-Requisite	Nil
Course Outcome	1. Knowledge of self-development.
	2. Learn the importance of Human values.
	3. Developing the overall personality.

Unit	Contents (Theory)	Marks Weightage
I	Values and self-development –Social values and individual attitudes; Work ethics, Indian vision of humanism; Moral and non- moral valuation; Standards and principles; Value judgments.	**07**
II	Importance of cultivation of values; Sense of duty. Devotion, Self-reliance. Confidence, Concentration; Truthfulness, Cleanliness; Honesty, Humanity; Power of faith, National Unity; Patriotism. Love for nature, Discipline	**07**
III	Personality and Behavior Development - Soul and Scientific; attitude; Positive Thinking. Integrity and discipline; Punctuality, Love and Kindness; Avoid fault Thinking; Free from anger, Dignity of labour.	**07**
IV	Universal brotherhood and religious tolerance; True friendship; Happiness Vs suffering, love for truth; Aware of self-destructive habits; Association and Cooperation; Doing best for saving nature.	**07**
V	Character and Competence –Holy books vs Blind faith; Self-management and Good health.; Science of reincarnation; Equality, Nonviolence, Humility, Role of Women; All religions and same message; Mind your Mind, Self-control; Honesty, Studying effectively.	**07**

 # Mandatory (Non Credit) subject according to AICTE. Non University Examination, End Sem marks not to be included in total marks and credit. Students must pass in this subject.

Text Book/References Books/ Websites:-

1. S.K. Chakroborty; Values and Ethics organizations Theory and practice; Oxford University Press, New Delhi.

Suggested List of Laboratory Experiments :- (Expandable): Nil