

Academic Council: 26/07/2019

Item No: 4.76

UNIVERSITY OF MUMBAI



Syllabus for M.Sc. Part I
(Semester I and II)

Programme: M.Sc.

Subject: Information Technology

(Choice Based Credit System with effect from
the academic year 2019 – 2020)

Semester – I		
Course Code	Course Title	Credits
PSIT101	Research in Computing	4
PSIT102	Data Science	4
PSIT103	Cloud Computing	4
PSIT104	Soft Computing Techniques	4
PSIT1P1	Research in Computing Practical	2
PSIT1P2	Data Science Practical	2
PSIT1P3	Cloud Computing Practical	2
PSIT1P4	Soft Computing Techniques Practical	2
Total Credits		24

Semester – II		
Course Code	Course Title	Credits
PSIT201	Big Data Analytics	4
PSIT202	Modern Networking	4
PSIT203	Microservices Architecture	4
PSIT204	Image Processing	4
PSIT2P1	Big Data Analytics Practical	2
PSIT2P2	Modern Networking Practical	2
PSIT2P3	Microservices Architecture Practical	2
PSIT2P4	Image Processing Practical	2
Total Credits		24

Program Specific Outcomes

PSO1: Ability to apply the knowledge of Information Technology with recent trends aligned with research and industry.

PSO2: Ability to apply IT in the field of Computational Research, Soft Computing, Big Data Analytics, Data Science, Image Processing, Artificial Intelligence, Networking and Cloud Computing.

PSO3: Ability to provide socially acceptable technical solutions in the domains of Information Security, Machine Learning, Internet of Things and Embedded System, Infrastructure Services as specializations.

PSO4: Ability to apply the knowledge of Intellectual Property Rights, Cyber Laws and Cyber Forensics and various standards in interest of National Security and Integrity along with IT Industry.

PSO5: Ability to write effective project reports, research publications and content development and to work in multidisciplinary environment in the context of changing technologies.

SEMESTER II

M. Sc (Information Technology)		Semester – II	
Course Name: Image Processing		Course Code: PSIT204	
Periods per week 1 Period is 60 minutes	Lectures	4	
	Credits	4	
		Hours	Marks
Evaluation System	Theory Examination	2½	60
	Theory Internal	--	40

Objectives	<ul style="list-style-type: none"> • Review the fundamental concepts of a digital image processing system. • Analyze images in the frequency domain using various transforms. • Evaluate the techniques for image enhancement and image restoration. • Categorize various compression techniques. • Interpret Image compression standards. • Interpret image segmentation and representation techniques.
-------------------	--

Unit	Details	Lectures
I	<p>Introduction: Digital Image Processing, Origins of Digital Image Processing, Applications and Examples of Digital Image Processing, Fundamental Steps in Digital Image Processing, Components of an Image Processing System,</p> <p>Digital Image Fundamentals: Elements of Visual Perception, Light and the Electromagnetic Spectrum, Image Sensing and Acquisition, Image Sampling and Quantization, Basic Relationships Between Pixels, Basic Mathematical Tools Used in Digital Image Processing, Intensity Transformations and Spatial Filtering: Basics, Basic Intensity Transformation Functions, Basic Intensity Transformation Functions, Histogram Processing, Fundamentals of Spatial Filtering, Smoothing (Lowpass) Spatial Filters, Sharpening (Highpass) Spatial Filters, Highpass, Bandreject, and Bandpass Filters from Lowpass Filters, Combining Spatial Enhancement Methods, Using Fuzzy Techniques for Intensity Transformations and Spatial Filtering</p>	12
II	<p>Filtering in the Frequency Domain: Background, Preliminary Concepts, Sampling and the Fourier Transform of Sampled Functions, The Discrete Fourier Transform of One Variable, Extensions to Functions of Two Variables, Properties of the 2-D DFT and IDFT, Basics of Filtering in the Frequency Domain, Image Smoothing Using Lowpass Frequency Domain Filters, Image Sharpening Using Highpass Filters, Selective Filtering, Fast Fourier Transform</p> <p>Image Restoration and Reconstruction: A Model of the Image Degradation/Restoration Process, Noise Models, Restoration in the Presence of Noise Only-----Spatial Filtering, Periodic Noise Reduction Using Frequency Domain Filtering, Linear, Position-Invariant Degradations, Estimating the Degradation Function, Inverse Filtering, Minimum Mean Square Error (Wiener) Filtering, Constrained Least Squares Filtering, Geometric Mean Filter, Image Reconstruction from Projections</p>	12
III	<p>Wavelet and Other Image Transforms: Preliminaries, Matrix-based Transforms, Correlation, Basis Functions in the Time-Frequency Plane, Basis</p>	12

	<p>Images, Fourier-Related Transforms, Walsh-Hadamard Transforms, Slant Transform, Haar Transform, Wavelet Transforms</p> <p>Color Image Processing: Color Fundamentals, Color Models, Pseudocolor Image Processing, Full-Color Image Processing, Color Transformations, Color Image Smoothing and Sharpening, Using Color in Image Segmentation, Noise in Color Images, Color Image Compression.</p> <p>Image Compression and Watermarking: Fundamentals, Huffman Coding, Golomb Coding, Arithmetic Coding, LZW Coding, Run-length Coding, Symbol-based Coding, 8 Bit-plane Coding, Block Transform Coding, Predictive Coding, Wavelet Coding, Digital Image Watermarking,</p>	
IV	<p>Morphological Image Processing: Preliminaries, Erosion and Dilation, Opening and Closing, The Hit-or-Miss Transform, Morphological Algorithms, Morphological Reconstruction, Morphological Operations on Binary Images, Grayscale Morphology</p> <p>Image Segmentation I: Edge Detection, Thresholding, and Region Detection: Fundamentals, Thresholding, Segmentation by Region Growing and by Region Splitting and Merging, Region Segmentation Using Clustering and Superpixels, Region Segmentation Using Graph Cuts, Segmentation Using Morphological Watersheds, Use of Motion in Segmentation</p>	12
V	<p>Image Segmentation II: Active Contours: Snakes and Level Sets: Background, Image Segmentation Using Snakes, Segmentation Using Level Sets.</p> <p>Feature Extraction: Background, Boundary Preprocessing, Boundary Feature Descriptors, Region Feature Descriptors, Principal Components as Feature Descriptors, Whole-Image Features, Scale-Invariant Feature Transform (SIFT)</p>	12

Books and References:					
Sr. No.	Title	Author/s	Publisher	Edition	Year
1.	Digital Image Processing	Gonzalez and Woods	Pearson/Prentice Hall	Fourth	2018
2.	Fundamentals of Digital Image Processing	A K. Jain	PHI		
3.	The Image Processing Handbook	J. C. Russ	CRC	Fifth	2010

Evaluation Scheme

Internal Evaluation (40 Marks)

The internal assessment marks shall be awarded as follows:

1. 30 marks (Any one of the following):
 - a. Written Test or
 - b. SWAYAM (Advanced Course) of minimum 20 hours and certification exam completed or
 - c. NPTEL (Advanced Course) of minimum 20 hours and certification exam completed or
 - d. Valid International Certifications (Prometric, Pearson, Certiport, Coursera, Udemu and the like)
 - e. One certification marks shall be awarded one course only. For four courses, the students will have to complete four certifications.

2. 10 marks

The marks given out of 40 for publishing the research paper should be divided into four course and should awarded out of 10 in each of the four course.

i. Suggested format of Question paper of 30 marks for the written test.

Q1.	Attempt <i>any two</i> of the following:	16
a.		
b.		
c.		
d.		
Q2.	Attempt <i>any two</i> of the following:	14
a.		
b.		
c.		
d.		

- ii. 10 marks from every course coming to a total of 40 marks, shall be awarded on publishing of research paper in UGC approved Journal with plagiarism less than 10%. The marks can be awarded as per the impact factor of the journal, quality of the paper, importance of the contents published, social value.

External Examination: (60 marks)

All questions are compulsory		
Q1	(Based on Unit 1) Attempt <u>any two</u> of the following:	12
a.		
b.		
c.		
d.		
Q2	(Based on Unit 2) Attempt <u>any two</u> of the following:	12
Q3	(Based on Unit 3) Attempt <u>any two</u> of the following:	12
Q4	(Based on Unit 4) Attempt <u>any two</u> of the following:	12
Q5	(Based on Unit 5) Attempt <u>any two</u> of the following:	12

Practical Evaluation (50 marks)

A Certified copy journal is essential to appear for the practical examination.

1.	Practical Question 1	20
2.	Practical Question 2	20
3.	Journal	5
4.	Viva Voce	5

OR

1.	Practical Question	40
2.	Journal	5
3.	Viva Voce	5