UNIVERSITY OF MUMBAI

Syllabus for M.sc. Part I
Program: M.Sc.
Subject: Information Technology

(Credit Based Semester and Grading System with effect from Academic Year 2019-2020)

Preamble

This is the first year (part I) curriculum in the subject of Information Technology. The revised structure is designed to transform students into technically competent, socially responsible and ethical Computer Science professionals. In these Semesters we have made the advancements in the subject based on the previous Semesters Knowledge.

In the first year is important to develop the intelligence regarding to various industry trends. Second year of this course making basics strong related to specialized industry and automation trends in wide diversification in technology.

The proposed curriculum contains two semesters; each Semester contains Ability to apply the knowledge of Information Technology with recent trends aligned with research and industry. Making students capable to apply IT in the field of Computational Research, Soft Computing, Big Data Analytics, Data Science, Image Processing, Artificial Intelligence, Networking and Cloud Computing. Making students aware about socially acceptable technical solutions in the domains of Information Security, Machine Learning, Internet of Things and Embedded System, Infrastructure Services as specializations.

Proposed Curriculum contains challenging and varied subjects aligned with the current trend with the application of knowledge of Intellectual Property Rights, Cyber Laws and Cyber Forensics and various standards in interest of National Security and Integrity along with IT Industry, write effective project reports, research publications and content development and to work in multidisciplinary environment in the context of changing technologies.

In essence, the objective of this syllabus is to create a pool of technologically savvy, theoretically strong, innovatively skilled and ethically responsible generation of computer science professionals. Hope that the teacher and student community of University of Mumbai will accept and appreciate the efforts.

M.Sc. PART I

(Semester I and II)

Information Technology Syllabus
Credit Based Semester and Grading System
To be implemented from the Academic year 2019-2020

SEMESTER I				
Course	TOPICS	Credits	L / Week	
PSIT101	Research in Computing	4	4	
PSIT102	Data Science	4	4	
PSIT103	Cloud Computing	4	4	
PSIT104	Soft Computing Techniques	4	4	
	Practical			
PSIT1P1	Research in Computing Practical	2	4	
PSIT1P2	Data Science Practical	2	4	
PSIT1P3	Cloud Computing Practical	2	4	
PSIT1P4	Soft Computing Techniques Practical	2	4	

SEMESTER II				
Course	TOPICS	Credits	L / Week	
PSIT201	Big Data Analytics	4	4	
PSIT202	Modern Networking	4	4	
PSIT203	Microservices Architecture	4	4	
PSIT204	Image Processing	4	4	
	Practical			
PSIT2P1	Big Data Analytics Practical	2	4	
PSIT2P2	Modern Networking Practical	2	4	
PSIT2P3	Microservices Architecture Practical	2	4	
PSIT2P4	Image Processing Practical	2	4	

Suggested List of Practical- SEMESTER II

Course: PSIT2P4	(Credits : 02 Lectures/Week: 04)	
	PSIT2P4: Image Processing Practical	
	Practical shall be implemented in MATLAB / Scilab / Python	
No.	**Name of the Practical**	
1	A. Program to calculate number of samples required for an image.	
	B. Program to study the effects of reducing the spatial resolution of a digital image.	
	C. Program to study the effects of varying the number of intensity levels in a digital image	
	D. Program to perform image averaging (image addition) for noise reduction.	
	E. Program to compare images using subtraction for enhancing the difference between images.	
	F. Image Registration	
2	Intensity transformation and Spatial Filtering	
	IMAGE ENHANCEMENT	

	A. Basic Intensity Transformation functions:
	i. Program to perform Image negation
	ii. Program to perform threshold on an image.
	iii. Program to perform Log transformation
	iv. Power-law transformations
	v. Piecewise linear transformations
	    a. Contrast Stretching
	    b. Gray-level slicing with and without background.
	    c. Bit-plane slicing	

	B. 1. Program to plot the histogram of an image and categorise 2. Program to apply histogram equalization	
	C. Write a program to perform convolution and correlation	
	D. Write a program to apply smoothing and sharpening filters on grayscale and color images (Use all kernels mentioned in the reference book) a, Low Pass b. High Pass	
3	Filtering in Frequency Domain:	

		A. Program to apply Discrete Fourier Transform on an image	
		B. Program to apply Low pass and High pass filters in frequency domain	
		C. Program to apply Laplacian filter in frequency domain	
		D. Note: All other filters can be applied, studied and compared with filters in spatial domain.	
		E. Program for high frequency emphasis filtering, high boost and homomorphic filtering.	
	4	Image Denoising:	
		A. Program to denoise using spatial mean, median and adaptive mean filtering	
		B. Program for Image deblurring using inverse, Weiner filters	
	5	Color Image Processing:	
		A. Program to read a color image and segment into RGB planes , histogram of color image	
		B. Program for converting from one color model to another model	
		C. Program to apply false colouring(pseudo) on a gray scale image	
	6	Fourier Related Transforms: Program to compute Discrete Cosine Transforms, Walsh -Hadamard Transforms, Haar Transform , Wavelet	
	7	Image compression: Program to apply compression and decompression algorithm on an image (Arithmetic, Huffman and LZW coding techniques.)	
	8	Morphological Image Processing:	
		A. Program to apply erosion, dilation, opening, closing	
		B. Program for detecting boundary of an image	
		C. Program to apply Hit-or-Miss transform	
		D. Program to apply morphological gradient on an image	
		E. Program to apply Top-Hat/Bottom-hat Transformations	
	9	Image Segmentation:	
		A. Program for Edge detection using Sobel, Prewitt, Marr-Hildreth and Canny	
		B. Illustrate Watershed segmentation algorithm	
		C. Any more to be included(to be consulted)	
	10	Feature Extraction:	
		A. Apply Principal components for image description	
		B. Apply Harris-Stephens corner detector algorithm	

Scheme of Examination

1. **Theory:**

   I. **Internal 30 Marks :** (Any one of the following):

   a. Written Test

   <div align="center">**OR**</div>

   b. SWAYAM (Advanced Course) of minimum 20 hours and certification exam completed

   <div align="center">**OR**</div>

   c. NPTEL (Advanced Course) of minimum 20 hours and certification exam completed

   <div align="center">**OR**</div>

   d. Valid International Certifications (Prometric, Pearson, Certiport, Coursera, Udemy and the like)

   e. One certification marks shall be awarded one course only. For four courses, the students will have to complete four certifications.

   II. **10 marks:**

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

   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.

2. **External Examination: 60 marks**

   As per university guideline.

3. **Practical and Project Examination:**

   The Marking Scheme for each of the Elective is given below:

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

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

   <div align="center">**OR**</div>

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

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