HSNC University, Mumbai

Ordinances and Regulations

With Respect to

Choice Based Credit System
(CBCS)
For the Programs under

The Faculty of Science and Technology

With effect from the Academic year 2021-2022

Department of M.Sc. IT
Board of Studies

Composition:

(i) The Board of Studies shall consist of the following members, namely: —

    (a) One head of the Department from amongst the Schools, Centers and Constituent Colleges, of the University in the relevant subject of the University nominated by the Vice Chancellor in consultation with the Dean concerned; -

. No.	Name	Designation	Contact Details
1.	Dr. Rakhi O. Gupta	Chairperson HOD Dept. of IT, KC College, HSNC University	9619914191 rakhi.gupta@kccollege.edu.in

    (b) Two to five teachers each having minimum five years teaching experience amongst the full time teachers of the Departments, Schools, Centers and Constituent Colleges of the University in the relevant subject nominated by the Vice-Chancellor in consultation with the Dean of the respective faculty; -

r. No.	Name	Designation	Contact Details
1.	Ms. Pragati V.Thawani	Co-chairperson Dept. of IT, KC College, HSNC University	9960782000 pragati.thawani@kccollege.edu.in
2.	Ms. Sandhya Bhavsar	Assistant Professor Dept. of IT, KC College, HSNC University	8446677643 sandhya.bhavsar@kccollege.edu.in

3.	Ms. Nashrah Gowalker	Assistant Professor Dept. of IT, KC College, HSNC University	9664774108 nashrah.gowalker@kccollege.edu.in

(c) one Professor / Associate Professor from other Universities or professor / Associate Professor from colleges managed by Parent Body; nominated by Parent Body; --

r. No.	Name	Designation	Contact Details
1.	Dr. R. Kamatchi	Director, ISME School of Management Studies and Entrepreneurship, Lower Parel.	9224450454 rkamatchiiyer@gmail.com
2.	Dr. Ajay Patil	Professor, School of Computer Sciences, KNMU, Jalgaon.	9423975215 ajaypatil.nmu@gmail.com

(d) four external experts from Industry / Research / eminent scholar in the field relevant to the subject nominated by the Parent Body;

r. No.	Name	Designation	Contact Details
1.	Dr. Hiren Dand	Head of Department (IT) Mulund College of Commerce.	9821140717 Hiren.dand@mccmulund.ac.in
2.	Mr. Asif K. Rampurawala	Vice Principal, Vidyalankar School of Information Technology	9820765273 asif.rampurawala@vsit.edu.in
3.	Mr. Kaushal Shah	Senior Manager Reliance Power Ltd.	9869069203 Kaushalshah78@gmail.com

4.	Mr. Prabhav Daga	Proprietor at Curaksha Partner at Gianda Trading Solutions, LLP.	8850252861 prabhav@curaksha.com

(e) top rankers of the Final Year Graduate and Final Year Post Graduate examination of previous year of the concerned subject as invitee members for discussions on framing or revision of syllabus of that subject or group of subjects for one year nominated by Vice Chancellor.

the Board of Studies, at its first meeting, shall elect one of the members as a Chairperson of the Board of Studies from amongst its members, subject that no person shall be Chairperson of the Board of the studies, for a second consecutive term whether as an elected, nominated or co-opted member, as the case may be.

Sr. No.	Name	Contact Details
1.	Ms. Kimberly Moniz	9619147188 kimberlythemoniz@gmail.com

Part – II

Outline of Choice Based Credit System as outlined by University Grants Commission:

R. **** : The Definitions Of The Key Terms Used In The Choice Based Credit System And Grading System Introduced From The Academic Year 2020-2021 Are As Under:

Outline of Choice Based Credit System as outlined by University Grants Commission:

1. **Core Course:** A course, which should compulsorily be studied by a candidate as a core requirement is termed as a Core course.

2. **Elective Course:** Generally, a course which can be chosen from a pool of courses and which may be very specific or specialized or advanced or supportive to the discipline/subject of study or which provides an extended scope or which enables an exposure to some other discipline/subject/domain or nurtures the candidate's proficiency/skill is called an Elective Course.

   2.1 **Discipline Specific Elective (DSE) Course**: Elective courses may be offered by the main discipline/subject of study is referred to as Discipline Specific Elective.
   The University/Institute may also offer discipline related Elective courses of **interdisciplinary** nature (to be offered by main discipline/subject of study).

   2.2 **Dissertation/Project**: An elective course designed to acquire special/advanced knowledge, such as supplement study/support study to a project work, and a candidate studies such a course on his own with an advisory support by a teacher/faculty member is called dissertation/project. A Project/Dissertation work would be of 6 credits. A Project/Dissertation work may be given in lieu of a discipline specific elective paper.

   2.3 **Generic Elective (GE) Course**: An elective course chosen generally from an unrelated discipline/subject, with an intention to seek exposure is called a Generic Elective.
   P.S.: A core course offered in a discipline/subject may be treated as an elective by other discipline/subject and vice versa and such electives may also be referred to as Generic Elective.

3. **Ability Enhancement Courses (AEC):** The Ability Enhancement (AE) Courses may be of two kinds: Ability Enhancement Compulsory Courses (AECC) and Skill Enhancement Courses (SEC). "AECC" courses are the courses based upon the content that leads to Knowledge enhancement; SEC courses are value-based and/or skill-based and are aimed at providing hands-on-training, competencies, skills, etc.

Choice Base Credit System

CBCS allows students to choose inter-disciplinary, intra-disciplinary courses, skill oriented papers (even from other disciplines according to their learning needs, interests and aptitude) and more flexibility for students.

Honours Program
To enhance employability and entrepreneurship abilities among the learners, through aligning Inter Disciplinary / Intra Disciplinary courses with Degree Program. Honours Program will have 40 additional credits to be undertaken by the learner across three years essentially in Inter / Intra Disciplinary course.

A learner who joins Regular Undergraduate Program will have to opt for Honours Program in the first year of the Program. However, the credits for honours, though divided across three years can be completed within three years to become eligible for award of honours Degree.

Program:
A Program is a set of course that are linked together in an academically meaningful way and generally ends with the award of a Degree Certificate depending on the level of knowledge attained and the total duration of study, B.Sc. Programs.

Course:
A 'course' is essentially a constituent of a 'program' and may be conceived of as a composite of several learning topics taken from a certain knowledge domain, at a certain level. All the learning topics included in a course must necessarily have academic coherence, i.e. there must be a common thread linking the various components of a course. A number of linked courses considered together are in practice, a 'program'.

Bridge Course:
Bridge course is visualized as Pre semester preparation by the learner before commencement of regular lectures. For each semester the topics, whose knowledge is considered as essential for effective and seamless learning of topics of the Semester, will be specified. The Bridge Course can be conducted in online mode. The Online content can be created for the Bridge Course Topics.

Module and Unit:
A course which is generally an independent entity having its own separate identity, is also often referred to as a 'Module' in today's parlance, especially when we refer to a 'modular curricular structure'. A module may be studied in conjunction with other learning modules or studied independently. A topic within a course is treated as a Unit. Each course should have exactly 3 Units.

Self-Learning:

20% of the topics will be marked for Self-Learning. Topics for Self-Learning are to be learned independently by the student, in a time-bound manner, using online and offline resources including online lectures, videos, library, discussion forums, field work, internships etc.

Evaluative sessions (physical/online), equivalent to the credit allocation of the Self Learning topics, shall be conducted, preferably, every week for each course. Learners are to be evaluated real time during evaluative sessions. The purpose of evaluative sessions is to assess the level of the students' learning achieved in the topics earmarked for Self-Learning.

The teacher's role in these evaluative sessions will be that of a Moderator and Mentor, who will guide and navigate the discussions in the sessions, and offer concluding remarks, with proper reasoning on the aspects which may have been missed by the students, in the course of the Self-Learning process.

The modes to evaluate self-learning can be a combination of the various methods such as written reports, handouts with gaps and MCQs, objective tests, case studies and Peer learning. Groups can be formed to present self-learning topics to peer groups, followed by Question and Answer sessions and open discussion. The marking scheme for Self Learning will be defined under Examination and Teaching.
The topics stipulated for self-learning can be increased or reduced as per the recommendations of the Board of Studies and Academic Council from time to time. All decisions regarding evaluation need to be taken and communicated to the

stakeholders preferably before the commencement of a semester. Some exceptions may be made in exigencies, like the current situation arising from the lockdown, but such ad hoc decisions are to be kept to the minimum possible.

Credit Point:

Credit Point refers to the 'Workload' of a learner and is an index of the number of learning hours deemed for a certain segment of learning. These learning hours may include a variety of learning activities like reading, reflecting, discussing, attending lectures / counseling sessions, watching especially prepared videos, writing assignments, preparing for examinations, etc. Credits assigned for a single course always pay attention to how many hours it would take for a learner to complete a single course successfully. A single course should have, by and large a course may be assigned anywhere between 2 to 8 credit points wherein 1 credit is construed as corresponding to approximately 30 to 40 learning hours.

Credit Completion and Credit Accumulation:

Credit completion or Credit acquisition shall be considered to take place after the learner has successfully cleared all the evaluation criteria with respect to a single course. Thus, a learner who successfully completes a 4 CP (Credit Point) course may be considered to have collected or acquired 4 credits. learner level of performance above the minimum prescribed level (viz. grades / marks obtained) has no bearing on the number of credits collected or acquired. A learner keeps on adding more and more credits as he completes successfully more and more courses. Thus the learner 'accumulates' course wise credits.

Credit Bank:

A Credit Bank in simple terms refers to stored and dynamically updated information regarding the number of Credits obtained by any given learner along with details regarding the course/s for which Credit has been given, the course-level, nature, etc. In addition, all the information regarding the number of Credits transferred to different programs or credit exemptions given may also be stored with the individual's history.

Credit Transfer:

(performance transfer) When a learner successfully completes a program, he/she is allowed to transfer his/her past performance to another academic program having some common courses and Performance transfer is said to have taken place.

Course Exemption:

Occasionally, when two academic programs offered by a single university or by more than one university, may have some common or equivalent course-content, the learner who has already completed one of these academic programs is allowed to skip these 'equivalent' courses while registering for the new program. The Learner is 'exempted' from 'relearning' the common or equivalent content area and from re-appearing for the concerned examinations. It is thus taken for granted that the learner has already collected in the past the credits corresponding to the exempted courses.

Note: The Ordinances and Regulations given below are applicable to Program of STATS under faculty of Science, unless and otherwise specified.

O***

Minimum duration of the programme will be of 2years in the Semester pattern i.e. from Sem. I to Sem. IV.

The degree will be awarded to a learner who successfully completes 96 credits of the program in period of 2 to 5 years from the year of enrollment to semester I.

If a learner does not earn 96 credits in 4 semesters from the year of enrolment to semester I, he/she may at his/her option transfer his/her performance in the existing/new program after establishing equivalence between old and new syllabus. Such a performance transfer will be decided by the Board of Studies / Ad-hoc Board / Ad hoc Committee of the concerned subject. The admission to the program will be governed by the existing rules

Part -II

O*** The fees for transfer of credits or performance will be based on number of credits that a learner has to complete for award of the degree.**

R ** Credits earned at one institution for one or more courses under a given program will be accepted under another program either by the same institution or another institution either through Direct Performance Transfer or Course exemption.

R** The Scheme of Teaching and Examination**:
The Scheme of Teaching and Examination shall be divided into THREE components, SELF LEARNING, Internal assessment and External assessment (semester end examination) for each course of the program.

1) **SELF LEARNING** Assessment. Some methodology has been described in Definition of Self Learning. However Subject Teacher is authorized to devise newer methods of evaluation, which must essentially be documented and circulated through mail or written circular to the learners at least 7 days prior to its implementation. 10% of the marks shall be allocated for Self Learning assessment.

2) **Internal Assessment** includes Assignments, Seminars, Core Practical, Practical, Commutative Test, Practical Record, Unit Tests etc. Subject Teacher is authorized to devise newer methods of evaluation, which must essentially be documented and circulated through mail or written circular to the learners at least 7 days prior to its implementation. For each course, there is a passing minimum for internal Assessment as 40% (16 out of 40 marks).

3) **Semester End Examination** 60% (24 out of 60 marks) overall 40% (40 out of 100 marks).
The semester end examination (external component) of 60% will be as follows:
1) Duration – 2 Hours

2) i) Theory Question Paper Pattern:-

1. There shall be five questions. On each unit there will be one question with 12 Marks each & fifth one will be based on all the four units with 12 Marks.
2. All questions shall be compulsory with internal choice within the questions. Question 1 (Unit-I), Question 2 (Unit-II), Question 3 (Unit-III), Question 4 (Unit-IV) & Question 5 (Combined Units) will be of 60 Marks with 100 percent internal options.
3. Please note that the allocation of marks depends on the weightage of the topic.

2) ii)Practical Question Paper Pattern:-
Semester End Examination-
Semester End Practical examination: (50M per Paper)

Sr.No	Particulars	Marks	Total
1	Laboratory work	40	40
2	Journal	05	05
3	Viva	05	05
	Grand Total	**50**	**50**

PRACTICAL BOOK/JOURNAL

Semester III:

The students are required to present a duly certified journal for appearing at the practical examination, failing which they will not be allowed to appear for the examination.
In case of loss of Journal and/ or Report, a Lost Certificate should be obtained from Head/ Co-ordinator / Incharge of the department; failing which the student will not be allowed to appear for the practical examination.

Semester IV:

The students are required to present a duly certified journal for appearing at the practical examination, failing which they will not be allowed to appear for the examination.
In case of loss of Journal and/ or Report, a Lost Certificate should be obtained from Head/ Co-ordinator / Incharge of the department; failing which the student will not be allowed to appear for the practical examination.

3) The marks will be given for all examinations and they will be converted into grade (quality) points. The semester-end, final grade sheets and transcripts will have only credits, grades, grade points,

4) The assessment of Part 'A' i.e. Internal Assessment as mentioned above for the Semesters I &IV shall be processed by the Colleges / Institutions of their learners admitted for the programme while the University shall conduct the assessment of Part 'B' i.e. Semester End Examination for Semesters I & IV.
The Internal Assessment marks of learners appearing for Semesters I & IV shall be submitted to the University by the respective colleges/ Institutions before the commencement of respective Semester End Examinations. The Semester End Examinations for Semesters I & IV shall be conducted by the University and the results shall be declared after processing the internal assessment and the marks awarded to the learners. The grade card shall be issued by the University after converting the marks into grades.

5) The marks of the internal assessment should not be disclosed to the students till the results of the corresponding semester is declared.

HSNC University
Mumbai

(2021-2022)

Ordinances and Regulations

With Respect to

Choice Based Credit System

(CBCS)

For the Programmes Under

The Faculty of Science and Technology

For the Course

Information Technology

Curriculum – Second Year Postgraduate Program

Semester-III and Semester -IV

2021-2022

Section D

Preamble

The M.Sc. Information Technology program is started with an aim to make the students employable after Post-Graduation and impart industry oriented training.

1. **Course Objective:** The main objectives of the course are:

- To think analytically, creatively and critically in developing robust, extensible and highly maintainable technological solutions to simple and complex problems related to human, technology and environmental factors.
- To apply their knowledge and skills to be employed and excel in IT professional careers and/or to continue their education in IT and/or related post graduate programs.
- To be capable of managing complex IT projects with consideration of various factors.
- To work effectively as a part of a team to achieve a common stated goal.
- To adhere to the highest standards of ethics, including relevant industry and organizational codes of conduct.
- To develop an aptitude to engage in continuing educational and professional development.
- To build on the basics and the core concepts learnt during relevant undergraduate program.

The new syllabus is aimed to achieve the following objectives. The syllabus spanning two years covers the industry endorsed relevant courses. The students will be ready for the jobs available in different fields like:

- Networking
- Security
- Machine Learning
- Artificial Intelligence
- Big Data
- Image Processing
- Cloud Computing and Applications
- AI Chat Bot
- And many others

2. **Process adopted for curriculum designing:** The department has conducted multiple meetings with academic partners, industry partners. After discussion with them, the changes in the syllabus were introduced with the view that students need to learn the core concepts in detail.

3. **Salient features, how it has been made more relevant:** After discussion and interaction with the industry partners and understanding the requirement of the industries certain changes in the syllabus are introduced. Upcoming Technologies like AI, Big Data, etc. have been added keeping the upcoming trends in the field of Information Technology.

4. **Learning Outcomes:** It is expected to improvise the soft skill as well as hardware skills for the students.

- **Input from stakeholders (Which sections have been modified) with relevant introduction:** There are modifications suggested by the Industry person to make changes in the syllabus provided by University of Mumbai and add a few more topic to the already developed syllabus.

Part 2   -   The Scheme of Teaching and Examination is as under:

Semester – III

Summary

Sr. No.	Choice Based Credit System			Subject Code	Remarks
1	Core Course (Information Technology)			MS-SIT-301,	
				MS-SIT-3P1,	
2	Elective Course	Discipline Specific Elective (DSE) Course		MS-SIT-302, MS-SIT-303, MS-SIT-304.	
				MS-SIT-305, MS-SIT-306, MS-SIT-307,	
				MS-SIT-308. MS-SIT-309, MS-SIT-310,	
				MS-SIT-3P2, MS-SIT-3P3, MS-SIT-3P4.	
				MS-SIT-3P5, MS-SIT-3P6, MS-SIT-3P7,	
				MS-SIT-3P8. MS-SIT-3P9, MS-SIT-3P10,	
		2.1	Interdisciplinary Specific Elective (IDSE) Course		
		2.2	Dissertation/Project		
		2.3	Generic Elective (GE) Course		
3	Ability Enhancement Compulsory Courses (AECC)				
	Skill Enhancement Courses (SEC)				

Second Year Semester -III Internal and External Detailed Evaluation Scheme

Sr. No.	Subject Code	Subject Title	Periods Per Week (Period of 45min)					Credit	Internals			Total Marks
			Units	S. L.	L	T	P		S. L. E	CT+ AT= 15+5	PA	
1	MS-SIT-301	**Technical Writing and Entrepreneurship Development**	4	20% *	5	0	0	4	10	20	10	100
	Track 1	**Artificial Intelligence**										
2	MS-SIT-302	Natural Language Processing	4	20% *	5	0	0	4	10	20	10	100
3	MS-SIT-303	Deep Learning	4	20% *	5	0	0	4	10	20	10	100
4	MS-SIT-304	Programming Computer Vision	4	20% *	5	0	0	4	10	20	10	100
	Track 2	**Cyber Security**										
5	MS-SIT-305	Cyber Forensics and Cyber Law	4	20% *	5	0	0	4	10	20	10	100
6	MS-SIT-306	Security in Cloud & other Emerging Technologies	4	20% *	5	0	0	4	10	20	10	100
7	MS-SIT-307	Security Operations	4	20% *	5	0	0	4	10	20	10	100
	Track 3	**Data Science and Big Data Analytics**										
8	MS-SIT-308	Applied Big Data Analytics Theory	4	20% *	5	0	0	4	10	20	10	100
9	MS-SIT-309	Data Management and Data Warehousing Theory	4	20% *	5	0	0	4	10	20	10	100
10	MS-SIT-310	Programming with Hadoop and Spark Theory	4	20% *	5	0	0	4	10	20	10	100
11	MS-SIT-3P1	Practical Based on MS-SIT-301 Technical Writing and Entrepreneurship Development	-	-	0	-	3	2				50
	Track 1	**Artificial Intelligence**										

12	MS-SIT-3P2	Practical Based on MS-SIT-302 Natural Language Processing	-	-	0	-	3	2				50
13	MS-SIT-3P3	Practical Based on MS-SIT-303 Deep Learning	-	-	0	-	3	2				50
14	MS-SIT-3P4	Practical Based on MS-SIT-304 Programming Computer Vision	-	-	0	-	3	2				50
	Track 2	**Cyber Security**										
15	MS-SIT-3P5	Practical Based on MS-SIT-305 Cyber Forensics and Cyber Law	-	-	0	-	3	2				50
16	MS-SIT-3P6	Practical Based on MS-SIT-306 Security in Cloud & other Emerging Technologies	-	-	0	-	3	2				50
17	MS-SIT-3P7	Practical Based on MS-SIT-307 Security Operations	-	-	0	-	3	2				50
	Track 3	**Data Science and Big Data Analytics**										
18	MS-SIT-3P8	Practical Based on MS-SIT-308 Applied Big Data Analytics Theory	-	-	0	-	3	2				50
19	MS-SIT-3P9	Practical Based on MS-SIT-309 Data Management and Data Warehousing Theory	-	-	0	-	3	2				50
20	MS-SIT-3P10	Practical Based on MS-SIT-310 Programming with Hadoop and Spark Theory	-	-	0	-	3	2				50
	Total Periods/ Credit							**24**				600

*One to two lectures to be taken for CONTINUOUS self -learning evaluation

Second Year Semester III – Units – Topics- Teaching Hours

S.N	Subject Code & Title		Subject Unit Title	Lectures (45 min)	Total Lectures	Credit	Total Marks
1	MS-SIT-301	1	Introduction to Technical Communication Writing Technical Documents Writing Collaboratively	15	60 L	4	100 (60+40)
		2	Introduction to Content Writing Blog Creation Organizing Your Information	15			
		3	Creating Graphics Researching Your Subject Research and Documentation Report Components	15			
		4	Writing Proposals Writing Informational Reports Writing Recommendation Reports Reviewing, Evaluating, and Testing Documents and Websites Innovation management: an introduction Market adoption and technology diffusion	15			
2	MS-SIT-302 (Track 1)	1	Classical Approaches to Natural Language Processing A Quick Tour of Traditional NLP Processing Raw Text	15	60 L	4	100 (60+40)
		2	Word Senses Segmentation Information Extraction	15			
		3	Learning to Classify Text Part-of-Speech tagging Sequence Labeling for Parts of Speech and Named Entities	15			
		4	NL parsing basics and approaches Semantic Role Labeling Sentiment Analysis	15			
3	MS-SIT-303	1	Applied Math and Machine Learning Basics Numerical Computation	15	60 L	4	100 (60+40)
		2	Deep Networks	15			
		3	Convolutional Networks, Sequence Modelling, Applications Approximate Inference, Deep Generative Models	15			
		4	Deep Learning Research	15			

4	MS-SIT-304	1	Introduction Getting to Know the SimpleCV Framework: Image Sources Advanced Features	15	60 L	4	100 (60+40)
		2	Basic Image Handling and Processing Camera Models and Augmented Reality Searching Images	15			
		3	Clustering Images Classifying Image Content Multiple View Geometry	15			
		4	OpenCV Handling Files, Cameras, and GUIs Filtering Images	15			

5	MS-SIT-305 (Track 2)	1	The present Scenario Setting up a lab for Computer Forensics Recovery of deleted files and partitions	15	60 L	4	100 (60+40)
		2	ISO 19011:2018	15			
		3	Study of features of : ISO Study of features of: NIST Study of features of :CCIS	15			
		4	Introduction to National cyber Laws and Regulations Introduction to International cyber Laws and Regulations	15			

6	MS-SIT-306	1	Understanding Cloud concepts Security Concept in Cloud Computing Overview of design principles of secure cloud Evaluating Cloud Service providers Overview cloud reference architecture	15	60 L	4	100 (60+40)
		2	Cloud Platform and Infrastructure security Cloud data security	15			
		3	Cloud Application Security Cloud Security operations	15			
		4	Impact of Emerging Technologies Case Studies Discussion on the following Technologies (IoT/Automation/Quantum Computing/BlockChain/SpaceTechnologies/ICS(IndustrialControlSystems)/Containerization/VR/AR/IR/3D Printing/Drones)	15			

7		1	CIA Triad Introduction to the Blue Team Mission SOC Overview	15	60 L	4	100

	MS-SIT-307		Overview of Defensible Network Concepts Introduction to Events, Alerts, Anomalies, and Incidents Incident Management Systems Threat Intelligence Platforms				(60+40)
		2	SIEM Opportunistic vs. targeted attackers : Endpoint Attack Tactics Endpoint Defense In-Depth Overview of how Windows Logging Works How Linux Logging Works Interpreting Important Events	15			
		3	Log Collection, Parsing, and Normalization Identifying and Handling Suspicious Files Perception, Memory, and Investigation Overview of Mental Models for Information Security Structured Analysis Techniques Overview OPSEC	15			
		4	Intrusion Discovery Incident Closing and Quality Review Overview of Improving Life in the SOC Analytic Features and Enrichment New Analytic Design, Testing, and Sharing Tuning and False Positive Reduction Automation and Orchestration: The Containing Identified Intrusions	15			

			Introduction to Big Data Analtyics Domain Specific Examples of Big Data Big Data Patterns	15			
		1					
		2	Data Acquisition Data Analysis	15			
8	MS-SIT-308 (Track 3)	3	Big Data Storage Real-time Analysis Interactive Querying Serving Databases & Web Frameworks	15	60 L	4	100 (60+40)
		4	Analytics Algorithms Data Visualization	15			

		1	Introduction to Data Mining Data Preprocessing Classification	15			
9	MS-SIT-309	2	Cluster Analysis Association Rule Mining	15	60 L	4	100 (60+40)
		3	Web mining and search engines Data warehouse Data Warehouse Schema	15			

		4	Online Analytical Processing NoSQL	15			
10	MS-SIT-310	1	Introduction to Hadoop Data analytics using Hadoop	15	60 L	4	100 (60+40)
		2	Data Processing with MapReduce Batch Analytics with Apache Spark	15			
		3	Spark Core Interactive Data Analysis with Spark Shell: Writing a Spark Application Spark Streaming	15			
		4	Spark SQL ML with Spark	15			

 Lecture Duration – 48 Minutes
 One Credit =15 Hours

L: Lecture: Tutorials P: Practical Ct-Core Theory, Cp-Core Practical, SLE- Self learning evaluation CT-Commutative Test, SEE- Semester End Examination, PA-Project Assessment, AT-Attendance

Part 3: Detailed Scheme
Theory M.Sc.IT Part 2
2021-2022
SEM 3
Course Code: MS-SIT-301: Technical Writing and Entrepreneurship Development

Unit	Details	No. of Lectures
1	**1.1 Introduction to Technical Communication:** What Is Technical Communication? The Challenges of Producing Technical Communication, Characteristics of a Technical Document, Measures of Excellence in Technical Documents, Skills and Qualities Shared by Successful Workplace Communicators, How Communication Skills and Qualities Affect Your Career? **1.2 Understanding Ethical and Legal Considerations:** A Brief Introduction to Ethics, Your Ethical Obligations, Your Legal Obligations, The Role of Corporate Culture in Ethical and Legal Conduct, Understanding Ethical and Legal Issues Related to Social Media, Communicating Ethically Across Cultures, Principles for Ethical Communication **1.3 Writing Technical Documents:** Planning, Drafting, Revising, Editing, Proofreading **1.4 Writing Collaboratively:** Advantages and Disadvantages of Collaboration, Managing Projects, Conducting Meetings, Using Social Media and Other Electronic Tools in Collaboration, Importance of Word Press Website, Gender and Collaboration, Culture and Collaboration.	15
2	**2.1 Introduction to Content Writing:** Types of Content (Article, Blog, E-Books, Press Release, Newsletters Etc.), Exploring Content Publication Channels. Distribution of your content across various channels. **2.2 Blog Creation:** Understand the psychology behind your web traffic, Creating killing landing pages which attract users, Using Landing Page Creators, Setting up Accelerated Mobile Pages, Identifying UI UX Experience of your website or blog. **2.3 Organizing Your Information:** Understanding Three Principles for Organizing Technical Information, Understanding Conventional Organizational Patterns, **2.4 Emphasizing Important Information:** Writing Clear, Informative Titles, Writing Clear, Informative Headings, Writing Clear Informative Lists, Writing Clear Informative Paragraphs.	15

3	**3.1 Creating Graphics:** The Functions of Graphics, The Characteristics of an Effective Graphic, Understanding the Process of Creating Graphics, Using Color Effectively, Choosing the Appropriate Kind of Graphic, Creating Effective Graphics for Multicultural Readers. **3.2 Researching Your Subject:** Understanding the Differences Between Academic and Workplace Research, Understanding the Research Process, Conducting Secondary Research, Conducting Primary Research, **3.3 Research and Documentation:** Literature Reviews, Interviewing for Information, Documenting Sources, Copyright, Paraphrasing, Questionnaires. **3.4 Report Components:** Abstracts, Introductions, Tables of Contents, Executive Summaries, Feasibility Reports, Investigative Reports, Laboratory Reports, Test Reports, Trip Reports, Trouble Reports	15
4	**4.1 Writing Proposals:** Understanding the Process of Writing Proposals, The Logistics of Proposals, The "Deliverables" of Proposals, Persuasion and Proposals, Writing a Proposal, The Structure of the Proposal. **4.2 Writing Informational Reports:** Understanding the Process of Writing Informational Reports, Writing Directives, Writing Field Reports, Writing Progress and Status Reports, Writing Incident Reports, Writing Meeting Minutes. **Writing Recommendation Reports:** Understanding the Role of Recommendation Reports, Using a Problem-Solving Model for Preparing Recommendation Reports, Writing Recommendation Reports. **4.3 Reviewing, Evaluating, and Testing Documents and Websites:** Understanding Reviewing, Evaluating, and Testing, Reviewing Documents and Websites, Conducting Usability Evaluations, Conducting Usability Tests, Using Internet tools to check writing Quality, Duplicate Content Detector, What is Plagiarism?, How to avoid writing plagiarism content? **4.4 Innovation management: an introduction:** The importance of innovation, Models of innovation, Innovation as a management process. **4.5 Market adoption and technology diffusion:** Time lag between innovation and useable product, Innovation and the market , Innovation and market vision ,Analyzing internet search data to help adoption and forecasting sales ,Innovative new products and consumption patterns, Crowd sourcing for	15

new product ideas, Frugal innovation and ideas from everywhere, Innovation diffusion theories. Introduction to Marketplaces (Amazon Seller, Flipkart Seller, Government e-Marketplace)	

References:
1 Technical Communication, Mike Markel, Bedford/St.Martin's 11 edition
2 Innovation Management and New Product Development, Paul Trott
3 Handbook of Technical Writing, Gerald J. Alred, Bedford/St. Martin's 09 edition
4 Technical Writing 101: A Real-World Guide to Planning and Writing Technical Content, Alan S. Pringle and Sarah S. O'Keefe
5 Innovation and Entrepreneurship, Peter Drucker, Harper Business 03 edition

Self-Learning topics (Unit wise):

Sub- unit	Topic
1.1	Skills and Qualities Shared by Successful Workplace Communicators,
1.2	Your Ethical Obligations
1.4	Culture and Collaboration.
2.2	Understand the psychology behind your web traffic
2.4	Writing Clear, Informative Titles, Writing Clear, Informative Headings, Writing Clear Informative Lists, Writing Clear Informative Paragraphs.
3.1	Creating Effective Graphics for Multicultural Readers.
3.2	Understanding the Differences Between Academic and Workplace Research
3.3	Interviewing for Information, Documenting Sources
4.2	Writing Field Reports, Writing Progress and Status Reports, Writing Incident Reports, Writing Meeting Minutes
4.3	Using Internet tools to check writing Quality
4.5	Analyzing internet search data to help adoption and forecasting sales

Online Resources
http://www.digimat.in/nptel/courses/video/121106007/L20.html https://nptel.ac.in/courses/110/105/110105091/

Track 1: Artificial Intelligence

Course Code: MS-SIT-302: Natural Language Processing

	Details	Lectures

1	**1.1: Classical Approaches to Natural Language Processing:** The Classical Toolkit, Text Preprocessing, Lexical Analysis, Syntactic Parsing, Semantic Analysis, Natural Language Generation **1.2 A Quick Tour of Traditional NLP**: Corpora, Tokens, and Types, Unigrams, Bigrams, Trigrams and N-grams, Lemmas and Stems, Categorizing Sentences and Documents, Categorizing Words: POS Tagging, Categorizing Spans: Chunking and Named Entity Recognition, Structure of Sentences, Word Senses and Semantics **1.3: Processing Raw Text:** Accessing Text from the Web and from Disk, The NLP Pipeline, Text Processing at the Lowest Level, Regular Expressions for Detecting Word Patterns, Normalizing Text **NLP applications**: Speech to Text(STT), Text to Speech(TTS), Story Understanding, NL Generation, QA system, Machine Translation, Text Summarization, Text classification, Sentiment Analysis, Grammar/Spell Checkers	15
2	**2.1: Word Senses:** Defining Word Senses, Relations Between Senses, Word Sense Disambiguation, Alternate WSD algorithms and Tasks **2.2 Segmentation**: word level, Sentence level. Survey of English and Indian Languages Morphology, Morphological parsing FSA and FST, Porter stemmer, Machine Learning approaches. **2.3 Information Extraction** : Noun Phrase Chunking, Chunking with Regular Expressions,WordNet: Senses and Synonyms, lexical relations, Semantic Similarity	15
3	**3.1 Learning to Classify Text:** Choosing the Right Features, Document Classification, Sequence Classification, Decision Trees **3.2 Part-of-Speech tagging** (POS): survey of POS tagsets, Rule based approaches (ENGTOWL), Stochastic approaches (Probabilistic, N-gram and HMM), TBL morphology, unknown word handling. **3.3: Sequence Labeling for Parts of Speech and Named Entities:** English Word Classes, Named Entities and Named Entity Tagging, Tagged Corpora: Representing Tagged Tokens, Reading Tagged Corpora, Exploring Tagged Corpora, The Default Tagger, The Regular Expression Tagger, The Lookup Tagger	15
4	**4.1 NL parsing basics and approaches:** TopDown, BottomUp, Indian Language Parsing in Paninian Karaka Theory, CFG parsing using Earley's and CYK algorithms, Probabilistic parsing, Grammar notations CFG, LFG, PCFG, LTAG, MALT parser, MST parser. Writing Your Own Grammars, Treebanks and Grammars **4.2: Semantic Role Labeling:** Semantic Roles, The Proposition Bank, FrameNet **4.3: Sentiment Analysis** :Lexicons for Sentiment, Defining Emotion, Available Sentiment and Affect Lexicons, Creating Affect Lexicons by Human Labeling, Semi-supervised Induction of Affect Lexicons, Supervised Learning of Word Sentiment The Problem of Sentiment Analysis: Document-Level Sentiment Classification, Sentence-Level Subjectivity and Sentiment Classification, Feature-Based Sentiment Analysis.	15

Reference Books:
1. Handbook of Natural Language Processing , Indurkhya.N. & Damerau F.J
2. Speech and Language Processing Martin, J. H & Jurafsky, D Pearson Education India
3. Foundations of Statistical Natural Language Processing , Manning, Christopher and Heinrich, Schutze , MIT Press
4. Natural Language Processing with PyTorch ,Delip Rao and Brian McMahan, O'REILLY
5. Natural Language Processing with Python Steven Bird, Ewan Klein, and Edward Loper , O'REILLY

Self-Learning topics (Unit wise):

Sub- unit	Topic
1.3	**NLP applications**: Speech to Text(STT), Text to Speech(TTS), Story Understanding, NL Generation, QA system, Machine Translation, Text Summarization, Text classification, Sentiment Analysis, Grammar/Spell Checkers
2.3	WordNet: Senses and Synonyms, lexical relations, Semantic Similarity
3.3	Tagged Corpora: Representing Tagged Tokens, Reading Tagged Corpora, Exploring Tagged Corpora, The Default Tagger, The Regular Expression Tagger, The Lookup Tagger
4.6	Writing Your Own Grammars, Treebanks and Grammars
4.3	The Problem of Sentiment Analysis: Document-Level Sentiment Classification, Sentence-Level Subjectivity and Sentiment Classification, Feature-Based Sentiment Analysis

Online Resources
https://onlinecourses.nptel.ac.in/noc21_cs102/preview

Course Code: MS-SIT-303 Deep Learning

Unit	Details	No. of Lectures
1	**1.1 Applied Math and Machine Learning Basics:** Linear Algebra: Scalars, Vectors, Matrices and Tensors , Multiplying Matrices and Vectors , Identity and Inverse Matrices, Linear Dependence and Span , norms, special matrices and vectors, eigen decompositions. Principle Component Analysis **1.2 Numerical Computation:** Overflow and under flow, poor conditioning, Gradient Based Optimization, Constraint optimization,History of Deep Learning, Deep Learning Success Stories	15
2	**2.1 Deep feedforward Networks :**Example :Learning XOR , Gradient based Learning , Hidden Units , Architecture Design, Back-Propagation **2.2 Regularization for Deep Learning :**Parameter Norm Penalties , Regularization and Under-Constrained Problems , Data Augmentation , Noise Robustness , Semi-Supervised Learning , Multi-Task Learning , Early Stopping , Dropout **2.3 Optimization for Training Deep Learning :**How learning differs from Pure Optimization , Challenges in Neural Network Optimization , Basic Algorithm , Parameter Initialization Strategies , Algorithms with Adaptive Learning Rates , Approximate Second-Order Methods	15
3	**3.1 Convolutional Network :**The convolution Operation , Pooling , Variants Of the Basic Convolution Function , Structured Outputs , Data Types **3.2 Sequence Modeling :**Recurrent Neural Network , Bidirectional RNNs , Encoder-Decoder Sequence to Sequence Architecture , Echo State Networks **3.3 Applications :**Large Scale Deep Learning , Computer Vision , Speech Recognition , Natural Language Processing **3.4 Approximate Inference :**Inference as Optimization , Expectation Maximization , MAP Inference and Sparse Coding , Learned Approximate Inference **3.5 Deep Generative Models :** Boltzmann Machines , Restricted Boltzmann Machines , Deep Boltzmann Machines , Convolution Boltzmann Machines , Back-Propagation through Random Operations , Directed Generative Nets , Generative Stochastic Networks, Evaluating Generative Models	15
4	**4.1 Linear Factor Models:** Probabilistic PCA and Factor Analysis, Independent Component Analysis (ICA) , Slow Feature Analysis , Sparse Coding **4.2 Autoencoders:** Undercomplete Autoencoders , Regularized Autoencoders , Stochastic Encoder and decoder , Denoising Autoencoders , Contractive Autoencoders , Application of	15

	Autoencoders **4.3 Representation Learning :**Greedy layer wise Unsupervised learning , Transfer Learning and Domain Adaptation**,** Semi supervised disentangling of Casual Factors **,** Distributed Representation	

Reference Books:

1. Deep Learning , Ian Goodfellow, Yoshua Bengio, Aaron Courvile , An MIT Press book
2. Fundamentals of Deep Learning, Nikhil Buduma, O'Reilly
3. Deep Learning: Methods and Applications , Deng & Yu , Now Publishers

Self-Learning topics (Unit wise):

Sub- unit	Topic
1.2	History of Deep Learning, Deep Learning Success Stories
2.1	Shallow Neural Networks; Deep Neural Networks; Recurrent Neural Networks
3.2	Deep Recurrent Networks, Bidirectional RNNs
4.1	**4.2 Autoencoders:** Undercomplete Autoencoders **,** Regularized Autoencoders **,** Stochastic Encoder and decoder **,** Denoising Autoencoders **,** Contractive Autoencoders **,** Application of Autoencoders

Online Resources
https://onlinecourses.nptel.ac.in/noc21_cs76/preview

Course Code: MS-FIT-304 Programming Computer Vision

Unit	Details	No. of Lectures
1	**1.1 Introduction :** Why Learn Computer Vision ? What Is the SimpleCV Framework? What Is Computer Vision? Easy Versus Hard Problems , What Is a Vision System? **1.2 Getting to Know the SimpleCV Framework:** Installation, The SimpleCV Shell, Introduction to the Camera, The Display **1.3 Image Sources:** Overview, Images, Image Sets, and Video, The XBox Kinect, Networked Cameras, Using Existing Images **1.4 Advanced Features:** Foreground/Background Segmentation, Feature Extractors, Edge Histograms, Hue Histogram, Morphology Revisited, Bitmaps and Pixels, Image Scaling , Image Cropping , Image Slicing , Geometric primitives and transformations, Photometric image formation	15
2	**2.1 Basic Image Handling and Processing:** PIL – the Python Imaging Library , Matplotlib , NumPy , SciPy, Advanced example: Image de-noising **2.2 Camera Models and Augmented Reality:** The Pin-hole Camera Model , Camera Calibration, Pose Estimation from Planes and Markers, Augmented Reality **2.3 Searching Images :** Content-based Image Retrieval , Visual Words , Indexing Images , Searching the Database for Images , Ranking Results using Geometry, Building Demos and Web Applications, Image Morphology, Binarization , Dilation and Erosion , Examples : The SpinCam ,Warp and Measurement	15
3	**3.1 Clustering Images:** K-means Clustering , Hierarchical Clustering , Spectral Clustering **3.2 Classifying Image Content :** K-Nearest Neighbors , Bayes Classifier , Support Vector Machines , Optical Character Recognition **3.3 Multiple View Geometry:** Epipolar Geometry, Computing with Cameras and 3D Structure , Multiple View Reconstruction , Stereo Images , Histograms, Using Hue Peaks , Binary Masking , Examples: Creating a Motion Blur Effect , Chroma Key (Green Screen)	15
4	**4.1 OpenCV :** The OpenCV Python Interface , OpenCV Basics , Processing Video , Tracking **4.2 Handling Files, Cameras, and GUIs :** Basic I/O scripts, Project concept, An object-oriented design **4.3 Filtering Images**: Creating modules , Channel mixing , Curves – bending color space, Highlighting edges, Bitmap Template Matching , Keypoint Template Matching, Optical	15

| | Flow , Haar-like Features ,Barcode , Examples: Barcode Scanner , Mustacheinator | |

Reference Books:

1. Practical Computer Vision with SimpleCV Kurt Demaagd, Anthony Oliver, Nathan Oostendorp, and Katherine Scott O'REILLY

2. Programming Computer Vision with Python Jan Erik Solem Creative Commons

3. OpenCV Computer Vision with Python Joseph Howse PACKT

Self-Learning topics (Unit wise):

Sub- unit	Topic
1.4	Bitmaps and Pixels, Image Scaling , Image Cropping , Image Slicing , Geometric primitives and transformations, Photometric image formation
2.3	Image Morphology, Binarization , Dilation and Erosion , Examples : The SpinCam ,Warp and Measurement
3.3	Histograms, Using Hue Peaks , Binary Masking , Examples: Creating a Motion Blur Effect , Chroma Key (Green Screen)
4.3	Bitmap Template Matching , Keypoint Template Matching, Optical Flow , Haar-like Features ,Barcode , Examples: Barcode Scanner , Mustacheinator

Online Resources

Track 2: Cyber Security
Course Code: MS-SIT-305 Cyber Forensics and Cyber Law:

Unit	Details	No. of Lectures
1	**Introduction to Cyber Forensics** **1.1** The present Scenario, The Investigation Process, Computers – Searching and Seizing, Electronic Evidence, Procedures to be followed by the first responder. **1.2** Setting up a lab for Computer Forensics, Hard Disks and File Systems, Forensics on Windows Machine, Acquire and Duplicate Data **1.3** Recovery of deleted files and partitions, Using Access Data FTK and Encase for Forensics Investigation, Forensics analysis of Steganography and Image files, Cracking Application passwords.	15
2	**Auditing** **2.1 ISO 19011:2018** : Plan, Do, Check, Act Cycle ,Overview of Management Systems & Certification Body , Accredited certification vs Unaccredited Certification/body, Overview of Clauses & Annex A Guidelines; Auditing terms and definitions; Types of Audit - Remote,	15

	Onsite, Human Interaction, Non-Human Interaction; Types of Audit - First Party, Second Party, Third Party; Types of Audit - Stage 1 Audit, Stage 2 Audit; Audit sequence (Input, Activity, Output);Audit process (Audit Criteria, Audit Evidence, Evaluation, Audit Findings, Audit Conclusion);Audit resources; Audit responsibilities (Lead Auditor, Audit Team Member, Auditee Top Management, Guides, Management Representative, Technical Experts);Audit evidence triangle (Document Review, Interview, Observation);Audit programme & activities; Audit scope, objectives and criteria; Principles of auditing; Typical audit activities; Planning the Audit; Initiating the audit; Document review; Auditing programming; Audit plan and sampling; Audit work documents; Opening meeting; Communication, attributes and question types; Verifying information and recording evidence; Nonconformities; Simulated internal audit; Documenting nonconformities; Preparing audit conclusions; Presenting nonconformities; Closing meeting; Audit report contents; Closing an Audit;SSAE	
3	**Introduction to Frameworks** **3.1** Study of features of : ISO 27001:2013 **,** ISO 27701:2019, , ISO 22301:2019**,** ISO 31000:2018 **3.2** Study of features of: NIST 800-53,14,26,12 Cybersecurity Framework, SOC1 SOC2 SOC3 **3.3** Study of features of :CCISv7, COSO, features of ITILv4, CMMI, Cloud Control Matrix (CCM)v4', features of COBIT5, COBIT 2019, Compare and contrast of different ISO frameworks , Compare and contrast of different Cloud frameworks	15
4	**Introduction to cyber laws** **4.1 Introduction to National cyber Laws and Regulations** Features of : Evidence Act 1872 , IT Act 2000, Personal Data Protection Law (PDPA) {Both Act and Bill} **4.2 Introduction to International cyber Laws and Regulations** Features of :GDPR-EU, California Privacy Act, Sarbanes-Oxley Act of 2002, The Health Insurance Portability and Accountability Act of 1996, Computer Fraud and Abuse Act (CFAA), NIST guidelines, FIPS (Federal Information Processing Standards),The Federal Information Security Management Act (FISMA)	15

Reference Books:

1) EC-Council CHFIv10 Study Guide, EC-Council, 2018

2) The official CHFI Exam 312-49 study Guide, Dave Kleiman, SYNGRESS, 2007

3) Digital Forensics and Incident Response, Gerard Johansen, Packt Publishing, 2020

4) Cyber Security and Cyber Laws Nilakshi Jain (Author), Ramesh Menon (Author) Publisher : Wiley (1 October 2020);
5) ISBN-13 : 978-9390395750

Self-Learning topics (Unit wise):

Sub- unit	Topic
1.1	The present Scenario, The Investigation Process, Electronic Evidence
1.2	Hard Disks and File Systems
3.1	ISO 27701:2019, ISO 22301:2019
3.2	NIST 800-,14,26,12,SOC1 SOC2 SOC3
3.3	Study of features of :CCISv7, COSO,CMMI, Cloud Control Matrix (CCM)v4', COBIT 2019, Compare and contrast of different ISO frameworks , Compare and contrast of different Cloud frameworks

Online Resources
Cyber Security - Course (swayam2.ac.in) https://preyproject.com/blog/en/cybersecurity-frameworks-101/ https://www.tessian.com/blog/beginners-guide-to-cybersecurity-frameworks/ https://www.cybersaint.io/ultimate-nist-cybersecurity-framework-adoption-guide https://advisera.com/eugdpracademy/knowledgebase/a-summary-of-10-key-gdpr-requirements/ https://www.darkreading.com/risk/how-to-choose-the-right-cybersecurity-framework/a/d-id/1340319

Course Code: MS-SIT-306: Security in Cloud & other Emerging Technologies

Unit	Details	No. of Lectures
1	**Cloud Architecture : Concept and Design** **1.1 Understanding Cloud concepts:** Glossary of definitions, Roles of Service: Customer ,Provider ,Broker and partner Characteristics of :Multitenancy, Elasticity, Scalability, Resource Pooling Block, Technologies:Virtualization,Storage,Networking,Databases and orchestration **1.2 Security Concept in Cloud Computing:** Cryptography and key management, Access Control, Data Sanitization and operations. , Network Security, Virtualization Security: Hypervisor Security and Container Security. **1.3 Overview of design principles of secure cloud computing :** Secure Data Lifecycle , Disaster Recovery , Business Continuity Planning , Cost Benefit Analysis , Portability and inter-operability , Vendor Locking , Security Considerations for SAAS,IAAS,PAAS	15

	1.4 Evaluating Cloud Service providers : Verification against criteria (eg:ISO27001,PCIDSS) , Product Certifications(e.g.: Common criteria(cc) , FIPS140-2) **1.5 Overview cloud reference architecture :** Categories: SAAS, IAAS,PAAS , Deployment models: Public, Private, Hybrid, Community	
2	**2.1 Cloud Platform and Infrastructure security :**Infrastructure Components: Physical environments, Management , Plane (Scheduling, Orchestration, Maintenance) , Secure Data Centre Design: Logical, Physical and environmental **,** Risk analysis and assessment, Virtualization Risks, Vulnerabilities, Threats, Attacks, Counter measures , Disaster recovery and business continuity : a)Business Requirements (e.g., Recovery Time Objective (RTO) , Recovery Point Objective (RPO), Recovery Service Level (RSL)) b)Strategy and Planning of DR and BC **2.2 Cloud data security :** Data Lifecycle, Data Dispersion, Storage types, Data Classification, Data Discovery(Structured and Unstructured data) Encryption and Key management, Data Loss prevention, Hashing, Masking, Tokenization, Obfuscation, Anonymization Data Rights, Provisioning, Access Models , Data Retention ,Deletion, Archiving , Event sources, Identity Attribution , Logging, Storage and Analysis of Data Events Chain of Custody and Non-repudiation	15
3	**3.1 Cloud Application Security:** Secure SDLC process , Common Cloud Vulnerabilities, Phases and Methodologies, Software Configuration Management and Versioning, Security Testing**,** Overview of secure Components e.g., Web Application Firewall (WAF), Database Activity Monitoring (DAM), Extensible Markup Language (XML) firewalls, Application Programming Interface (API) gateway. Identity and Access Management (IAM) Solutions e.g.(Federated Identity, Identity Providers, Single Sign-On (SSO), Multi-factor Authentication, Cloud Access Security Broker (CASB)) **3.2 Cloud Security operations :** Hardware Security Configuration(BIOS, TPM, Controllers),Virtualization Tools(Network, Storage, CPU, Memory), Guest OS , Access Control(Secure KVM,RDP,SSH),Secure Network Configuration(VLAN, TLS, DHCP, DNS, VPN), Network Security Controls(IDS,IPS),Network Security Groups, OS Hardening through baselines, backup and restore , Management of Change, Continuity, Security,Incident,Problem,Release,Deployment,Configuration,Availability,Capacity,Service Level	15
4	**4.1 Impact of Emerging Technologies :** (AI/ML/DL/DataScience) Application of Security concepts to the respected technologies a)Developer/Defender b)Attacker **4.2 Case Studies** **4.3** Discussion on the following Technologies (IoT/Automation/Quantum Computing/BlockChain/SpaceTechnologies/ICS(IndustrialControlSystems)/Containerization/VR/AR/IR/3D Printing/Drones)	15

Reference books:

1. Official (ISC) ² CCSP Study Guide, Second Edition
2. https://cyberstartupobservatory.com/cyber-security-next-generation-challenges-threats-and-defense/
3. Cybersecurity Issues in Emerging Technologies By Leandros Maglaras, Ioanna Kantzavelou ISBN 9780367626174 October 15, 2021 Forthcoming by CRC Press
4. Space Security: Emerging Technologies and Trends (First)Publisher : K W Publishers Pvt Ltd; First edition (15 January 2017) ISBN-13 : 978-9386288356

Self-Learning topics (Unit wise):

Sub- unit	Topic
1.1	Glossary of definitions, Roles of Service: Customer ,Provider ,Broker and partner Characteristics of :Multitenancy, Elasticity, Scalability, Resource Pooling Block, Technologies: Virtualization, Storage, Networking, Databases and orchestration
1.2	Access Control, Data Sanitization and operations. ,Network Security
1.3	Business Continuity Planning ,Portability and inter-operability Security Considerations for SAAS,IAAS,PAAS
1.4	Product Certifications(e.g.: Common criteria(cc) , FIPS140-2)
1.5	Categories: SAAS, IAAS,PAAS , Deployment models: Public, Private, Hybrid, Community
2.1	Physical environments, Management , Plane (Scheduling, Orchestration, Maintenance Business Requirements (e.g., Recovery Time Objective (RTO) , Recovery Point Objective (RPO), Recovery Service Level (RSL))
2.2	Data Lifecycle, Data Dispersion, Storage types, Data Classification, Data Discovery(Structured and Unstructured data), Hashing, Event sources
3.1	Secure SDLC process, Phases and Methodologies, Software Configuration Management and Versioning, Security Testing**,** Solutions e.g.(Federated Identity, Identity Providers, Single Sign-On (SSO), Multi-factor Authentication, Cloud Access Security Broker (CASB))
3.2	backup and restore , Management of Change, Continuity, Security, Incident ,Problem, Release, Deployment ,Configuration, Availability, Capacity, Service Level
4.3	Discussion on the following Technologies (IoT/Automation/Quantum Computing/BlockChain/SpaceTechnologies/ICS(IndustrialControlSystems)/Containerization/VR/AR/IR/3D Printing/Drones)

Online Resources
https://www.japcc.org/cybersecurity-challenges-with-emerging-technologies/ http://www3.weforum.org/docs/WEF_Future_Series_Cybersecurity_emerging_technology_and_systemic_risk_2020.pdf

Course Code: MS-SIT-307 Security Operations

Unit	Details	No. of Lectures
1	**1.1 CIA Triad :** Who is a Threat Actor and Types of Threats & Threat Actors , Patch Tuesday, Exploit Wednesday, Zero day attacks , Common Vulnerabilities and Exposures (CVE) , Common Vulnerability Scoring system (CVSS) **1.2 Introduction to the Blue Team Mission:** What is a SOC? What is the mission? , Why are we being attacked? , Modern defense mindset , The challenges of SOC work **1.3 SOC Overview :**The people, process, and technology of a SOC , Aligning the SOC with your organization , SOC functional component overview , Tiered vs. tierless SOCs , Important operational documents **1.4 Overview of Defensible Network Concepts :** Network security monitoring (NSM) concepts , NSM event collection , NSM by network layer , Continuous security monitoring (CSM) concepts , CSM event collection , **1.5 Introduction to Events, Alerts, Anomalies, and Incidents :** Event collection , Alert collection , Signatures vs. anomalies , Alert incident creation , Event creation, attributes, correlation, and sharing , What is Alert Triage, How to prioritize alert. **1.6 Incident Management Systems :** SOC data organization tools ,Incident management systems options and features , Case creation, alerts, observables, playbooks, and workflow , Incident categorization **1.7 Threat Intelligence Platforms:** What is cyber threat intelligence? , Threat data vs. information vs. intelligence , Threat intel platform and workflow	15
2	**2.1 SIEM :**Benefits of data centralization , SIEM options and features , SIEM searching, visualizations, and dashboards , Use cases and use case databases , Advanced tools, including SIEM 2.0 , How SOAR works and benefits the SOC , Options and features , Data flow between SOAR and the SIEM **2.2 Opportunistic vs. targeted attackers :** Hacktivists, insiders, organized crime, governments , Motivation by attacker group , Case studies of different attack groups , Attacker group naming convention **2.3 Endpoint Attack Tactics :**Initial exploitation , Service-side vs client-side exploits , Post-exploitation tactics, tools, and explanations - execution, persistence, discovery, privilege escalation, credential access, lateral movement, collection, exfiltration **2.4 Endpoint Defense In-Depth :**Software inventory and Whitelisting , Vulnerability scanning and patching , Host intrusion prevention and detection systems , File integrity monitoring , Windows privileges and permissions , Endpoint detection and response tools (EDR) , Data loss prevention(DLP) , User and entity behavior analytics (UEBA) **2.5 Overview of how Windows Logging Works (PRAC) :** Channels, event IDs, and sources , XML format and event templates ,Log collection path	15

	2.6 How Linux Logging Works (PRAC)**:**Syslog log format , Syslog daemons , Syslog network protocol , Log collection path , Systemd journal , Application logging , Service vs. system logs **2.7 Interpreting Important Events :** Windows and Linux login events , Process creation logs , Service creation logs , USB events , User creation and modification **,** Windows Defender events , Kerberos events	
3	**3.1 Log Collection, Parsing, and Normalization:** Logging pipeline and collection methods**,** Parsing logs **,** The role of parsing and log enrichment , Log storage , classification and retention lifecycle **3.2 Identifying and Handling Suspicious Files :**Safely handling suspicious files , Dangerous files types , Exploits vs. program "features" ,Exploits vs. Payloads ,Executables, scripts, office docs, RTFs, PDFs, and miscellaneous exploits , Detecting malicious scripts **3.3 Perception, Memory, and Investigation :**The role of perception and memory in observation and analysis **,** Introduction to decomposition and externalization **3.4 Overview of Mental Models for Information Security :**Cyber kill chain , Defense-in-depth , NIST cybersecurity framework ,Incident response cycle **,** Threat intelligence levels and models **,** Diamond model **,** The OODA loop **,** Attack modeling, graph/list thinking, attack trees**,**Pyramid of pain **,** MITRE ATT&CK **3.5 Structured Analysis Techniques :**System 1 vs. System 2 thinking **,** Data-driven vs. concept-driven analysis , Confirmation bias avoidance , Link analysis, event matrices **3.6 Overview OPSEC :** OPSEC vs. your threat model , Traffic light protocol and intel sharing	15
4	**4.1 Intrusion Discovery :**Choosing an appropriate response , Reacting to opportunistic/targeted attacks **4.2 Incident Closing and Quality Review:** Steps for closing incidents **4.3 Overview of Improving Life in the SOC :**Improvement through SOC human capital theory , The future of SOCs, including AI-Assisted SOCs, machine learning, and training models **4.4 Analytic Features and Enrichment:** High-feature vs. low-feature logs **4.5 New Analytic Design, Testing, and Sharing :**Introduction to false positives/negatives **,** Verification of false positives/negatives with threat intel Regular expressions , Common matching and rule logic options **4.6 Tuning and False Positive Reduction :**Using policy to raise fidelity Automation and fast lanes **4.7 Automation and Orchestration: The** definition of automation vs. orchestration, What is SOAR? **,** Features of SOAR **,** Common SOAR use cases **4.8 Containing Identified Intrusions** Overview of Isolation options across network layers - physical, link, network, transport, application DNS firewalls, HTTP blocking and containment, SMTP, Web Application Firewalls	15

Reference books:

1. The Modern Security Operations Centerby Joseph Muniz, Aamir Lakhani, Omar Santos, Moses Frost ,Released April 2021 ,Publisher(s): Addison-Wesley Professional, ISBN: 9780135619773
2. Cisco CyberOps Associate CBROPS 200-201 by Omar Santos / Ron Taylor Released March 2021 Publisher(s): Pearson IT Certification ISBN: 0137333455
3. Security Operations Center: Building, Operating and Maintaining your SOC by Joey Muniz, Gary McIntyre, Nadhem AlFardan Released November 2015 Publisher(s): Cisco Press ISBN: 9780134052083

Self-Learning topics (Unit wise):

Sub- unit	Topic
1.2	Why are we being attacked? , Modern defense mindset
1.3	The people, process, and technology of a SOC, Tiered vs. tierless SOCs , Important operational documents
1.5	Event creation, attributes, correlation, and sharing
1.6	SOC data organization tools
2.1	Benefits of data
2.2	Hacktivists, insiders, organized crime, governments , Motivation by attacker group , Case studies of different attack groups , Attacker group naming convention
2.4	Software inventory and Whitelisting ,Windows privileges and permissions Data loss prevention(DLP) ,
2.5	Channels, event IDs, and sources , XML format and event templates ,Log collection path
2.6	Syslog log format , Syslog daemons , Syslog network protocol , Log collection path , Systemd journal , Application logging , Service vs. system logs
3.3	Dangerous files types , Exploits vs. program "features" ,Exploits vs. Payloads
3.5	Cyber kill chain , Defense-in-depth , NIST cybersecurity framework ,
3.6	Data-driven vs. concept-driven analysis , Confirmation bias avoidance ,
4.1	Choosing an appropriate response , Reacting to opportunistic/targeted attacks
4.4	High-feature vs. low-feature logs
4.5	Regular expressions
4.7	definition of automation vs. orchestration
4.8	Firewalls

Online Resources

Track 3: Data Science and Big Data Analytics
Course Code: MS-SIT-308 Applied Big Data Theory

Unit	Details	No. of Lectures

1	**1.1 Introduction to Big Data Analtyics:** What is Analytics? What is Big Data? Characteristics of Big Data , Analytics Flow for Big Data, Big Data Stack **1.2 Domain Specific Examples of Big Data:** Web ,Financial, Healthcare ,Internet of Things , Environment Logistics & Transportation Industry Retail **1.3 Big Data Patterns:** Analytics Architecture Components & Design Styles, MapReduce Patterns, **Case studies** : Setting up Big Data Stack: Hortonworks Data Platform (HDP) , Cloudera CDH Stack , Amazon Elastic MapReduce (EMR) Azure HDInsight	15
2	**2.1 Data Acquisition:** Data Acquisition Considerations, Publish - Subscribe Messaging Frameworks, Big Data Collection Systems, Messaging Queues, Custom Connectors **2.2 Data Analysis:** Steps of Data Analysis, Descriptive Analysis, Predictive Analysis, Predictive Analysis Methods. **Case studies:** The Effects of Predictive Analytics on Real Estate, The National Association of Realtors (NAR) and Its Use of Predictive Analytics, The Revolution of Predictive Analysis across a Variety of Industries	15
3	**3.1 Big Data Storage:** HDFS Architecture, HDFS Usage Examples **3.2 Real-time Analysis:** Stream Processing, Storm Case Studies, In-Memory Processing, **3.3: Interactive Querying:** Spark SQL, Hive, Amazon Redshift, Google BigQuery **3.4 Serving Databases & Web Frameworks:** Relational (SQL) Databases, Non-Relational (NoSQL) Databases, Python Web Application Framework – Django , **Case Studies** : Real-time Sensor Data Analysis , Real-Time Parking Sensor Data Analysis for Smart Parking System , Real-time Twitter Sentiment Analysis, Windowed Analysis of Tweets , Django application for viewing weather data, Batch Analysis of News Articles,	15
4	**4.1 Analytics Algorithms:** Frameworks, Clustering, Classification & Regression, Recommendation Systems **4.2 Data Visualization:** Frameworks & Libraries, Visualization Examples, Case Study: Genome Data Analysis (Implementation), Recommendation Systems, Alternating Least Squares (ALS) , Singular Value Decomposition (SVD), Classifying Handwritten Digits	15

REFERENCE BOOKS
1. Data Analytics Practical Guide, Arthur Zhang
2. Big Data Analytics : A Hands on Approach, Anshdeep Bagha and Vijay Madisetti
3. Big Data in Practice, Bernard Marr

Self-Learning Topic (Unit Wise)

Sub Unit	Topic
1.4	Setting up Big Data Stack: Hortonworks Data Platform (HDP) , Cloudera CDH Stack , Amazon Elastic MapReduce (EMR) Azure HDInsight
2.4	The Effects of Predictive Analytics on Real Estate, The National Association of Realtors (NAR) and Its Use of Predictive Analytics, The Revolution of Predictive Analysis across a Variety of Industries
3.5	Case Studies : Real-time Sensor Data Analysis , Real-Time Parking Sensor Data Analysis for Smart Parking System , Real-time Twitter Sentiment Analysis, Windowed Analysis of Tweets , Django application for viewing weather data, Batch Analysis of News Articles,
4.3	Case Study: Genome Data Analysis (Implementation), Recommendation Systems, Alternating Least Squares (ALS) , Singular Value Decomposition (SVD), Classifying Handwritten Digits

Online Resources

Course Code: MS-SIT-309 Data Warehousing and Management

Unit	Details	No. of Lectures
1	**1.1 Introduction to Data Mining:** Need of Data Mining, What Can Data Mining Do and Not Do? Data Mining Applications, Data Mining Process, Data Mining Techniques **1.2 Data Preprocessing:** Need for Data Preprocessing, Data Preprocessing Methods, Data cleaning, Data integration, Data transformation, Data reduction **1.3 Classification:** Types of Classification, Working of Classification , Guidelines for Size and Quality of the Training Dataset , Introduction to the Decision Tree Classifier, Naïve Bayes Method , Understanding Metrics to Assess the Quality of Classifiers : The boy who cried wolf , True positive , True negative , False positive ,False negative , Confusion matrix ,Precision , Recall , F-Measure	15

2	**2.1 Cluster Analysis:** Applications of Cluster Analysis , Desired Features of Clustering, Distance Metrics, Major Clustering Methods/Algorithms, Partitioning Clustering, Hierarchical Clustering Algorithms **2.2 Association Rule Mining:** Defining Association Rule Mining, Representations of Items for Association Mining, The Metrics to Evaluate the Strength of Association Rules , The Naïve Algorithm for Finding Association Rules, Approaches for Transaction Database Storage, The Apriori Algorithm, , Closed and Maximal Itemsets , The Apriori–TID Algorithm for Generating Association Mining Rules, Direct Hashing and Pruning (DHP) , Dynamic Itemset Counting (DIC) , Mining Frequent Patterns without Candidate Generation (FP Growth) Implementing Clustering with Weka and R: Handling Missing Values, Results Analysis after Applying Clustering, Classification of Unlabeled Data, Clustering in R using Simple k-Means	15
3	**3.1 Web mining and search engines:** Introduction ,Web Content Mining , Web Usage Mining , Web Structure Mining, Introduction to Modern Search Engines, Working of a Search Engine, PageRank Algorithm , Precision and Recall **3.2 Data warehouse:** The Need for an Operational Data Store (ODS) , Operational Data Store , Data warehouse , Data Marts **3.3 Data Warehouse Schema:** Introduction to Data Warehouse Schema , Star Schema, Snowflake Schema ,Fact Constellation Schema (Galaxy Schema) , Comparative Study of Data Warehouse with OLTP and ODS Data warehouses versus OLTP: similarities and distinction Comparison among Star, Snowflake and Fact Constellation Schema	15
4	**4.1 Online Analytical Processing:** Introduction to OLAP, Representation of Multi-dimensional Data , Implementing Multi-dimensional View of Data in Oracle, Improving efficiency of OLAP by pre-computing the queries, Types of OLAP Servers, OLAP Operations **4.2 NoSQL:** The Rise of Relational Databases, Major Issues with Relational Databases, Challenges from the Internet Boom, Possible Solutions to Handle Huge Amount of Data, The Emergence of Technologies for Cluster Environment, Birth of NoSQL, Defining NoSQL from the Characteristics it Shares, Data Models of NoSQL, Future of NoSQL, Recent applications	15

	of data mining methods; Decision support system (DSS) and its components, Knowledge discovery from data, Difference between NoSQL and Relational Data Models (RDBMS)	

REFERENCE BOOK
1. Data Mining and Data Warehousing, Prateek Bhatia
2. Data Mining Concepts and Techniques

Self-Learning Topic (Unit Wise)

Sub Unit	Topic
1.4	Understanding Metrics to Assess the Quality of Classifiers : The boy who cried wolf , True positive , True negative , False positive ,False negative , Confusion matrix ,Precision , Recall , F-Measure
2.3	Implementing Clustering with Weka and R: Handling Missing Values, Results Analysis after Applying Clustering, Classification of Unlabeled Data, Clustering in R using Simple k-Means
3.4	Comparative Study of Data Warehouse with OLTP and ODS Data warehouses versus OLTP: similarities and distinction, Comparison among Star, Snowflake and Fact Constellation Schema
4.3	Recent applications of data mining methods; Decision support system (DSS) and its components, Knowledge discovery from data, Difference between NoSQL and Relational Data Models (RDBMS)

Online Resources

Course Code: MS-SIT-310 Programming with Hadoop and Spark

Unit	Details	No. of Lectures
1	**1.1 Introduction to Hadoop:** Hadoop Distributed File System, YARN, Installing Hadoop3 **1.2 Data analytics using Hadoop:** Distributed computing using Apache Hadoop, Hive, Apache Spark, Visualization using Tableau , Scientific Computing and Big Data Analysis with Python and Hadoop : Installing standard Python, Installing Anaconda ,Using Conda	15
2	**2.1 Data Processing with MapReduce:** The MapReduce framework**,** MapReduce job types, MapReduce patterns **2.2 Batch Analytics with Apache Spark:** SparkSQL and DataFrames, DataFrame APIs and the SQL API, Schema – structure of data, Loading datasets, Saving datasets, Aggregations, Joins , Statistical big data with r and Hadoop: Install R on workstations and connect to the data in Hadoop Install R on a shared server and connect to Hadoop, Utilize Revolution R Open Execute R inside of MapReduce using RMR2 Summary and outlook for pure open source options	15
3	**3.1 Spark Core:** Overview, High-level Architecture, Application Execution, Data Sources, Application Programming Interface, Lazy Operations, Caching , Spark Jobs, Shared Variables **3.2 Interactive Data Analysis with Spark Shell:** Getting Started, REPL Commands ,Using the Spark Shell as a Scala Shell, Number Analysis, Log Analysis **3.3 Writing a Spark Application:** Hello World in Spark, Compiling and Running the Application, Monitoring, the Application , Debugging the Application **3.4 Spark Streaming:** Introduction, API, A Complete Spark Streaming Application , Monitoring Spark Application: jobs launched by application, stages in Job, Environment, Spark Streaming Application, Spark SQL Queries	15
4	**4.1 Spark SQL:** Introducing Spark SQL, Performance, Applications, API , Built-in Functions, UDFs and UDAFs , Interactive Analysis with Spark SQL JDBC Server **4.3 ML with Spark:** Introduction **,** Spark Machine Learning Libraries , MLlib Overview, The MLib API An Example of MLib Application, Spark ML, An example of Spark ML Application	15

REFERENCE BOOKS
1. Big Data Analytics with Hadoop 3, Pakt
2. Big Data Analytics with Spark, Apress

Self-Learning Topic (Unit Wise)

Sub Unit	Topic

1.3	Scientific Computing and Big Data Analysis with Python and Hadoop : Installing standard Python, Installing Anaconda , Using Conda
2.3	Statistical big data with r and Hadoop: Install R on workstations and connect to the data in Hadoop Install R on a shared server and connect to Hadoop, Utilize Revolution R Open Execute R inside of MapReduce using RMR2 Summary and outlook for pure open source options
3.5	Monitoring Spark Application: jobs launched by application, stages in Job, Environment, Spark Streaming Application, Spark SQL Queries
4.3	Built-in Functions, UDFs and UDAFs , Interactive Analysis with Spark SQL JDBC Server, An Example of MLib Application, Spark ML, An example of Spark ML Application

Online Resources

Part - 4 Detailed Scheme Practical

Course Code: MS-SIT-3P1

Practical I	Technical Writing and Entrepreneurship	**Total Credits: 2**
Unit (1 to 4)	**Content**	Periods per week : 4 (1 period is 60minutes)
	The learners are expected to develop a project beyond the undergraduate level. Normal web sites, web applications, mobile apps are not expected. Preferably, the project should be from the elective chosen by the learner at the post graduate level in semester two. The learner is supposed to prepare the synopsis and documentation for SRS (Software Requirement Specification). The same project has to be implemented in Semester IV. The learner is supposed to publish a research paper in National/International journal of repute on the same / similar topic.	

Course Code: MS-SIT-3P2

Practical I	Natural Language Processing	Total Credits: 2
Unit (1 to 4)	**Content**	Periods per week : 4 (1 period is 60 minutes)
1	a. Install NLTK b. Convert the given text to speech c. Convert audio file Speech to Text.	
2	a. Study of various Corpus – Brown, Inaugural, Reuters, udhr with various methods like fields, raw, words, sents, categories, b. Create and use your own corpora(plaintext, categorical) c. Study Conditional frequency distributions Study of tagged corpora with methods like tagged_sents, tagged_words. d. Write a program to find the most frequent noun tags. e. Map Words to Properties Using Python Dictionaries f. Study DefaultTagger, Regular expression tagger, UnigramTagger g. Find different words from a given plain text without any space by comparing this text with a given corpus of words. Also find the score of words.	
3	a. Study of Wordnet Dictionary with methods as synsets, definitions, examples, antonyms. b. Study lemmas, hyponyms, hypernyms, entailments, c. Write a program using python to find synonym and antonym of word "active" using Wordnet d. Compare two nouns e. Handling stopword. Using nltk Adding or Removing Stop Words in NLTK's Default Stop Word List Using Gensim Adding and Removing Stop Words in Default Gensim Stop Words ListUsing Spacy Adding and Removing Stop Words in Default Spacy Stop Words List	
4	Text Tokenization a. Tokenization using Python's split() function b. Tokenization using Regular Expressions (RegEx) c. Tokenization using NLTK d. Tokenization using the spaCy library e. Tokenization using Keras f. Tokenization using Gensim	
5	Important NLP Libraries for Indian Languages and perform: a. word tokenization in Hindi b. Generate similar sentences from a given Hindi text input c. Identify the Indian language of a text	

6	Illustrate part of speech tagging. a. Part of speech Tagging and chunking of user defined text. b. Named Entity recognition of user defined text. c. Named Entity recognition with diagram using NLTK corpus – treebank	
7	a. Define grammar using nltk. Analyze a sentence using the same. b. Accept the input string with Regular expression of FA: 101+ c. Accept the input string with Regular expression of FA: (a+b)*bba d. Implementation of Deductive Chart Parsing using context free grammar and a given sentence.	
8	Study PorterStemmer, LancasterStemmer, RegexpStemmer, SnowballStemmer Study WordNetLemmatizer	
9	Speech Tagging: a. Speech tagging using spacy b. Speech tagging using nktl Statistical parsing: a. Usage of Give and Gave in the Penn Treebank sample b. probabilistic parser Malt parsing: Parse a sentence and draw a tree using malt parsing.	
10	a. Multiword Expressions in NLP b. Normalized Web Distance and Word Similarity c. Word Sense Disambiguation	

Course Code: MS-SIT-3P3

Practical I	Deep Learning	Total Credits: 2
Unit (1 to 4)	**Content**	Periods per week : 4 (1 period is 60minutes)
1	Performing matrix multiplication and finding eigen vectors and eigen values using TensorFlow	
2	Solving XOR problem using deep feed forward network.	
3	Implementing deep neural network for performing binary classification task.	
4	a) Aim: Using deep feed forward network with two hidden layers for performing multiclass classification and predicting the class. b) Aim: Using a deep feed forward network with two hidden layers for performing classification and predicting the probability of class.	

	c) Aim: Using a deep feed forward network with two hidden layers for performing linear regression and predicting values.	
5	a)Evaluating feed forward deep network for regression using KFold cross validation. b)Evaluating feed forward deep network for multiclass Classification using KFold cross-validation.	
6	Implementing regularization to avoid overfitting in binary classification.	
7	Demonstrate recurrent neural network that learns to perform sequence analysis for stock price.	
8	Performing encoding and decoding of images using deep autoencoder.	
9	Implementation of convolutional neural network to predict numbers from number images	
10	Denoising of images using autoencoder	

Course Code: MS-SIT-3P4

Practical I	Programming Computer Vision	**Total Credits: 2**
Unit (1 to 4)	**Co nte nt**	Periods per week : 4 (1 period is 60 minutes)

1	Basic Image Processing using PIL.
	    a. Convert images to another format
	    b. Create thumbnails
	    c. Copy and paste regions
	Resize and rotate	

2	Place a 3D model in a scene using OpenGL.	
3	Loading 3D models and displaying them.	
4	Write a simple image search engine.	
5	Apply the dense SIFT descriptor to images of hand gestures to build a simple hand gesture recognition system.	
6	A simple OCR problem of recognizing numbers in images of printed sudokus.	

7	Basic Feature Detection using SimpleCV.
	    a. Finding Blobs of a Specific Color
	    b. Find the line features in an image	

	Find circular features in an image	
8	Extract the information from a barcode.	
9	Track objects between frames using Optical Flow.	
10	Face Detection using OpenCV.	

Course Code: MS-SIT-3P5

Practical I	Cyber Forensics and Cyber Law	**Total Credits: 2**
Unit (1 to 4)	**Content**	Periods per week : 4 (1 period is 60minutes)
1	File System Analysis Using Autopsy	
2	File System Analysis Using The Sleuth Kit (TSK)	
3	Identifying and Extracting Malware	
4	Getting an Image Ready for Examination	
5	Viewing an Image on a Windows, Linux and Mac Forensic Workstations	
6	Using Xplico for Network Forensics	
7	Imaging using DCFLDD and XXD	
8	Using Bulk Extractor	
9	Mock Stage 1 Audit (Document Review) per ISO 19011 & ISO 27001 for Fictitious Organization	
10	Mock Stage 2 Audit per ISO 19011 & ISO 27001 for Fictitious Organization	

Course Code: MS-SIT-3P6

Practical I	Security in cloud and other emerging technologies	**Total Credits: 2**

Unit (1 to 4)	Content	Periods per week : 4 (1 period is 60minutes)
1	Design and implement security monitoring.	
2	Design and implement security alerting.	
3	Design and implement logging solution.	
4	Design and implement secure network infrastructure.	
5	Design and implement host-based security.	
6	Design and implement key management and use.	
7	Design and implement data encryption solution for data at rest	
8	Design and implement data encryption solution for data in transit.	
9	Designing a cloud setup	
10	Understanding cloud privacy policy	

Course Code: MS-SIT-3P7

Practical I	Security Operations	Total Credits: 2
Unit (1 to 4)	Content	Periods per week : 4 (1 period is 60 minutes)
1	Recovering Deleted Partitions	
2	Analyze traffic for FTP password cracking attempts	
3	Forensic Analysis of Storage to Acquire the Email Attachments	
4	USB Device Enumeration using Windows PowerShell	
5	Database Forensics Using SQL Server Management Studio	
6	Logical / Physical Acquisition of Android Devices	
7	Collecting Windows /Linux Logs using scripts	

8	Implement packet transmission analysis	
9	Analyze traffic for SMB password cracking attempts	
10	Analyze traffic for sniffing attempts/ Analyze traffic to detect malware activity	

Reference tools :
OSSIM OSSEC Sagan Splunk Free Snort Elasticsearch MozDef ELK Stack Wazuh Apache Metron

Course Code: MS-SIT-3P8

Practical I	Applied Big Data Analytics	Total Credits: 2
Unit (1 to 4)	Cont ent	Periods per week : 4 (1 period is 60minutes)
1	Processing data generated by social media platform(raw data fetching)	
2	Write a Python / R program to pick the content for Bill Boards from the given data	
3	Write a Python program to process the balance sheet to ensure that only good data is processing.	
4	Collecting and ingesting data from various sources into the big data storage using Data Access Connectors.	
5	Analyze data stored in Hbase	
6	Pig Latin scripts to sort, group, join, project, and filter your data	

7	Real time Analysis using Apache Storm	
8	Writing interactive Query using BigQuery	
9	Hive Databases, Tables, Views, Functions and Indexes	
10	Data visualization using Pygal / Creating data model using Cassandra	

Course Code: MS-SIT-3P9

Practical I	Data Management and Data Warehousing Theory	Total Credits: 2
Unit (1 to 4)	Content	Periods per week : 4 (1 period is 60minutes)
1	Create an Employee Table with the help of Data Mining Tool WEKA.	
2	Apply Pre-Processing techniques to the training data set of Employee Table.	
3	Normalize Employee Table data using Knowledge Flow.	
4	Finding Association Rules for Banking data.	
5	To Construct Decision Tree for Customer data and classify it.	
6	Write a procedure for Clustering Customer data using Simple KMeans Algorithm.	
7	Develop a star schema defining subject area , fact Table and dimension table.	
8	Demonstration of OLAP operations.	
9	Write a program of Apriori algorithm using any programming language.	
10	Demonstration of classification rule process on WEKA data-set using j48 algorithm.	

Course Code: MS-SIT-3P10

Practical I		Total Credits: 2
	Programming with Hadoop and Spark	
Unit (1 to 4)	**Content**	Periods per week : 4 (1 period is 60minutes)
1	Hadoop Installation Stand Alone Mode Pseudo Distributed Mode	
2	Word Count Map Reduce program to understand Map Reduce Paradigm.	
3	Implementing Page Rank algorithm using Map-Reduce	
4	Implementing Clustering algorithm using Map-Reduce.	
5	Implementing Frequent Item set algorithm using Map-Reduce.	
6	Performing various RDD operation	
7	Performing interactive data analysis using spark shell	
8	Data stream processing using Spark streaming	
9	Storing, modifying and Retrieving using Spark Sql	
10	Graph processing with Spark	

Part 5 - The Scheme of Teaching and Examination is as under: Semester – IV Summary

Sr. No.	Choice Based Credit System			Subject Code	Remarks
1	Core Course (Information Technology)			MS-SIT-401, MS-SIT-402, MS-SIT-403,	
				MS-SIT-4P1, MS-SIT-4P2, MS-SIT-4P3,	
2	Elective Course	Discipline Specific Elective (DSE) Course			
		2.1	Interdisciplinary Specific Elective (IDSE) Course		
		2.2	Dissertation/Project		
		2.3	Generic Elective (GE) Course		
3	Ability Enhancement Compulsory Courses (AECC)				
	Skill Enhancement Courses (SEC)				

Second Year Semester –IV Internal and External Detailed Evaluation Scheme

Sr. No.	Subject Code	Subject Title	Periods Per Week (Period of 45min)						Internals				Total Marks
			Units	S. L.	L	T	P	Credit	S. L. E	CT+AT=15+5	PA	SEE	
1	MS-SIT-401	Block Chain	4	20%*	5	0	0	4	4	20	10	60	100
2	MS-SIT-402		-	-	0	0	0	0	0	0	0	0	0
3	MS-SIT-403		=	-	0	0	0	0	0	0	0	0	0
5	MS-SIT-4P1		-	-	0	-	3	2					50
6	MS-SIT-4P2		-	-	0	-	0	6					150
7	MS-SIT-4P3		-	-	0	-	0	12					300
	Total Periods/ Credit		24					24					600

*One to two lectures to be taken for CONTINUOUS self -learning evaluation

First Year Semester IV – Units – Topics- Teaching Hours

S.N	Subject Code & Title		Subject Unit Title	Lectures (45 min)	Total Lectures	Credit	Total Marks
1	MS-SIT-401	1	Blockchain Introduction Working of Blockchain Working of Bitcoin Ethereum	15	60	4	100 (60+40)
		2	Ethereum Solidity Programming	15			
		3	Hyperledger Smart Contracts and Tokens Mining Ether	15			
		4	Cryptoecnomic Blockchain Application Development	15			
2	MS-SIT-402	1				0	0
		2					
		3					
		4					
	MS-SIT-403	1				0	0
		2					
		3					
		4					
5	MS-SIT-4P1 Practical based on MS-SIT-401	1	Practical Based on MS-SIT-401 Blockchain		36 L x3 batches = 108 lectures	2	50

6	MS-SIT-4P2 Practical based on MS-SIT-402	2				4	150
7	MS-SIT-4P3 Practical based on MS-SIT-403	3				10	300
			TOTAL			**24**	600

- Lecture Duration – 48 Minutes
- **One Credit =15 Hours**

L: Lecture: Tutorials P: Practical Ct-Core Theory, Cp-Core Practical, SLE- Self learning evaluation CT-Commutative Test, SEE- Semester End Examination, PA-Project Assessment, AT-Attendance

Course Code: MS-SIT-401 Block Chain

Unit	Details	No. of Lectures
1	**1.1 Blockchain:** Introduction, History, Centralized versus Decentralized systems, Layers of blockchain, Importance of blockchain, Blockchain uses and use cases , Blockchain funding and ICO's. **1.2 Working of Blockchain:** Blockchain foundation, Cryptography, Game Theory, Computer Science Engineering, Properties of blockchain solutions, blockchain transactions, distributed consensus mechanisms, Blockchain mechanisms, Scaling blockchain **1.3 Working of Bitcoin:** Money, Bitcoin, Bitcoin blockchain, bitcoin network, bitcoin scripts, Full Nodes and SVPs, Bitcoin wallets. **1.4 Introduction to Ethereum:** three parts of blockchain, Ether as currency and commodity, Building trustless systems, Smart contracts, Ethereum Virtual Machine, The Mist browser, Wallets as a Computing Metaphor, The Bank Teller Metaphor, Breaking with Banking History,	15
2	**2.1 Advance Ethereum:** How Encryption Leads to Trust, System Requirements, Using Parity with Geth, Anonymity in Cryptocurrency, Central Bank Network, Virtual Machines, EVM Applications, State Machines, Guts of the EVM, Blocks, Mining's Place in the State Transition Function, Renting Time on the EVM, Gas, Working with Gas, Accounts, Transactions, and Messages, Transactions and Messages, Estimating Gas Fees for Operations, Opcodes in the EVM. **2.2 Solidity Programming:** Introduction, Global Banking Made Real, Complementary Currency, Programming the EVM, Design Rationale, Importance of Formal Proofs, Automated Proofs, Testing, Formatting Solidity Files, Reading Code, Statements and Expressions in Solidity, Value Types, Global Special Variables, Units, and Functions,	15
3	**3.1 Hyperledger:** Overview, Fabric, composer, installing hyperledger fabric and composer, deploying, running the network, error troubleshooting. **3.2 Smart Contracts and Tokens:** EVM as Back End, Assets Backed by Anything, Cryptocurrency Is a Measure of Time, Function of Collectibles in Human Systems, Platforms for High-Value Digital Collectibles, Tokens as Category of Smart Contract, Creating a Token, Deploying the Contract, Playing with Contracts **3.3 Mining Ether:** Why? Ether's Source, Defining Mining, Difficulty, Self-Regulation, and the Race for Profit, How Proof of Work Helps Regulate Block Time, DAG and Nonce, Faster Blocks, Stale Blocks, Difficulties, Ancestry of Blocks and Transactions, Ethereum and Bitcoin, Forking, Mining, Geth on Windows, Executing Commands in the EVM via the Geth Console, Launching Geth with Flags, Mining on the Testnet, GPU Mining Rigs, Mining on a Pool with Multiple GPUs.	15

4	**4.1 Cryptoecnomics:** Introduction, Usefulness of cryptoeconomics, Speed of blocks, Ether Issuance scheme, Common Attack Scenarios , Case Study **4.2 Blockchain Application Development:** Decentralized Applications, Blockchain Application Development, Interacting with the Bitcoin Blockchain, Interacting Programmatically with Ethereum—Sending Transactions, Creating a Smart Contract, Executing Smart Contract Functions, Public vs. Private Blockchains, Decentralized Application Architecture, **4.4 Building an Ethereum DApp:** The DApp, Setting Up a Private Ethereum Network, Creating the Smart Contract, Deploying the Smart Contract, Client Application, **4.5 DApp deployment:** Seven Ways to Think About Smart Contracts, DApp Contract Data Models, EVM back-end and front-end communication, JSON-RPC, Web 3, JavaScript API, Using Meteor with the EVM, Executing Contracts in the Console, Recommendations for Prototyping, Third-Party Deployment Libraries, Creating Private Chains. **4.6 Case Studies on practical Blockchain implementation: Suggested Case Studies: Case Studies of Enterprise Blockchain :** Overview of enterprise-level blockchain implementations such as JP Morgan's Quorum, Ripple, Tendermint, and HyperLedger . **Case study of PolkaPlay (polkaplay.io):** Polkaplay is a unique platform where users can create images, short videos, and NFTs seamlessly while earning rewards. Measures that governments have taken to regulate and control blockchain technology e.g. Anti-Money Laundering (AML) and Know Your Customer (KYC) regulations, anonymity goals, and government techniques for deanonymization of entities on blockchain	15

References

1 Beginning Blockchain A Beginner's Guide to Building Blockchain Solutions, Bikramaditya Singhal, Gautam Dhameja, Priyansu Sekhar Panda,Apress,2018
1 Introducing Ethereum and Solidity, Chris Dannen,Apress,2017
2 The Blockchain Developer, Elad Elrom,Apress.2019
3 Mastering Ethereum, Andreas M. Antonopoulos ,Dr. Gavin Wood, O'Reilly,First,2018
4 Blockchain Enabled Applications,Vikram Dhillon,David Metcalf,Max Hooper,Apress,2017

Sub Unit	Topic
4.6	**Case Studies on practical blockchain implementation** **Suggested Case Studies:** 1. **Case Studies of Enterprise Blockchain:** Overview of enterprise-level blockchain implementations such as JP Morgan's Quorum, Ripple, Tendermint, and HyperLedger. 2. **Case study of PolkaPlay (polkaplay.io):** Polkaplay is a unique platform where users can create images, short videos, and NFTs seamlessly while earning rewards. 3. Measures that governments have taken to regulate and control blockchain technology e.g. Anti-Money Laundering (AML) and Know Your Customer (KYC) regulations, anonymity goals, and government techniques for deanonymization of entities on blockchain

Part -7 Detailed Scheme Practical

Course Code: MS-SIT-4P1

Practical I	Blockchain	**Total Credits: 2**
Unit (1 to 4)	**Content**	Periods per week : 4 (1 period is 60minutes)
1	Write the following programs for Blockchain in Python: a. A simple client class that generates the private and public keys by using the builtin Python RSA algorithm and test it. b. A transaction class to send and receive money and test it. c. Create multiple transactions and display them. d. Create a blockchain, a genesis block and execute it. e. Create a mining function and test it. f. Add blocks to the miner and dump the blockchain.	
2	Install and configure Go Ethereum and the Mist browser. Develop and test a sample application	
3	Implement and demonstrate the use of the following in Solidity: A. Variable, Operators, Loops, Decision Making, Strings, Arrays, Enums, Structs, Mappings, Conversions, Ether Units, Special Variables. B. Functions, Function Modifiers, View functions, Pure Functions, Fallback Function, Function Overloading, Mathematical functions, Cryptographic functions.	
4	Implement and demonstrate the use of the following in Solidity: a. Withdrawal Pattern, Restricted Access. b. Contracts, Inheritance, Constructors, Abstract Contracts, Interfaces. c. Libraries, Assembly, Events, Error handling.	
5	Install hyperledger fabric and composer. Deploy and execute the application.	
6	Write a program to demonstrate mining of Ether.	
7	Demonstrate the running of the blockchain node.	
8	Demonstrate the use of Bitcoin Core API.	
9	Create your own blockchain and demonstrate its use.	
10	Build Dapps with angular.	

Course Code: MS-SIT-402
Project Documentation and Viva-voce (Semester III) and
Project Implementation and Viva-Voce (Semester IV)

Goals of the course Project Documentation & Implementation and Viva-Voce

The student should:
- Be able to apply relevant knowledge and abilities, within the main field of study, to a given problem
- Within given constraints, even with limited information, independently analyse and discuss complex inquiries/problems and handle larger problems on the advanced level within the main field of study
- Reflect on, evaluate and critically review one's own and others' scientific results
- Be able to document and present one's own work with strict requirements on structure, format, and language usage
- Be able to identify one's need for further knowledge and continuously develop one's own knowledge
- To prepare the synopsis and documentation for SRS (Software Requirement Specification).

To start the project:
- Start thinking early in the programme about suitable projects.
- Read the instructions for the project.
- Attend and listen to other student´s final oral presentations.
- Refer to previously submitted project reports.
- Communicate and be mentored by senior master students.
- Attend related information events (workshops / seminars / conferences etc.) about the related topics.

Application and approval:
- Read all the detailed information about project.
- Finalise supervisor / guide / guide in area of interest.
- Check with the coordinator about subject/project, place and supervisor / guide / guide.
- Write the project proposal and plan along with the supervisor / guide / guide.
- Fill out the application together with the supervisor / guide / guide.
- Hand over the complete application, proposal and plan to the coordinator.
- Get an acknowledgement and approval from the coordinator to start the project.

During the project:
- Search, gather and read information and literature about the theory.
- Document the practical work and your results systematically.
- Take part in seminars and the follow-ups/supervision.
- Think early on about disposition and writing of the final report.

- Discuss your thoughts with the supervisor / guide and others.
- Read the SOP and the remaining document which will be required again.
- Plan for and do the mid-term reporting to the coordinator/examiner.
- Do a mid-term report also at the work-place (can be a requirement in some work-places).
- Write the first draft of the final report and rewrite it based on feedback from the supervisor / guide / and possibly others.
- Plan for the final presentation of the report.

Finishing the project:
- Finish the report and obtain an OK from the supervisor / guide.
- Ask the supervisor / guide to send the certificate and feedback form to the coordinator.
- Attend the pre-final oral presentation arranged by the Coordinator.
- Rewrite the final report again based on feedback from the opponents and possibly others.
- Prepare a title page and a popular science summary for your report.
- Send the completed final report to the coordinator (via plagiarism software)
- Rewrite the report based on possible feedback from the coordinator.
- Appear for the final exam.

Project Proposal/research plan
- The student should spend the first 1-2 weeks writing a 1-2 pages project plan containing: - Short background of the project
  - Aims of the project
  - Short description of methods that will be used
  - Estimated time schedule for the project
- The research plan should be handed in to the supervisor / guide and the coordinator.
- Writing the project plan will help you plan your project work and get you started in finding information and understanding of methods needed to perform the project.

Project Documentation
The documentation should contain:
- Introduction - that should contain a technical and social (when possible) motivation of the project topic.
- Description of the problems/topics.
- Status of the research/knowledge in the field and literature review.
- Description of the methodology/approach. (The actual structure of the chapters here depends on the topic of the documentation.)
- Results - must always contain analysis of results and associated uncertainties.
- Conclusions and proposals for the future work.
- Appendices (when needed).
- Bibliography - references and links.

For the master's documentation, the chapters cannot be dictated, they may vary according to the type of project. However, in Semester III Project Documentation and Viva Voce must contain at least 3 chapters (Introduction, Review of Literature, Methodology / Approach, etc. depending on the type of project.) The Semester III report should be spiral bound.
In Semester IV, the remaining Chapters should be included (which should include Proposed Design / UI design , Experiments performed, Results and discussion, Testing methodology , Conclusions and proposals for future work, Appendices ,) and Bibliography - references and links. Semester IV report should include all the chapters and should be hardbound. It should also contain the National/International paper published in reputed journal by the student.

SEM 4
Course Code: MS-SIT-403: Internship

Internship Documentation:

PURPOSE OF INTERNSHIP:

- An internship is a great opportunity to learn in industrial environment without being an employee of the company. Students are advised to set their goals prior to starting their internship and focus on completing them during the internship.

INTERNSHIP DURATION AND ACADEMIC CREDENTIALS:
The following framework is proposed to give academic credit for the internship undergone as part of the programme.

- A 12 credits of Internship/ Entrepreneurial activities / Inter/ Intra Institutional Training may be counted toward MScIT Post Graduate Programme.

- Here, 1 credit is equivalent to minimum 40-45 hours of work. Therefore, a full-time intern is expected to spend 40 - 45 hours per week on Internship, Training, Project work, Seminar activities etc. This will result in about 600-800 hours of total internship duration for MScIT students.

- Intimation of commencement of internship shall be submitted to the HOD concerned before the commencement of the ongoing semester.

- Two guides will supervise the internship project work, one from the department and another one from industry.

- Industry/Educational Organization must submit the month-wise satisfactory attendance of the students to the department.

- Candidate should regularly visit the institute and present his/her project progress report to their respective guide(s).

- The final project presentation is evaluated on the basis of the recommendation given by outside supervisor, and further can be evaluated by institute guide.

- If the internship project is not found to be of high quality, then the student will have to reappear in the next semester for their work.

- The candidate is required to publish internship work in conferences and journals with due permission/ consent from the organization/industry where he has undergone the internship.

- If the student feels that the internship work is not of high quality/not-related to their field of interest, then he/ she should submit the application to the department.

- Industry/ Institute should allow to produce results obtained during project/ internship period in the project report. The written certificate to this effect from the industry/ institute is mandatory before consideration of the proposed project/ internship.

GUIDELINES FOR INTERNS-

- If a student joins a very large organization to do an internship, he must use the opportunity to learn about the activities performed in the various departments.

- Attitude and mindset play a great role in the learning process. Do tackle all tasks given with enthusiasm and positive attitude.

- Interns must avoid negativity and never ignore a chance offered to them to learn more about a concept, technology, industry or company.

- Interns must be inquisitive and try to gain maximum knowledge and exposure.

- Interns shall identify a good mentor within the company and take initiative to execute new projects where one can make a difference to the company.

- Interns should enjoy during the internship and leave with tangible accomplishments.

- The intern will maintain a regular internship schedule determined by the Intern and his/her Project Head.

FORMAT1. STUDENT INTERNSHIP PROGRAM APPLICATION

1. Student Name:		
2. Campus Address:		Phone:
3. Home Address:		Phone:
3a. Student email address:		
4. Academic Concentration	5. Internship Semester:_____Year.	
6. Overall GPA:		

Faculty mentor Signature:_____Date_____.

Signature confirms that the student has attended the internship orientation and has met all paperwork and process requirements to participate in the internship program,and has received approval from his/her Advisor..

Student Signature:_____Date_____.

Signature confirms that the student agrees to the terms, conditions, and requirements of the Internship Program

Complete and submit to the TPO/ Internship Program Coordinator. Type or write clearly.

FORMAT 2: REQUEST LETTER FROM INSTITUTE TO INTERNSHIP PROVIDER

To

      The General Manager (HR)

      ......….………….….....

      ......….………….….....

Subject: REQUEST FOR 04/06 months INTERNSHIP TRAINING of M.ScIT students.

Dear Sir,

      Our Students have undergone internship training in your esteemed Organization in the previous years. Iacknowledge the help and the support extended to our students during training in previous years.

For first time HSNC University has made internship mandatory for all MScIT students in their final semester.

      In view of the above, I request your good self to allow our following_____students for practical raining in your esteemed organization. Kindly accord your permission and give at least one-week time for students to join training after confirmation.

S. No.	Name	Roll No.	Year	Discipline

If vacancies exist, kindly do plan for Campus/Off Campus Interview for_____batch passing out students in above branches.

      A line of confirmation will be highly appreciated.

With warm regards,

Yours sincerely,

TPO.

FORMAT 3. OBJECTIVES/ GUIDELINES/ AGREEMENT: INTERNSHIP SYNOPSIS (THIS WILL BE PREPARED IN CONSULTATION WITH FACULTY MENTOR)

An internship is a unique learning experience that integrates studies with practical work. This agreement is written by the student in consultation with the faculty Mentor and Industrial supervisor. It shall serve to clarify the educational purpose of the internship and to ensure an understanding of the total learning experience among the principal parties involved.

Part I: Contact Information Student

Name:_____Student ID#_____Class Year: _____

Campus Address: _____

City, State: _____

Phone:_____Email: _____

Industrial Supervisor

Name:_____Title:_____

Company/Organization:_____

Internship Address: _____

City, State, Pin: _____

Phone:_____Email: _____

Faculty Mentor

Name:_____Phone: _____

Campus Address: _____

Academic Credit Information

Internship Title:_____Department:_____

Course #:_____Credits:_____

Grading Option: Credit/Non-credit_____

Beginning Date:_____Ending Date: _____

Hours per Week:_____Internship is:_____Paid_____Unpaid _____

Part II: Internship Objectives/Learning Activities

Internship Objectives: What do you intend to learn, acquire and clarify through this internship? Try to use concrete, measurable terms in listing your learning objectives under each of the following categories:

- Knowledge and Understanding

- Skills

Learning Activities: How will your internship activities enable you to acquire the knowledge/understanding, and skills you listed above?

On the job: Describe how your internship activities will enable you to meet your learning objectives. Include projects, research, report writing, conversations, etc., which you will do while working, relating them to what you intend to learn.

Teaching/Mentoring Activities: How your technical knowledge can be applied at the site of the internship. How you can create value through mentoring/help people learn new things.

Off the job: List reading, writing, contact with faculty supervisor, peer group discussion, field trips, observations, etc., you will make and carry out which will help you meet your learning objectives.

Evaluation: Your Internship supervisor will provide a written evaluation of your internship. Describe in detail what other evidence you will provide to your faculty Mentor to document what you have learned (e.g. journal, analytic paper, project, descriptive paper, oral presentation, etc.) Include deadline dates.

Part III: The Internship

Job Description: Describe in as much detail as possible your role and responsibilities while on your internship. List duties, project to be completed, deadlines, etc. How can you contribute to the organization/site of internship.

Supervision: Describe in as much detail as possible the supervision to be provided/needed at the work site. List what kind of instruction, assistance, consultation you will receive from whom, etc.

Evaluation: How will your work performance be evaluated? By whom? When?

Part IV: Agreement

This contract may be terminated or amended by student, faculty coordinator or work supervisor at any time upon written notice, which is received and agreed to by the other two parties.

Student_____ Date _____

Faculty Mentor_____ Date _____

Industry Supervisor_____ Date _____

FORMAT 4: RELIEVING LETTER OF STUDENT

To

....

....

Subject: Relieving letter of student and Industry. Dear

Sir,

Kindly refer your letter/e-mail dated. ....on the above cited subject. As permitted by your good self the following students will undergo Industrial Internship in your esteemed organization under your sole guidance & directions:

S.No.	Name of Students	Roll No.	Branch

This training being an essential part of the curriculum, the following guidelines have been prescribed in the curriculum for the training. You are therefore, requested to please issue following guidelines to the concerned manager/Industrial Supervisor.

1. Internship schedule may be prepared and a copy of the same may be sent to us.
2. Each student is required to prepare Internship diary and report.
3. Kindly check the Internship diary of the student daily.
4. Issue instruction regarding working hours during training and maintenance of the attendance record.

You are requested to evaluate the student's performance on the basis of grading i.e. Excellent, Very Good, Satisfactory and Non Satisfactory on the below mentioned factors. The performance report may please be forwarded to the undersigned on completion of training in sealed envelope.

S.No.	Name of Students	Evaluation Ranking
a	Attendance and general behavior	
b	Relation with workers and supervisors	
c	Initiative and efforts in learning	
d	Knowledge and skills improvement	
e	Contribution to the organization	

Your efforts in this regard will positively enhance knowledge and practical skills of the students, your cooperation will be highly appreciated and we shall feel obliged.

The students will abide by the rules and regulation of the organization and will maintain a proper discipline with keen interest during their Internship. The students will report to you on dated...along with a copy of this letter.

Yours sincerely,

Training & Placement Officer

FORMAT 5: STUDENT'S DAILY DIARY/ DAILY LOG

DAY-1		DATE		
Time of arrival		Time of Departure		Remarks
Deptt./Division		Number of hours:		
Name of HOD/ Supervisor With e-mail id				
Main points of the day				

Signature of Industry Supervisor

FORMAT 6: SUPERVISOR EVALUATION OF INTERN

Student Name:_____Date:_____

Work Supervisor:_____Title:_____

Company/Organization:_____

Internship Address: _____

Dates of Internship: From_____To_____

Please evaluate your intern by indicating the frequency with which you observed the following behaviors:

Parameters	Needs improvement	Satisfactory	Good	Excellent
Behaviors				
Performs in a dependable manner				
Cooperates with co-workers and supervisors				
Shows interest in work				
Learns quickly				
Shows initiative				
Produces high quality work				
Accepts responsibility				
Accepts criticism				
Demonstrates organizational skills				
Uses technical knowledge and expertise				
Shows good judgment				
Demonstrates creativity/originality				
Analyzes problems effectively				
Is self-reliant				
Communicates well				
Writes effectively				
Has a professional attitude				
Gives a professional appearance				
Is punctual				
Uses time effectively				

Overall performance of student intern (circle one):

(Needs improvement/ Satisfactory/_____Good/_____Excellent)

Additional comments, if any:

Signature of Industry supervisor_____HR Manager _____

FORMAT 7: STUDENT FEEDBACK OF INTERNSHIP (TO BE FILLED BY STUDENTS AFTER INTERNSHIP COMPLETION)

Student Name: _____ Date:_____

Industrial Supervisor: _____ Title:_____

Supervisor Email: _____ Internship is:_____Paid_____Unpaid_____

Company/Organization: _____

Internship Address: _____

Faculty Coordinator: _____ Department: _____

Dates of Internship: From _____ To _____

Please fill out the above in full detail

Give a brief description of your internship work (title and tasks for which you were responsible): Was your internship experience related to your major area of study?

_____Yes, to a large degree_____Yes, to a slight degree_____No, not related at all

Indicate the degree to which you agree or disagree with the following statements.

This experience has:	Strongly Agree	Agree	No Opinion	Disagree	Strongly Disagree
Given me the opportunity to explore a career field					
Allowed me to apply classroom theory to practice					
Helped me develop my decision-making and problem-solving skills					
Expanded my knowledge about the work world prior to permanent employment					
Helped me develop my written and oral communication skills					
Provided a chance to use leadership skills (influence others, develop ideas with others, stimulate decision-making and action)					
This experience has:	Strongly Agree	Agree	No Opinion	Disagree	Strongly Disagree
Expanded my sensitivity to the ethical implications of the work involved					

Made it possible for me to be more confident in new situations					
Given me a chance to improve my interpersonal skills					
Helped me learn to handle responsibility and use my time wisely					
Helped me discover new aspects of myself that I didn't know existed before					
Helped me develop new interests and abilities					
Helped me clarify my career goals					
Provided me with contacts which may lead to future employment					
Allowed me to acquire information and/or use equipment not available at my Institute					

In the Institute internship program, faculty members are expected to be mentors for students. Do you feel that your faculty coordinator served such a function? Why or why not?

How well were you able to accomplish the initial goals, tasks and new skills that were set down in your learning contract? In what ways were you able to take a new direction or expand beyond your contract? Why were some goals not accomplished adequately?

In what areas did you most develop and improve?

What has been the most significant accomplishment or satisfying moment of your internship? What did you

dislike about the internship?

Considering your overall experience, how would you rate this internship? (Circle one). (Satisfactory/ Good/

Excellent)

Give suggestions as to how your internship experience could have been improved. (Could you have handled added responsibility? Would you have liked more discussions with your professor concerning your internship? Was closer supervision needed? Was more of an orientation required?)

FORMAT 8 : PROFORMA FOR EVALUTION OF INTERNSHIP BY INSTITUTE

DEPARTMENT OF TRAINING AND PLACEMENT

Ph._____Fax_____Email_____

Evaluation (I)_____

1. Name of Student_____Mob. No. _____
2. College Roll No._____University Roll No. _____
3. Branch/Semester_____Period of Training_____
4. Home Address with contact No._____
5. Address of Training Site: _____
6. Address of Training Providing Agency: _____
7. Name/Designation of Training In- charge _____
8. Type of Work_____
9. Date of Evaluation _____

    a) Attendance: _ (Satisfactory/ Good/ Excellent)

    b) Practical Work:___ (Satisfactory/ Good/ Excellent

    c) Faculty's Evaluation: _ (Satisfactory/ Good/ Excellent)

    d) Evaluation of Industry:_____(Satisfactory/ Good/ Excellent)

Overall grade: (Satisfactory/ Good/ Excellent)

Signature of Faculty Mentor   Signature of Internship Supervisor (Industry)

With date and stamp

*Photocopy of the attendance record duly attested by the training in-charge should be attached with the evaluation Proforma.

FORMAT 9: INTERNSHIP EVALUATION REPORT

Name & Address of Organization

_____

_____

_____

Sr. No.	Name of Student	Roll No.	Marks to be awarded by			OVER ALL GRADE
			Punctuality Grade (Satisfactory/ Good/ Excellent)	Maintenance of Daily Diary Grade (Satisfactory/ Good/ Excellent)	Skill Test Grade (Satisfactory/ Good/ Excellent)	

FORMAT 10: ATTENDANCE SHEET

Name & Address of Organization

_____

_____

_____

Name of Student	
Roll. No	
Name of Course	
Date of Commencement of Trg.:	
Date of Completion of Training:	

Initials of the student

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
Month & Year																															

Signature of Company internship supervisor with company stamp/
seal

(Name_____) Contact

Reference document:

https://www.aicte-india.org/sites/default/files/AICTE%20Internship%20Policy.pdf

The performance grading shall be based on the aggregate performance of Internal Assessment and Semester End Examination.

R. **** Carry Forwards of Marks: In Case of A Learner Who Fails In The Internal Assessment And /Or Semester End Assessment In One Or More Subjects:

1) A learner who PASSES in the Internal Examination but FAILS in the Semester End Examination of the course shall re-appear for the Semester End Examination of that course. However, his/her marks of the Internal Examinations shall be carried over and he/she shall be entitled for grade obtained by him/her on passing.

2) A learner who PASSES in the Semester End Examination but FAILS in the Internal Assessment of the course shall re-appear for the Internal Examination of that course. However, his/her marks of the Semester End Examination shall be carried over and he/she shall be entitled for grade obtained by him/her on passing.

R.**** ALLOWED TO KEEP TERMS (ATKT):

a. A learner shall be allowed to keep term for Semester II irrespective of number of heads of failure in the Semester I.

b. A learner shall be allowed to keep term for Semester III if he/she passes each of Semester I and Semester II

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

learner who fails in not more than two courses of Semester I and Semester II taken together.

c. A learner shall be allowed to keep term for Semester IV irrespective of number of heads of failure in Semester III. However, the learner shall pass each course of Semester I and Semester II in order to appear for Semester IV.

d. A learner shall be allowed to keep term for Semester V if he/she passes Semester I, Semester II, Semester III and Semester IV

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

Learner shall pass Semester I and Semester II and fails in not more than two courses of Semester III and Semester IV taken together.

e. A learner shall be allowed to keep term for Semester VI irrespective of number of heads of failure in the Semester V. However, the learner shall pass each course of Semester III and Semester IV in order to appear for Semester VI.

f. The result of Semester VI of a learner, in regular program, shall be kept in abeyance until the learner passes each of Semester I, Semester II, Semester III, Semester IV and Semester V.

g. The result of Semester VI of a learner, in Honours program, shall be kept in abeyance until the learner passes each of Semester I, Semester II, Semester III, Semester IV and Semester V and additional

R. **** ADDITIONAL EXAMINATION:
INTERNAL ASSESSMENT:

Eligibility norms to appear for the additional class test or assignment or project for learners who remained absent:

a. The learner must apply to the Head of the Institution / School / Department giving the reason(s) for absence within 8 days of the conduct of the examination along with the necessary documents and testimonials.

b. If the learner is absent, on sanctioned lave from head of Institution / School / Department, for participation in Inter Collegiate events, State or National or International level events, Training camp or coaching camp organized by authorized university or state or national or international bodies, NSS / NCC Events / Camps / cultural activities / sports activities /

research festival or any other activities authenticated by the head of the institution, the head of the Institution shall generally grant permission to the learner to appear for the additional class test or assignment.

c. The Head of the Institution, on scrutiny of the documents and testimonials, may grant the permission to the learner to appear for the additional examination.

Class test or assignment for Internal Assessment:

a. A learner who is absent for the class test and for all the assignment/s will be declared fail in the Internal Assessment Scheme.

b. A learner who is absent for the class test and has appeared for all the assignment/s will be allowed to appear for the additional class test

c. A learner who has appeared for the class test but remains absent for all the assignment/s will be allowed to appear for only one additional assignment.

d. A learners who is absent for the class test or one assignment as the case may be the learner will be allowed to appear for the additional class test/assignment.

The Additional Class Test (or viva examination) or Assignment must be conducted 15 days prior to the commencement of the Semester End Examination after following the necessary procedure and completing the formalities.

SEMESTER END EXAMINATIONS
Eligibility to Appear For Additional Semester End Examination:
a. A learner who does not appear i.e. remains absent in some or all the courses on medical grounds or for representing the college / university in sports, cultural activities, activities of NSS, NCC or sports training camps conducted by recognized bodies / competent authorities or for any other reason which is considered valid under exceptional circumstances and to the satisfaction of the
Principal or the Head of the Institute OR fails n some or all the subjects is eligible to appear for the additional examination.

A learner who does not appear for both the Internal Assessment and Semester End Examination shall not be eligible to appear for the additional Semester End Examination.
The additional Semester End Examination shall be of two and half hours duration and of 70 marks. The learner shall appear for the course of the Semester End Examination for which he/she was absent or has failed.

MODE OF CONDUCT OF SEMESTER END ADDITIONAL EXAMINATION:
a) There will be one additional examination for semester I, II, III and IV for those who have failed or remained absent.

b) The absent learner will be allowed to appear for the examination by the head of the institution after following the necessary formalities subject to the reasons to the satisfaction of the head of the institution.

c) This examination will be held 20 days after the declaration of results but not later than 40 days.
PROJECT EVALUATION
1. A learner who PASSES IN ALL THE COURSES BUT DOES NOT secures minimum grade of E in project as applicable has to resubmit a fresh project till he/she secures a minimum of grade E.
2. The credits and grade points secured by him/her in the other courses will be carried forward and he/she shall be entitled for grade obtained by them on passing of all the courses.

3. The evaluation of project and viva/voce examination shall be done by marks only and then it will be converted into grade in the Ten point scale and award the same to the learner.

4. A learner shall have to obtain minimum of grade E (or its equivalent marks) in project evaluation and viva/voce taken together to obtain 30% marks in project work.

R.**: Grade Cum Marks Cards:**
The result gazette and the format of the Grade Cards for the semesters conducted by colleges on behalf of the University will be uniform for all the Colleges / Institutions as indicated in the manual for the faculty.

R.*: Semester wise Credit allocation:**

Course	Sem-1	Sem-II	Sem-III	Sem-IV	Total credit
IT	24	24	24	24	96

R.*** GRACING:** The gracing shall be carried out as per existing ordinances of the University in force.

R.** Question Papers Setting, Assessment Pattern:**
1. The question papers shall be set and assessed by the teacher, teaching the course. If the course is taught by more than one teacher, the question paper shall preferably be set jointly and assessment of the sections / questions shall be done by the respective teacher.
2. The College authorities may request the teachers from other institutes teaching the course to set the question paper and/or assess the answer papers. However, for such actions the university authorities may seek proper reasons and justifications from the concerned Head of the Institute.
3. The question paper set by the college in different courses shall be forwarded to the University within 15 days of the declaration of the results for the semester for being placed before the respective Board of Studies, which shall report their observations to the Academic Council and inform the observations of the Board and the Academic Council to the concerned colleges.

R.** Centralised Assessment:**
The entire work of assessment of the answer papers at the Semester End Examinations shall be centralized within the premises of the concerned college as per the provisions of the University Act and shall be open to inspection by the University. The College can appoint a Committee of 5 members to plan and conduct the CAP Center to ensure smooth, efficient and effective conduct of CAP and Completion of the Assessment.

R.** Verification and Revaluation**:
Shall be as per the existing ordinances and regulation / & VCD of the University.

R.** Ex-student:** Learner's who are declared failed, on account of failure at the Internal Assessment and/or Semester End Examinations or who have been allowed to keep terms for the higher class shall appear as ex-student for the Internal Assessment and/or the Semester End Examination in the failed course at the examinations held by their respective college. Examination for the ex-students will be held at least 15 days prior to the Semester End Examination of the next Semester as per the pattern of the course in the respective (failed) semester examination. The examinations for the ex-students shall be held in every semester.

R.** College Examination Committee**: The College Examination Committee shall consist of not more than 10 members, nominated by the Principal / Head of the Institute. One of the members shall be the Chairman of the Committee. The Committee will act as the custodian and shall be In-charge of all the matters pertaining to the Internal Assessment, Semester End Examination of regular as well as ex-students for all the examination at Semester I to IV and for the Internal Assessment for Semester V and VI including preparation of time table, setting of the question paper, arrangement for

assessment of the answer books, the declaration of the results, attending to and resolving the grievances/queries of the learners which are not part of Unfair Means Inquiry Committee, keeping records of the assessment of all the assessments and examinations, scrutiny of the student's eligible to appear for the additional examination and any other matter pertaining to the conduct of the additional and examination for the ex-students. The committee shall work as per the rules & regulation of the University and under the superintendent of the Principal/ Head of the Institution but as per direction of University Examination authority from time to time.

R.**** College Unfair Means Inquiry Committee: The College Unfair Means Inquiry Committee as per the prevailing ordinances of the University. The term of the committee shall be for five years subject to the provision of the Maharashtra Universities Act. The proceedings and working of the committee shall be maintained in the form of documents and minutes.

R.**** Sets of Question papers: Three different sets of question papers shall be drawn with the model answer paper and assessment scheme per course for every Semester End Examination one of which shall be used for the regular examination, the second set can be used for the additional examination and the third set can be used for the examination for the ex-student. Similarly two sets of question papers shall be drawn for every test/assignment conducted per course one of which shall be used for the examination and the other for the additional examination.

R.**** Remuneration to Paper Setters / Examiners / Teaching and Non-

Teaching Staff: The remuneration payable to the paper setters and examiners will be as prescribed by the University Statute from time to time. The remuneration payable to the teaching and non-teaching staff appointed for the conduct of the examinations will be as per the rates prescribed by the University for the conduct of the Third Year Examinations by the University in the concerned faculty

R.****** GRACING: The gracing shall be carried out as per existing ordinances of the University in force

O.*********: - Grace Marks passing in each head of passing: Grace Marks passing in each course/ head of passing (Theory/ Practical/ Oral/ Sessional/ TW/ External / Semester End Exam / Internal Assessment) The examinee shall be given the benefit of grace marks only for passing in each course / head of passing (Theory / Practical / Oral / Sessional/ TW) in External / Semester End Examination or Internal Examination Assessment as follows:

Head of Passing	Grace Marks Upto
Upto - 50	2
051 - 100	3
101 - 150	4
151 - 200	5
201 - 250	6
251 - 300	7
301 - 350	8
351 - 400	9
401 and above	10

Provided that the benefit of such gracing marks given in STATS courses head of passing shall not exceed 1% of the aggregate marks in that examination. Provided further that the benefit of gracing of marks under this Ordinance, shall be applicable only if the candidate passes the entire examination of semester / year. Provided further that this gracing is concurrent with the rules and guidelines of professional statutory bodies at the All India level such as AICTE, MCI, Bar

Council, CCIM, CCIH, NCTE, UGC etc.

O **** Grace Marks for getting Higher Class / Grade**
A candidate/learners who passes in all the subjects / courses and heads of passing in the examination without the benefit of either gracing or condonation rules and whose total number of marks falls short for securing Second Class / Higher Second Class/ First Class or next Higher Grade by marks not more 1% of the aggregate marks of that examination or up to 10 marks, which ever is less, shall be given the required marks to get the next higher or grade as the case may be.

O.****: - Grace Marks for getting Higher Class / Grade**
 A candidate/learners who passes in all the subjects / courses and heads of passing in the examination without the benefit of either gracing or condonation rules and whose total number of marks falls short for securing Second Class /
Higher Second Class/ First Class or next Higher Grade by marks not more 1% of the aggregate marks of that examination or up to 10 marks, whichever is less, shall be given the required marks to get the next higher or grade as the case may be.

Provided that benefits of above mentioned grace marks shall not be given, if the candidate fails to secure necessary passing marks in the aggregate course / head of passing also, if prescribed, in the examination concerned.

Provided further that benefits of above mentioned grace marks shall be given to the candidate for such examination/s only for which provision of award of Class / Grade has been prescribed.

Provided further that this gracing is concurrent with the rules and guidelines of professional statutory bodies at the All India level such as AICTE, MCI, Bar Council, CCIM, CCIH, NCTE etc.

O.**Grace Marks for getting distinction / Grade 'O' in the subject / course only**.
A candidate/learners who passes in all the Courses or Subjects/ Heads of passing in the examination without benefit of either gracing or condonation rules and whose total number of marks in the courses/ subject/s falls short by not more than three marks for getting Grade 'O'/ distinction in the courses / subject/s respected shall be given necessary grace marks up to three (03) in maximum two subjects, courses subject to maximum 1% of the total marks of that Head of Passing whichever is more, in a given examination.
Provided that benefits of above mentioned grace marks shall not be given to the candidate only for such examination/s for which provision for distinction in a course /subject has been prescribed.

Provided further that this gracing is concurrent with the rules and guidelines of professional statutory bodies at the All India level. such as AICTE, MCI, Bar Council, CCIM, CCIH, NCTE etc.

O. *** Condonation**
If a candidate/learners fails in only one course/ head of passing, having passed in all other courses/ heads of passing, his/her deficiency of marks in such head of passing may be condoned by not more than 1% of the aggregate marks of the examination or 10% of the total number of marks of that course / head of passing in which he/she is failing, whichever is less. However condonation, whether in one head of passing or aggregate head of passing be restricted to maximum up to 10 marks only.

Condonation of deficiency of marks be shown in the Grade Card/ Statement of Marks in the form of asterisk and Ordinance number. Provided that this condonation of marks is concurrent with the rules and guidelines of professional statutory bodies at the All India level such as AICTE, MCI, Bar Council, CCIM, CCIH, NCTE etc.

O.*** Moderation**

1. The Moderation System shall be application to all the faculties for Under Gradate and Post Graduate Semester End

Examination / External Theory Examination.

2.100% moderation of the answer book shall be carried out in the case of candidates failing by 10% of marks of the aggregate marks of that course / paper.

3. In case of STATS course, 100% moderation shall be carried out in case of candidates obtaining 70% and above marks or Grade 'O'.

4. The moderation of answer books of at least 5% of total number of candidates obtaining marks between Grade 'E' / minimum passing marks and marks
required for Grade 'A' and above First Class/ distinction shall be carried out on random sample basis.

5. One moderator shall be appointed per five examiners. However Chairman, Board of paper setters will act as the moderator, where there are less than five examiners.

6. Moderation work shall be carried out simultaneously with the central assessment of answer books at CAPs.

7. Where marks awarded by the moderator vary from those awarded by original examiner, the marks awarded by the moderator shall be taken as final.

8. University shall formulate detailed scheme of moderation on the basis of guidelines given above.

O.****: Vigilance Squad**
1. The Vigilance Squad/s of not less than three and not more than four members shall be appointed by the Vice Chancellor to visit the Centres of University Examinations to:

i. Ensure that the University Examinations are conducted as per norms laid down.

ii. Observe whether the Senior Supervisor / guides and Block Supervisor / guides are following scrupulously instructions for conduct of the University Examinations.

iii. Check the students who try to resort to malpractices at the time of University Examinations and report such case to the University.

2. The Vigilance Squad is authorized to visit any Examination Centre without prior intimation and enter office of the In-charge of the Examination Centre to check the record and other material relating to the conduct of Examination. They can enter in any block of Examination for checking the candidates identify card, fee receipt, hall tickets etc. to ascertain the authenticity of the Candidate. The Vigilance Squad shall e authorized to detect use of malpractices and unfair means in the University Examination.

3. The Vice Chancellor shall appoint Vigilance Squad which may include: Senior Teachers of Affiliated College/Recognized Institution/ University Departments /Teachers and desirably one lady teacher; and any other person as the Vice Chancellor considers appropriate.

4. The Chairman of Vigilance Squad/s shall submit the report on surprise visit directly to the Vice Chancellor with a copy to the concerned Principal. The Vigilance Squad/s may make suggestions in the matter of proper conduct of examinations, if necessary.

5. The Principal of the College where the centre of examination is located shall be responsible for the smooth conduct of examination. He/ She shall ensure strict vigilance against the use of unfair means by the students and shall be responsible

for reporting such cases to the University as well as the law of enforcing authority.

O. ******Amendments of Results

1)**Due To Errors** In any case where it is found that the result of an examination has been affected by errors, the Controller of Examinations shall have power to amend such result in such manner as shall be in accordance with the true position and to make such declaration as is necessary, with the necessary approval of Vice Chancellor, provided the errors are reported / detected within 6 months from the date declaration of results. Errors detected thereafter shall be placed before the Board of Examinations.
Error Means:-
i) Error in computer/data entry, printing or programming and the like.

ii) Clerical error, manual or machine, in totaling or entering of marks on ledger/register.

iii) Error due to negligence or oversight of examiner or any other person connected with evaluation, moderation and result preparation.
2. Due to fraud, malpractices etc.
In any case where the result of an examination has been ascertained and published and it is found that such result has been affected by any malpractices, fraud or any other improper conduct whereby an examinee has

benefited and that such examinee, has in the opinion of the Board of Examination been party of privy to or connived at such malpractice, fraud or improper conduct, the Board of Examination shall have power at any time notwithstanding the issue of the Certificate or the award of a Prize or Scholarship, to amend the result of such examinee and to make such declaration as the Board of Examination considers necessary in that behalf

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