Syllabus of M. Tech. in Computer Science (Internet of Things)

Semester I

Course Number	Subject	L	T	P	Credits
PGCS(IoT)101	Program Core I- Mathematical foundations of Computer Science	3	0	0	3
PGCS(IoT)102	Program Core II- Advanced Data Structures	3	0	0	3
PGCS(IoT)103 PGCS(IoT)103B/PGCS(IoT)103C	Program Elective I- A. Data Science/ B. Wireless Access Technologies/ C. Mobile Applications and Services	3	0	0	3
PGCS(IoT)104 PGCS(IoT)104 PGCS(IoT)104C	Program Elective II- A. Machine Learning/ B. Smart Sensors and Internet of Things/ C. Logic and Functional Programming	3	0	0	3
PGCS(IoT)105	Research Methodology and IPR	2	0	0	2
PGCS(IoT)106A/B/C/D/E/F	Audit Course	2	0	0	0
PGCS(IoT)192	Laboratory 1 (Advanced Data Structures)	0	0	4	2
PGCS(IoT)193A/B/C	Laboratory 2 (Based on Elective I)	0	0	4	2
PGCS(IoT)194A/B/C	Laboratory 3 (Based on Elective II)	0	0	4	2
	Total CredCSs: 20				

Semester II

Course Number	Subject	L	T	P	
PGCS(IoT)201	Program Core III – Advanced Computer Architecture	3	o	o	3
PGCS(IoT)202	ProgramCore IV – Wireless and Sensor Networks	3	o	o	3
PGCS(IoT)203A/B/C	Program Elective III – A. Sensor Networks and Internet of Things B. Data Visualization C. IoT Application and Communication Protocol	3	o	o	3
PGCS(IoT)204A/B/C	Program Elective IV – A. Big Data Analytics B. Network Security C. Advanced Machine Learning	3	o	o	3

PGCS(IoT)205A /B/C/D	AudCS Course	2	0	0	0
PGCS(IoT)291	Advanced Computer Architecture Lab	0	0	4	2
PGCS(IoT)292	Wireless and Sensor Networks Lab	0	0	4	2
PGCS(IoT)293A /B/C	Lab based on Elective III	0	0	4	2
PGCS(IoT)294	Term Paper with Seminar	0	0	4	2
	Total Credits: 20				

Semester III

Course Number	**Subject**	L	T	P	Credits
PGCS(IoT)301A/B/C	Program Elective V – A. Cloud Computing B. Real Time Operating Systems C. Emulation and Simulation Methodologies	3	0	0	03
PGCS(IoT)302A/ PGCS(IoT)302B/ PGCS(IoT)302C/ PGCS(IoT)302D/ PGCS(IoT)302E/ PGCS(IoT)302F	Open Elective A. Business Analytics B. Industrial Safety C. Operations Research D. Cost Management of Engineering Projects E. Composite Materials F. Waste to Energy	3	0	0	03
PGCS(IoT)391	Dissertation-I /Industrial Project	0	0	20	10
	Total Credits: 16				

Semester IV

Course Number	**Subject**	L	T	P	Credits
PGCS(IoT)491	Dissertation II	0	0	32	16
	Total Credits: 16				

Semester I

Name of the Course: M.Tech. in Internet of Things **Subject: Mathematical Foundation of Computer Science**			
Course Code: PGCS(IoT)101		**Semester:1st**	
Duration: 48 Hours		**Maximum Marks: 100**	
Teaching Scheme		**Examination Scheme**	
Theory: 3		End Semester Exam: 70	
Tutorial: 0		Attendance: 05	
Practical: NA		Internal Assessment: 25	
Credit: 3		Practical Sessional internal continuous evaluation: NA	
		Practical Sessional external examination: NA	
Aim:			
Sl. No.			
1.	**To understand the basic notions of discrete and continuous probability.**		
2.	**To understand the methods of statistical inference, and the role that sampling distributions play in those methods.**		
3.	**To be able to perform correct and meaningful statistical analyses of simple to moderate complexity.**		
Objective:			
Sl. No.			
1.	**To understand the mathematical fundamentals that are prerequisites for a variety of courses like Data mining, Network protocols, analysis of Web traffic, Computer security, Software engineering, Computer architecture, operating systems, distributed systems, Bioinformatics, Machine learning.**		
2.	**To develop the understanding of the mathematical and logical basis to many modern techniques in information technology like machine learning, programming language design, and concurrency.**		
3.	**To study various sampling and classification problems.**		
Pre-Requisite:			
Sl. No.			
1.	**Discrete Mathematics**		
2.			
Contents		**Hrs./week**	
Chapter	**Name of the Topic**	**Hours**	**Marks**
01	**Probability mass, density, and cumulative distribution functions, Parametric families of distributions, Expected value, variance, conditional expectation, Applications of the univariate and multivariate Central Limit Theorem, Probabilistic inequalities, Markov chains**	**7**	**10**
02	**Random samples, sampling distributions of estimators, Methods of Moments and Maximum Likelihood**	**7**	**12**
3	**Statistical inference, Introduction to multivariate statistical models: regression and classification problems, principal components analysis, The problem of overfitting**	**8**	**12**

	model assessment.		
4	**Graph Theory: Isomorphism, Planar graphs, graph colouring, Hamilton circuits and Euler cycles. Permutations and Combinations with and without repetition. Specialized techniques to solve combinatorial enumeration problems**	**11**	**16**
5	**Information Technology Applications, Data mining, Network protocols, analysis of Web traffic, Computer security, Software engineering, Computer architecture, operating systems, distributed systems, Bioinformatics, Machine learning.**	**10**	**15**
6	**Recent Trends in various distribution functions in the mathematical field of computer science for varying fields like bioinformatics, soft computing, and computer vision.**	**5**	**5**
	Sub Total:	**40**	**70**
	Internal Assessment Examination & Preparation of Semester Examination		**30**
	Total:		**100**

Practical:
Skills to be developed:

List of Practical: Sl. No. 1& 2 compulsory & at least three from the rest)

Assignments:

List of Books
Text Books:

Name of Author	**Title of the Book**	**Edition/ISSN/ISBN**	**Name of the Publisher**
1. John Vince,	**Foundation Mathematics for Computer Science,**		**Springer.**
2. K. Trivedi.	**Probability and Statistics with Reliability, Queuing, and Computer Science Applications.**		**Wiley.**
3.M.Mitzenmacher and E. Upfal.	**Probability and Computing: Randomized Algorithms and Probabilistic Analysis.**		
4. Alan Tucker	**Applied Combinatorics**		**Wiley**

Reference Books:

List of equipment/apparatus for laboratory experiments:	
Sl. No.	

1.	
2.	
3.	
4.	
5.	

End Semester Examination Scheme. Maximum Marks-70. Time allotted-3hrs.

Group	**Unit**	**Objective Questions** (MCQ only with the correct answer)		**Subjective Questions**			
		No of question to be set	Total Marks	No of question to be set	To answer	Marks per question	Total Marks
A	**1,2,3**	**12**	**20**	**5**	**3**	**10**	**70**
B	**4,5**	**8**		**4**	**2**		

- Only multiple choice type question (MCQ) with one correct answer are to be set in the objective part.
- Specific instruction to the students to maintain the order in answering objective questions should be given on top of the question paper.

Examination Scheme for end semester examination:

Group	**Chapter**	**Marks of each question**	**Question to be set**	**Question to be answered**

Examination Scheme for Practical Sessional examination:

Practical Internal Sessional Continuous Evaluation

Internal Examination: 40

Five No of Experiments			

External Examination: Examiner- 60

Signed Lab Note Book(for five experiments)		
On Spot Experiment(one for each group consisting 5 students)		
Viva voce		

Name of the Course: M.Tech. in Internet of Things **Subject:Advanced Data Structures**	
Course Code:PGCS(IoT)102, PGCS(IoT)192	**Semester: 1st**
Duration: 48 Hrs.	**Maximum Marks:** 200
Teaching Scheme	**Examination Scheme**
Theory: 3	**End Semester Exam:** 70
Tutorial: 0	**Attendance :** 5
Practical: 4	**Continuous Assessment:** 25
Credit: 3 + 2	**Practical Sessional internal continuous evaluation:** 40

	Practical Sessional external examination: 60		
Aim:			
Sl. No.			
1.	**Understand the implementation of symbol table using hashing techniques.**		
2.	**Develop and analyze algorithms for red-black trees, B-trees and Splay trees.**		
3.	**Develop algorithms for text processing applications.**		
4.	**Identify suitable data structures and develop algorithms for computational geometry problems.**		
Objective:			
Sl. No.	**The student should be able to choose appropriate data structures, understand the ADT/libraries, and use it to design algorithms for a specific problem.**		
1.	**Students should be able to understand the necessary mathematical abstraction to solve problems.**		
2.	**To familiarize students with advanced paradigms and data structure used to solve algorithmic problems.**		
3.	**Student should be able to come up with analysis of efficiency and proofs of correctness.**		
Pre-Requisite:			
Sl. No.			
3.	**UG level course in Data Structures**		
4.			
Contents		**Hrs./week**	
Chapter	**Name of the Topic**	**Hours**	**Marks**
01	**Dictionaries: Definition, Dictionary Abstract Data Type, Implementation of Dictionaries. Hashing: Review of Hashing, Hash Function, Collision Resolution Techniques in Hashing, Separate Chaining, Open Addressing, Linear Probing, Quadratic Probing, Double Hashing, Rehashing, Extendible Hashing.**	**7**	**10**
02	**Skip Lists: Need for Randomizing Data Structures and Algorithms, Search and Update Operations on Skip Lists, Probabilistic Analysis of Skip Lists, Deterministic Skip Lists**	**5**	**12**
03	**Trees: Binary Search Trees, AVL Trees, Red Black Trees, 2-3 Trees, B-Trees, Splay Trees 9**	**9**	**12**
04	**Text Processing: Sting Operations, Brute-Force Pattern Matching, The Boyer- Moore Algorithm, The Knuth-Morris-Pratt Algorithm, Standard Tries, Compressed Tries, Suffix Tries, The Huffman Coding Algorithm, The Longest Common Subsequence Problem (LCS), Applying Dynamic Programming to the LCS Problem.**	**12**	**16**
05	**Computational Geometry: One Dimensional Range Searching, Two Dimensional Range Searching, Constructing a Priority Search Tree, Searching a Priority Search Tree, Priority Range Trees, Quadtrees, k-D Trees.**	**10**	**15**
06	**Recent Trands in Hashing, Trees, and various computational geometry methods for effeciently solving the new evolving problem**	**5**	**5**
	Sub Total:	**48**	**70**
	Internal Assessment Examination & Preparation of Semester		**30**

	Examination		
	Total:		**100**

Practical: Based on Theory

Skills to be developed:

List of Practical: Sl. No. 1& 2 compulsory & at least three from the rest)

Assignments:

List of Books
Text Books:

Name of Author	**Title of the Book**	**Edition/ISSN/ISBN**	**Name of the Publisher**

Reference Books:

1. Mark Allen Weiss	**Data Structures and Algorithm Analysis in C++**	**2nd Edition**	**Pearson, 2004**
2. M T Goodrich, Roberto Tamassia	**Algorithm Design**		**John Wiley, 2002.**

List of equipment/apparatus for laboratory experiments:

Sl. No.	
6.	
7.	
8.	
9.	
10.	

End Semester Examination Scheme. Maximum Marks-70. Time allotted-3hrs.

Group	**Unit**	**Objective Questions** (MCQ only with the correct answer)		**Subjective Questions**			
		No of question to be set	Total Marks	No of question to be set	To answer	Marks per question	Total Marks
A	ALL	10	10				
B	ALL			5	3	5	70
C	ALL			5	3	15	

- Only multiple choice type question (MCQ) with one correct answer are to be set in the objective part.
- Specific instruction to the students to maintain the order in answering objective questions should be given on top of the question paper.

Examination Scheme for end semester examination:

Group	**Chapter**	**Marks of each question**	**Question to be set**	**Question to be answered**

A	**ALL**	**1**	**10**	**10**
B	**ALL**	**5**	**5**	**3**
C	**ALL**	**15**	**5**	**3**
Examination Scheme for Practical Sessional examination:				
Practical Internal Sessional Continuous Evaluation				
Internal Examination:				**40**
Five No of Experiments				
External Examination: Examiner-				**60**
Signed Lab Note Book(for five experiments)			**10**	
On Spot Experiment(one for each group consisting 5 students)			**40**	
Viva voce			**10**	

Name of the Course: M.Tech. in Internet of Things **Subject: Data Science**	
Course Code:PGCS(IoT)103A, PGCS(IoT)193A	**Semester: 1st**
Duration: 48 Hrs.	**Maximum Marks:** 200
Teaching Scheme	**Examination Scheme**
Theory: 3	**End Semester Exam:** 70
Tutorial: 0	**Attendance :** 5
Practical: 4	**Continuous Assessment:** 25
Credit: 3 + 2	**Practical Sessional internal continuous evaluation:** 40
	Practical Sessional external examination: 60

Aim:	
Sl. No.	
1.	**Explain how data is collected, managed and stored for data science;**
2.	**Understand the key concepts in data science, including their real-world applications and the toolkit used by data scientists;**
3.	**Implement data collection and management scripts using MongoDB**
Objective:	
Sl. No.	
1.	**Provide you with the knowledge and expertise to become a proficient data scientist.**
2.	**Demonstrate an understanding of statistics and machine learning concepts that are vital for data science;**
3.	**Produce Python code to statistically analyze a dataset;**
4.	**Critically evaluate data visualizations based on their design and use for communicating stories from data;**
Pre-Requisite:	
Sl. No.	
5.	
6.	

Contents		**Hrs./week**	
Chapter	**Name of the Topic**	**Hours**	**Marks**

01	**Unit 1:** **Introduction to core concepts and technologies: Introduction, Terminology, data science process, data science toolkit, Types of data, Example applications**	**6**	**10**
02	**Data collection and management: Introduction, Sources of data, Data collection and APIs, Exploring and fixing data, Data storage and management, Using multiple data sources**	**7**	**12**
03	**Data analysis: Introduction, Terminology and concepts, Introduction to statistics, Central tendencies and distributions, Variance, Distribution properties and arithmetic, Samples/CLT, Basic machine learning algorithms, Linear regression, SVM, Naive Bayes.**	**10**	**12**
04	**Data visualisation: Introduction, Types of data visualisation, Data for visualisation: Data types, Data encodings, Retinal variables, Mapping variables to encodings, Visual encodings.**	**11**	**16**
05	**Applications of Data Science, Technologies for visualisation, Bokeh (Python)**	**7**	**15**
06	**Recent trends in various data collection and analysis techniques, various visualization techniques, application development methods of used in data science.**	**7**	**5**
	Sub Total:	**48**	**70**
	Internal Assessment Examination & Preparation of Semester Examination		**30**
	Total:		**100**

Practical: Based on Theory

Skills to be developed:

List of Practical: Sl. No. 1& 2 compulsory & at least three from the rest)

Assignments:

List of Books
Text Books:

Name of Author	**Title of the Book**	**Edition/ISSN/ISBN**	**Name of the Publisher**

Reference Books:

1. Cathy O'Neil and Rachel Schutt.	**Doing Data Science,**	**Straight Talk From The Frontline.**	**O'Reilly.**
2. Jure Leskovek, AnandRajaraman and Jeffrey Ullman.	**Mining of Massive Datasets.**	**v2.1**	**Cambridge University Press.**

List of equipment/apparatus for laboratory experiments:

Sl. No.	
11.	
12.	
13.	

14.	
15.	

End Semester Examination Scheme. Maximum Marks-70. Time allotted-3hrs.

Group	**Unit**	**Objective Questions** (MCQ only with the correct answer)		**Subjective Questions**			
		No of question to be set	Total Marks	No of question to be set	To answer	Marks per question	Total Marks
A	ALL	10	10				
B	ALL			5	3	5	70
C	ALL			5	3	15	

- Only multiple choice type question (MCQ) with one correct answer are to be set in the objective part.
- Specific instruction to the students to maintain the order in answering objective questions should be given on top of the question paper.

Examination Scheme for end semester examination:

Group	**Chapter**	**Marks of each question**	**Question to be set**	**Question to be answered**
A	**ALL**	**1**	**10**	**10**
B	**ALL**	**5**	**5**	**3**
C	**ALL**	**15**	**5**	**3**

Examination Scheme for Practical Sessional examination:

Practical Internal Sessional Continuous Evaluation

Internal Examination:			**40**
Five No of Experiments			

External Examination: Examiner-		**60**
Signed Lab Note Book(for five experiments)	**10**	
On Spot Experiment(one for each group consisting 5 students)	**40**	
Viva voce	**10**	

Name of the Course: M.Tech. in Internet of Things **Subject:Wireless Access Technologies**	
Course Code:PGCS(IoT)103B, PGCS(IoT)193B	**Semester: 1st**
Duration: 48 Hrs.	**Maximum Marks:** 200
Teaching Scheme	**Examination Scheme**
Theory: 3	**End Semester Exam:** 70
Tutorial: 0	**Attendance :** 5
Practical: 4	**Continuous Assessment:** 25
Credit: 3 + 2	**Practical Sessional internal continuous evaluation:** 40
	Practical Sessional external examination: 60

Aim:	
Sl. No.	
1.	**Interpret basic terms and characteristics of wireless access networks**

2.	**Compare various wireless access technologies**
3.	**Analyze measurements of wireless access network parameter**
4.	**Assess security issues in wireless networks**
5.	**Choose modulation technique for wireless transmission**
Objective:	
Sl. No.	
1.	**Overview of wireless access technologies, Fixed wireless access networks. Terminal mobility issues regarding wireless access to Internet**
2.	**Introduction to various Network topologies, hotspot networks, Communication links: point-to-point, point-to-multipoint, multipoint-to-multipoint.**
3.	**To provide an overview of Standards for most frequently used wireless access networks: WPAN, UWB, WLAN, WMAN, WWAN. Network services. Wireless access networks planning, design and installation.**
4.	**To get and insight of Wireless networking security issues, Wireless access network exploitation and management, software requirements, link quality control.**
Pre-Requisite:	
Sl. No.	
1.	**Wireless Networks**
2.	

Contents		**Hrs./week**	
Chapter	**Name of the Topic**	**Hours**	**Marks**
01	**Necessity for wireless terminals connectivity and networking. Wireless networking advantages and disadvantages, Overview of wireless access technologies. Narrowband and broadband networks, fixed and nomadic networks. Wireless local loop (WLL), Public Switched Telephone Network (PSTN) interfaces.**	**8**	**10**
02	**Fixed wireless access (FWA) networks, frequency bands for different networks. Criterions for frequency bands allocation, Network topologies, hotspot networks. Communication links: point-to-point (PTP), point-to-multipoint (PMP), multipoint-to-multipoint (MTM).**	**8**	**12**
03	**Standards for most frequently used wireless access networks: WPAN (802.15, Bluetooth, DECT, IrDA), UWB (Ultra-Wideband), WLAN (802.11, Wi-Fi, HIPERLAN, IrDA), WMAN (802.16, WiMAX, HIPERMAN, HIPERACCESS), WWAN (802.20), Other technologies for broadband wireless access, Local Multipoint Distribution Service (LMDS), Multichannel Multipoint Distribution Servicem (MMDS). Ad Hoc networks, Network services. Services types based on carrier frequency and bandwidth.**	**10**	**12**
04	**Wireless access networks planning, design and installation. Services provision, legislative and technical aspects, Technical and economic factors for network planning: expenses, coverage, link capacity, network complexity and**	**9**	**16**

	carrier-to-interference ratio (C/I). Base station or access point allocation. Base station and access point equipment. Terminal mobility issues regarding wireless access to Internet. Wireless networking security issues		
05	**Example of laptop or handheld PC wireless connection in real environment. PC wireless interface equipment. Wireless access network exploitation and management, software requirements, link quality control. Business model, wireless network services market, market research and marketing, service providers, wireless data application service providers (WDASP) and their role on public telecommunication services market, billing systems.**	**8**	**15**
06	**Recent trends in wireless networking and various access mechanism,new standards of wireless communication.**	**5**	**5**
	Sub Total:	**48**	**70**
	Internal Assessment Examination & Preparation of Semester Examination		**30**
	Total:		**100**

Practical: Based on Theory

Skills to be developed:

List of Practical: Sl. No. 1& 2 compulsory & at least three from the rest)

Assignments:

List of Books
Text Books:

Name of Author	**Title of the Book**	**Edition/ISSN/ISBN**	**Name of the Publisher**
Reference Books:			
1. M. P. Clark	**Wireless Access Networks: Fixed Wireless Access and WLL networks -- Design and Operation**		**John Wiley & Sons, Chichester**
2. D. H. Morais	**Fixed Broadband Wireless Communications: Principles and Practical Applications**		**Prentice Hall, Upper Saddle River**
3. R. Pandya	**Introduction to WLLs: Application and Deployment for Fixed and Broadband Services**		**IEEE Press, Piscataway**

List of equipment/apparatus for laboratory experiments:	
Sl. No.	

16.	
17.	
18.	
19.	
20.	

End Semester Examination Scheme. Maximum Marks-70. Time allotted-3hrs.

Group	**Unit**	**Objective Questions** (MCQ only with the correct answer)		**Subjective Questions**			
		No of question to be set	Total Marks	No of question to be set	To answer	Marks per question	Total Marks
A	ALL	10	10				
B	ALL			5	3	5	70
C	ALL			5	3	15	

- Only multiple choice type question (MCQ) with one correct answer are to be set in the objective part.
- Specific instruction to the students to maintain the order in answering objective questions should be given on top of the question paper.

Examination Scheme for end semester examination:

Group	**Chapter**	**Marks of each question**	**Question to be set**	**Question to be answered**
A	**ALL**	**1**	**10**	**10**
B	**ALL**	**5**	**5**	**3**
C	**ALL**	**15**	**5**	**3**

Examination Scheme for Practical Sessional examination:

Practical Internal Sessional Continuous Evaluation

Internal Examination: 40

Five No of Experiments			

External Examination: Examiner- 60

Signed Lab Note Book(for five experiments)	**10**	
On Spot Experiment(one for each group consisting 5 students)	**40**	
Viva voce	**10**	

Name of the Course: M.Tech. in Internet of Things **Subject:** Mobile Applications and Services	
Course Code:PGCS(IoT)103C, PGCS(IoT)193C	**Semester:1st**
Duration: 48 Hrs.	**Maximum Marks:** 200
Teaching Scheme	**Examination Scheme**
Theory: 3	**End Semester Exam:** 70
Tutorial: 0	**Attendance :** 5
Practical: 4	**Continuous Assessment:** 25
Credit: 3 + 2	**Practical Sessional internal continuous evaluation:** 40
	Practical Sessional external examination: 60

Aim:			
Sl. No.			
1.	**Identify the target platform and users and be able to define and sketch a mobile application**		
2.	**Understand the fundamentals, frameworks, and development lifecycle of mobile application platforms including iOS, Android, and PhoneGap**		
3.	**Design and develop a mobile application prototype in one of the platform (challenge project)**		
Objective:			
Sl. No.			
1.	**This course presents the three main mobile platforms and their ecosystems, namely Android, iOS, and PhoneGap/WebOS.**		
2.	**It explores emerging technologies and tools used to design and implement feature-rich mobile applications for smartphones and tablets**		
3.	**It also takes into account both the technical constraints relative to storage capacity, processing capacity, display screen, communication interfaces, and the user interface, context and profile**		
4.			
Pre-Requisite:			
Sl. No.			
1.	Wireless Communication and Mobile Computing		
2.			
Contents		**Hrs./week**	
Chapter	**Name of the Topic**	**Hours**	**Marks**
01	**Unit 1:Introduction:Introduction to Mobile Computing, Introduction to Android Development Environment, Factors in Developing Mobile Applications, Mobile Software Engineering, Frameworks and Tools, Generic UI Development Android User**	**8**	**10**
02	**More on Uis: VUIs and Mobile Apps, Text-to-Speech Techniques, Designing the Right UI, Multichannel and Multimodal Uis, . Storing and Retrieving Data, Synchronization and Replication of Mobile Data, Getting the Model Right, Android Storing and Retrieving Data, Working with a Content Provider**	**8**	**12**
03	**Communications via Network and the Web: State Machine, Correct Communications Model, Android Networking and Web, Telephony Deciding Scope of an App, Wireless Connectivity and Mobile Apps, Android Telephony Notifications and Alarms: Performance, Performance and Memory Management, Android Notifications and Alarms, Graphics, Performance and Multithreading, Graphics and UI Performance, Android Graphics**	**10**	**12**
04	**Putting It All Together : Packaging and Deploying, Performance Best Practices, Android Field Service App, Location Mobility and Location Based Services Android Multimedia: Mobile Agents and Peer-to-Peer Architecture, Android Multimedia**	**9**	**16**
05	**Platforms and Additional Issues : Development Process,**	**8**	**15**

	Architecture, Design, Technology Selection, Mobile App Development Hurdles, Testing, Security and Hacking , Active Transactions, More on Security, Hacking Android		
06	**Recent trends in Communication protocols for IoT nodes, mobile computing techniques in IOT, agents based communications in IoT**	**5**	**5**
	Sub Total:	**48**	**70**
	Internal Assessment Examination & Preparation of Semester Examination		**30**
	Total:		**100**

Practical: Based on Theory

Skills to be developed:

List of Practical: Sl. No. 1& 2 compulsory & at least three from the rest)

Assignments:

List of Books
Text Books:

Name of Author	**Title of the Book**	**Edition/ISSN/ISBN**	**Name of the Publisher**
Reference Books:			
Wei-Meng Lee	**Beginning Android™ 4 Application Development**	**2012**	**John Wiley & Sons**

List of equipment/apparatus for laboratory experiments:	
Sl. No.	
21.	
22.	
23.	
24.	
25.	

End Semester Examination Scheme. Maximum Marks-70. Time allotted-3hrs.

Group	**Unit**	**Objective Questions** (MCQ only with the correct answer)		**Subjective Questions**			
		No of question to be set	Total Marks	No of question to be set	To answer	Marks per question	Total Marks
A	ALL	10	10				
B	ALL			5	3	5	70

C	ALL			5	3	15	

- Only multiple choice type question (MCQ) with one correct answer are to be set in the objective part.
- Specific instruction to the students to maintain the order in answering objective questions should be given on top of the question paper.

Examination Scheme for end semester examination:

Group	**Chapter**	**Marks of each question**	**Question to be set**	**Question to be answered**
A	**ALL**	**1**	**10**	**10**
B	**ALL**	**5**	**5**	**3**
C	**ALL**	**15**	**5**	**3**

Examination Scheme for Practical Sessional examination:

Practical Internal Sessional Continuous Evaluation

Internal Examination:				**40**
Five No of Experiments				
External Examination: Examiner-				**60**
Signed Lab Note Book(for five experiments)		**10**		
On Spot Experiment(one for each group consisting 5 students)		**40**		
Viva voce		**10**		

Name of the Course: M.Tech. in Internet of Things **Subject:Machine learning**	
Course Code:PGCS(IoT)104A, PGCS(IoT)194A	**Semester: 1st**
Duration: 48 Hrs.	**Maximum Marks:** 200
Teaching Scheme	**Examination Scheme**
Theory: 3	**End Semester Exam:** 70
Tutorial: 0	**Attendance :** 5
Practical: 4	**Continuous Assessment:** 25
Credit: 3 + 2	**Practical Sessional internal continuous evaluation:** 40
	Practical Sessional external examination: 60

Aim:	
Sl. No.	
1.	**Extract features that can be used for a particular machine learning approach in various IOT applications.**
2.	**To compare and contrast pros and cons of various machine learning techniques and to get an insight of when to apply a particular machine learning approach.**
3.	**To mathematically analyse various machine learning approaches and paradigms.**
Objective:	
Sl. No.	
1.	**To learn the concept of how to learn patterns and concepts from data without being explicitly programmed in various IOT nodes.**

2.	**To design and analyse various machine learning algorithms and techniques with a modern outlook focusing on recent advances.**
3.	**Explore supervised and unsupervised learning paradigms of machine learning.**
4.	**To explore Deep learning technique and various feature extraction strategies.**

Pre-Requisite:

Sl. No.	
1.	**Algorithm and Data Structure**
2.	

Contents		**Hrs./week**	
Chapter	**Name of the Topic**	**Hours**	**Marks**
01	**Unit 1:** **Supervised Learning (Regression/Classification)** ● **Basic methods: Distance-based methods, Nearest-Neighbours, Decision Trees, Nave Bayes** • **Linear models: Linear Regression, Logistic Regression, Generalized Linear Models** • **Support Vector Machines, Nonlinearity and Kernel Methods** • **Beyond Binary Classification: Multi-class/Structured Outputs, Ranking**	**10**	**10**
02	**Unsupervised Learning** • **Clustering: K-means/Kernel K-means** • **Dimensionality Reduction: PCA and kernel PCA** • **Matrix Factorization and Matrix Completion** • **Generative Models (mixture models and latent factor models)**	**7**	**12**
03	**Evaluating Machine Learning algorithms and Model Selection, Introduction to Statistical Learning Theory, Ensemble Methods (Boosting, Bagging, Random Forests)**	**6**	**12**
04	**Sparse Modeling and Estimation, Modeling Sequence/Time-Series Data, Deep Learning and Feature Representation Learning**	**10**	**16**
05	**Scalable Machine Learning (Online and Distributed Learning)** **A selection from some other advanced topics, e.g., Semi-supervised Learning, Active Learning, Reinforcement Learning, Inference in Graphical Models, Introduction to Bayesian Learning and Inference**	**10**	**15**
06	**Recent trends classification applications.in various methods for learning techniques IoT applications of machine learning Various models for and IoT**	**5**	**5**
	Sub Total:	**48**	**70**

	Internal Assessment Examination & Preparation of Semester Examination		**30**
	Total:		**100**

Practical: Based on Theory

Skills to be developed:

List of Practical: Sl. No. 1& 2 compulsory & at least three from the rest)

Assignments:

List of Books
Text Books:

Name of Author	**Title of the Book**	**Edition/ISSN/ISBN**	**Name of the Publisher**

Reference Books:

1. Kevin Murphy	**Machine Learning: A Probabilistic Perspective**		**MIT Press, 2012**
2. Trevor Hastie, Robert Tibshirani, Jerome Friedman,	**The Elements of Statistical Learning,**		**Springer 2009 (freely available online)**
3.Christopher Bishop,	**Pattern Recognition and Machine Learning,**		**Springer, 2007.**

List of equipment/apparatus for laboratory experiments:

Sl. No.	
26.	
27.	
28.	
29.	
30.	

End Semester Examination Scheme. Maximum Marks-70. Time allotted-3hrs.

Group	**Unit**	**Objective Questions** (MCQ only with the correct answer)		**Subjective Questions**			
		No of question to be set	Total Marks	No of question to be set	To answer	Marks per question	Total Marks
A	ALL	10	10				
B	ALL			5	3	5	70
C	ALL			5	3	15	

- Only multiple choice type question (MCQ) with one correct answer are to be set in the objective part.
- Specific instruction to the students to maintain the order in answering objective questions should

be given on top of the question paper.				
Examination Scheme for end semester examination:				
Group	**Chapter**	**Marks of each question**	**Question to be set**	**Question to be answered**
A	**ALL**	**1**	**10**	**10**
B	**ALL**	**5**	**5**	**3**
C	**ALL**	**15**	**5**	**3**
Examination Scheme for Practical Sessional examination:				
Practical Internal Sessional Continuous Evaluation				
Internal Examination:				**40**
Five No of Experiments				
External Examination: Examiner-				**60**
Signed Lab Note Book(for five experiments)			**10**	
On Spot Experiment(one for each group consisting 5 students)			**40**	
Viva voce			**10**	

Name of the Course: M.Tech. in Internet of Things **Subject:Smart Sensors and Internet of Things**	
Course Code:PGCS(IoT)104B, PGCS(IoT)194B	**Semester: 1st**
Duration: 48 Hrs.	**Maximum Marks:** 200
Teaching Scheme	**Examination Scheme**
Theory: 3	**End Semester Exam:** 70
Tutorial: 0	**Attendance :** 5
Practical: 4	**Continuous Assessment:** 25
Credit: 3 + 2	**Practical Sessional internal continuous evaluation:** 40
	Practical Sessional external examination: 60

Aim:	
Sl. No.	
1.	**Understand the vision of IoT from a global context.**
2.	**Determine the Market perspective of IoT.**
3.	**Use of Devices, Gateways and Data Management in IoT.**
4.	**Application of IoT in Industrial and Commercial Building Automation and Real-World Design Constraints.**
5.	**Building state of the art architecture in IoT.**
Objective:	
Sl. No.	
1.	**Able to understand the application areas of IoT**
2.	**Able to realize the revolution of Internet in Mobile Devices, Cloud & Sensor Networks**

3.	**Able to understand building blocks of Internet of Things and characteristics**		
Pre-Requisite:			
Sl. No.			
1.	**Wireless Networks**		
2.			
Contents		**Hrs./week**	
Chapter	**Name of the Topic**	**Hours**	**Marks**
01	**Unit 1: Environmental Parameters Measurement and Monitoring: Why measurement and monitoring are important, effects of adverse parameters for the living being for IOT**	**7**	**10**
02	**Sensors: Working Principles: Different types; Selection of Sensors for Practical Applications Introduction of Different Types of Sensors such as Capacitive, Resistive, Surface Acoustic Wave for Temperature, Pressure, Humidity, Toxic Gas etc**	**8**	**12**
03	**Important Characteristics of Sensors: Determination of the Characteristics Fractional order element: Constant Phase Impedance for sensing applications such as humidity, water quality, milk quality Impedance Spectroscopy: Equivalent circuit of Sensors and Modelling of Sensors Importance and Adoption of Smart Sensors**	**11**	**12**
04	**Architecture of Smart Sensors: Important components, their features Fabrication of Sensor and Smart Sensor: Electrode fabrication: Screen printing, Photolithography, Electroplating Sensing film deposition: Physical and chemical Vapor, Anodization, Sol-gel**	**10**	**16**
05	**Interface Electronic Circuit for Smart Sensors and Challenges for Interfacing the Smart Sensor, Usefulness of Silicon Technology in Smart Sensor And Future scope of research in smart sensor**	**7**	**15**
06	**Recent trends in smart sensor for day to day life, evolving sensors and their architecture.**	**5**	**5**
	Sub Total:	**48**	**70**
	Internal Assessment Examination & Preparation of Semester Examination		**30**
	Total:		**100**

Practical: Based on Theory

Skills to be developed:

List of Practical: Sl. No. 1& 2 compulsory & at least three from the rest)

Assignments:

List of Books
Text Books:

Name of Author	**Title of the Book**	**Edition/ISSN/ISBN**	**Name of the**

			Publisher
Reference Books:			
1. Yasuura, H., Kyung, C.-M., Liu, Y., Lin, Y.-L.,	**Smart Sensors at the IoT Frontier,**		**Springer International Publishing**
2. Kyung, C.-M., Yasuura, H., Liu, Y., Lin, Y.-L	**Smart Sensors and Systems,**		**Springer International Publishing**

List of equipment/apparatus for laboratory experiments:	
Sl. No.	
31.	
32.	
33.	
34.	
35.	

End Semester Examination Scheme. Maximum Marks-70. Time allotted-3hrs.

Group	**Unit**	**Objective Questions** (MCQ only with the correct answer)		**Subjective Questions**			
		No of question to be set	Total Marks	No of question to be set	To answer	Marks per question	Total Marks
A	ALL	10	10				
B	ALL			5	3	5	70
C	ALL			5	3	15	

- Only multiple choice type question (MCQ) with one correct answer are to be set in the objective part.
- Specific instruction to the students to maintain the order in answering objective questions should be given on top of the question paper.

Examination Scheme for end semester examination:

Group	**Chapter**	**Marks of each question**	**Question to be set**	**Question to be answered**
A	**ALL**	**1**	**10**	**10**
B	**ALL**	**5**	**5**	**3**
C	**ALL**	**15**	**5**	**3**

Examination Scheme for Practical Sessional examination:

Practical Internal Sessional Continuous Evaluation

Internal Examination:			**40**
Five No of Experiments			
External Examination: Examiner-			**60**
Signed Lab Note Book(for five experiments)	**10**		

On Spot Experiment(one for each group consisting 5 students)	**40**	
Viva voce	**10**	

Name of the Course: M.Tech. in Internet of Things **Subject:Logic And Functional Programming**			
Course Code:PGCS(IoT)104C, PGCS(IoT)194C	**Semester: 1st**		
Duration: 48 Hrs.	**Maximum Marks:** 200		
Teaching Scheme	**Examination Scheme**		
Theory: 3	**End Semester Exam:** 70		
Tutorial: 0	**Attendance :** 5		
Practical: 4	**Continuous Assessment:** 25		
Credit: 3 + 2	**Practical Sessional internal continuous evaluation:** 40		
	Practical Sessional external examination: 60		
Aim:			
Sl. No.			
1.	**Understanding of the theory and practice of functional and logic programming For IoT.**		
2.	**The ability to write functional and logic programs for nodes in IoT.**		
3.	**The ability to solve problems in and using functional and logic programming.**		
Objective:			
Sl. No.			
1.	**To further the state of the art on the theoretical and practical aspects of developing declarative programming tools in logic programming for IOT data analysis**		
2.	**To introduce basics of functional programming and constraint logic programming for nodes in IoT.**		
3.	**Introduction into formal concepts used as a theoretical basis for both paradigms, basic knowledge and practical experience.**		
Pre-Requisite:			
Sl. No.			
1.	**Computer Programming, Mathematical Logic**		
2.			
Contents		**Hrs./week**	
Chapter	**Name of the Topic**	**Hours**	**Marks**
01	**Unit 1: Proposition Logic: Introduction of logic and Functional Paradigm, Propositional Concepts, Semantic Table, Problem Solving with Semantic Table**	**5**	**10**
02	**Natural Deduction and Axiomatic Propositional Logic: Rules of Natural Deduction, Sequent Calculus, Axiomatic Systems, Meta theorems, Important**	**7**	**12**

	Properties of AL, Resolution, Resolving Arguments		
03	**Introduction to Predicate Logic Objects, Predicates and Quantifiers, Functions, First Order Language, Quantifiers, Scopeand Binding, Substitution, An Axiomatic System for First Order Predicate Logic, Soundness and Completeness, Axiomatic Semantic and Programming**	**9**	**12**
04	**Semantic Tableaux & Resolution in Predicate Logic: Semantic Tableaux, Instantiation Rules, Problem-solving in Predicate Logic, Normal forms, Herbrand Universes and H-interpretation, Resolution, Unification, Resolution as a computing Tool, Nondeterministic Programming, Incomplete Data Structure, Second Order Programming in Prolog, Logic Grammars: Definite Clause Grammar, A Grammar Interpreter.**	**13**	**16**
05	**Lazy and Eager Evaluation strategies: Evaluation Strategies, Lazy Evaluation: Evaluation Order and strictness of function, Programming with lazy evaluation, Interactive functional program, Delay of unnecessary Computation, Infinite Data Structure, Eager Evaluation and Reasoning**	**9**	**15**
06	**Recent trends in logical and functional programming, predicate logics and various evaluation strategies**	**5**	**5**
	Sub Total:	**48**	**70**
	Internal Assessment Examination & Preparation of Semester Examination		**30**
	Total:		**100**

Practical: Based on Theory

Skills to be developed:

List of Practical: Sl. No. 1& 2 compulsory & at least three from the rest)

Assignments:

List of Books
Text Books:

Name of Author	**Title of the Book**	**Edition/ISSN/ISBN**	**Name of the Publisher**
Reference Books:			
1. John Kelly,	**"The Essence of Logic",**		**Prentice-Hall India.**
2. Saroj Kaushik,	**"Logic and Prolog Programming",**		**New Age International ltd**

List of equipment/apparatus for laboratory experiments:	
Sl. No.	
36.	
37.	

End Semester Examination Scheme. Maximum Marks-70. Time allotted-

3hrs.							
Group	**Unit**	**Objective Questions** (MCQ only with the correct answer)		**Subjective Questions**			
		No of question to be set	Total Marks	No of question to be set	To answer	Marks per question	Total Marks
A	ALL	10	10				
B	ALL			5	3	5	70
C	ALL			5	3	15	

- Only multiple choice type question (MCQ) with one correct answer are to be set in the objective part.
- Specific instruction to the students to maintain the order in answering objective questions should be given on top of the question paper.

Examination Scheme for end semester examination:				
Group	**Chapter**	**Marks of each question**	**Question to be set**	**Question to be answered**
A	**ALL**	**1**	**10**	**10**
B	**ALL**	**5**	**5**	**3**
C	**ALL**	**15**	**5**	**3**

Examination Scheme for Practical Sessional examination:			
Practical Internal Sessional Continuous Evaluation			
Internal Examination:			**40**
Five No of Experiments			
External Examination: Examiner-			**60**
Signed Lab Note Book(for five experiments)	**10**		
On Spot Experiment(one for each group consisting 5 students)	**40**		
Viva voce	**10**		

Name of the Course:M.Tech. in Internet of Things **Subject:Research Methodology and IPR**	
Course Code: PGCS(IoT)105	**Semester: 1st**
Duration: 36 hours	**Maximum Marks:100**
Teaching Scheme	**Examination Scheme**
Theory:2	End Semester Exam:70
Tutorial:0	End Semester Exam:70
Practical:0	Attendance : 5
Credit: 2	Continuous Assessment: 25

Aim:	
Sl. No.	
1.	**Understand research problem formulation.**
2.	**Analyze research related information**
3.	**Follow research ethics**

Objective:	
Sl. No.	
1.	**Understand research problem formulation.**
2.	**Analyze research related information**
3.	**Follow research ethics**
4.	**Understand that today's world is controlled by Computer, Information Technology, but tomorrow world will be ruled by ideas, concept, and creativity.**
5.	**Understanding that when IPR would take such important place in growth of individuals & nation, it is needless to emphasise the need of information about Intellectual Property Right to be promoted among students in general & engineering in particular.**
6.	**Understand that IPR protection provides an incentive to inventors for further research work and investment in R & D, which leads to creation of new and better products, and in turn brings about, economic growth and social benefits.**
Pre-Requisite:	
Sl. No.	
7.	
8.	

Contents		**Hrs./week**	
Chapter	**Name of the Topic**	**Hours**	**Marks**
01	**Meaning of research problem, Sources of research problem, Criteria Characteristics of a good research problem, Errors in selecting a research problem, Scope and objectives of research problem. Approaches of investigation of solutions for research problem, data collection, analysis, interpretation, Necessary instrumentations.**	**6**	**14**
02	**Effective literature studies approaches, analysis Plagiarism, Research ethics**	**6**	**10**
03	**Effective technical writing, how to write report, Paper Developing a Research Proposal, Format of research proposal, a presentation and assessment by a review committee.**	**6**	**14**
04	**Nature of Intellectual Property: Patents, Designs, Trade and Copyright. Process of Patenting and Development: technological research, innovation, patenting, development. International Scenario: International cooperation on Intellectual Property. Procedure for grants of patents, Patenting under PCT.**	**6**	**14**
05	**Patent Rights: Scope of Patent Rights. Licensing and transfer of technology. Patent information and databases. Geographical Indications.**	**6**	**14**
06	**New Developments in IPR: Administration of Patent System. New developments in IPR; IPR of Biological Systems, Computer Software etc. Traditional knowledge Case Studies, IPR and IITs.**	**6**	**4**

	Sub Total:	**36**	**70**
	Internal Assessment Examination & Preparation of Semester Examination	**4**	**30**
	Total:	**40**	**100**

Practical:
Skills to be developed:
List of Practical: Sl. No. 1& 2 compulsory & at least three from the rest)
Assignments: Based on theory

List of Books
Text Books:

Name of Author	**Title of the Book**	**Edition/ISSN/ISBN**	**Name of the Publisher**

Reference Books:

1. StuartMelvilleandWayneGoddard,	**"Researchmethodology: an introduction for science & engineering students'"**		
WayneGoddardand StuartMelville,	**"ResearchMethodology: An Introduction"**		
Ranjit Kumar,	**"Research Methodology: A Step by Step Guide for beginners"**	**2nd Edition,**	
T. Ramappa, S. Chand,	**"Intellectual Property Rights Under WTO",**	**2008**	
Robert P. Merges, Peter S. Menell, Mark A. Lemley,	**" Intellectual Property in New Technological Age",**	**2016.**	
Asimov,	**"Introduction to Design", Prentice Hall,**	**1962.**	
Mayall,	**"Industrial Design",**		**McGraw Hill, 1992.**
Halbert,	**"Resisting Intellectual Property",**		**Taylor & Francis Ltd ,2007.**
Niebel,	**"Product Design",**		**McGraw Hill, 1974.**

List of equipment/apparatus for laboratory experiments:

Sl. No.	
1	
2	
3	

End Semester Examination Scheme. Maximum Marks-70. Time allotted-3hrs.

Group	Unit	Objective Questions (MCQ only with the correct answer)		Subjective Questions			
		No of question to be set	Total Marks	No of question to be set	To answer	Marks per question	Total Marks
A	**All**	**10**	**10**	**5**	**3**	**15**	**70**
B	**All**			**5**	**3**	**45**	
C	**All**						

- Only multiple choice type question (MCQ) with one correct answer are to be set in the objective part.
- Specific instruction to the students to maintain the order in answering objective questions should be given on top of the question paper.

Examination Scheme for end semester examination:

Group	Chapter	Marks of each question	Question to be set	Question to be answered
A	**ALL**	**1**	**10**	**10**
B	**ALL**	**5**	**5**	**3**
C	**ALL**	**15**	**5**	**3**

Name of the Course: M.Tech. in Internet of Things
Subject: English for research paper writing

Course Code:PGCS(IoT)106A	**Semester: 1st**
Duration: 24 hours	**Maximum Marks:100**
Teaching Scheme	**Examination Scheme**
Theory:02	End Semester Exam:70
Tutorial:	End Semester Exam:70
Practical:	Attendance : 5
Credit:02	Continuous Assessment: 25

Aim:

Sl. No.	
1.	**Understand that how to improve your writing skills and level of readability**
2.	**Learn about what to write in each section**
3.	**Understand the skills needed when writing a Title Ensure the good quality of paper at very first-time submission**

Objective:

Sl. No.	
1.	**Understand that how to improve your writing skills and level of readability**
2.	**Learn about what to write in each section**
3.	**Understand the skills needed when writing a Title Ensure the good quality of paper at very first-time submission**

Pre-Requisite:

Sl. No.	
1.	**Basic Knowledge of English**
2.	

Contents	**Hrs./week**

Chapter	**Name of the Topic**	**Hours**	**Marks**
01	**Planning and Preparation, Word Order, Breaking up long sentences, Structuring Paragraphs and Sentences, Being Concise and Removing Redundancy, Avoiding Ambiguity and Vagueness**	**4**	**14**
02	**Clarifying Who Did What, Highlighting Your Findings, Hedging and Criticising, Paraphrasing and Plagiarism, Sections of a Paper, Abstracts.Introduction**	**4**	**14**
03	**Review of the Literature, Methods, Results, Discussion, Conclusions, TheFinal Check.**	**4**	**10**
04	**key skills are needed when writing a Title, key skills are needed when writing an Abstract, key skills are needed when writing an Introduction,skills needed when writing a Review of the Literature,**	**4**	**4**
05	**skills are needed when writing the Methods, skills needed when writingthe Results, skills are needed when writing the Discussion, skills are needed when writing the Conclusions**	**4**	**14**
06	**useful phrases, how to ensure paper is as good as it could possibly bethe first- time submission**	**4**	**14**
	Sub Total:	**24**	**70**
	Internal Assessment Examination & Preparation of Semester Examination	**4**	**30**
	Total:	**28**	**100**

Assignments: Based on theory

List of Books
Text Books:

Name of Author	**Title of the Book**	**Edition/ISSN/ISBN**	**Name of the Publisher**

Reference Books:

1. Goldbort R	**(2006) Writing for Science,**		**Yale University Press (available on Google Books)**
2. Day R	**(2006) How to Write and Publish a Scientific Paper,**		**Cambridge University Press**
3. Highman N	**(1998), Handbook of Writing for the Mathematical Sciences,**		**SIAM. Highman'sbook.**
4. Adrian Wallwork,	**English for Writing Research Papers,**		**Springer New York Dordrecht Heidelberg London,**

				2011.

End Semester Examination Scheme. Maximum Marks-70. Time allotted-3hrs.

Group	**Unit**	**Objective Questions** (MCQ only with the correct answer)		**Subjective Questions**			
		No of question to be set	Total Marks	No of question to be set	To answer	Marks per question	Total Marks
A	ALL	10	10				
B	ALL			5	3	5	70
C	ALL			5	3	15	

- Only multiple choice type question (MCQ) with one correct answer are to be set in the objective part.
- Specific instruction to the students to maintain the order in answering objective questions should be given on top of the question paper.

Examination Scheme for end semester examination:

Group	**Chapter**	**Marks of each question**	**Question to be set**	**Question to be answered**
A	**ALL**	**1**	**10**	**10**
B	**ALL**	**5**	**5**	**3**
C	**ALL**	**15**	**5**	**3**

Name of the Course: M.Tech. in Internet of Things **Subject:Disaster management**	
Course Code:PGCS(IoT)106B	**Semester: 1st**
Duration:24 hrs	**Maximum Marks:100**
Teaching Scheme	**Examination Scheme**
Theory:02	End Semester Exam:70
Tutorial:0	End Semester Exam:70
Practical:0	Attendance : 5
Credit: 02	Continuous Assessment: 25

Aim:

Sl. No.	
1.	**learn to demonstrate a critical understanding of key concepts in disaster risk reduction and humanitarian response.**
2.	**critically understand the strengths and weaknesses of disaster management approaches, planning and programming in different countries, particularly their home country or thecountries they work in**
3.	

Objective:

Sl. No.	
1.	**learn to demonstrate a critical understanding of key concepts in disaster risk reduction and humanitarian response.**
2.	**critically understand the strengths and weaknesses of disaster management approaches, planning and programming in different countries, particularly their home country or thecountries they work in**
3.	**critically evaluate disaster risk reduction and humanitarian response policy and practice from multiple perspectives.**

4.	**develop an understanding of standards of humanitarian response and practical relevance in specific types of disasters and conflict situations.**		
Pre-Requisite:			
Sl. No.			
1.			
2.			
Contents		**Hrs./week**	
Chapter	**Name of the Topic**	**Hours**	**Marks**
01	**Introduction** **Disaster: Definition, Factors And Significance; Difference Between Hazard And Disaster; Natural And Manmade Disasters: Difference, Nature, Types And Magnitude. 4** **Repercussions Of Disasters And Hazards: Economic Damage, Loss Of Human And Animal Life, Destruction Of Ecosystem. Natural Disasters: Earthquakes, Volcanisms, Cyclones, Tsunamis, Floods, Droughts And Famines, Landslides And Avalanches, Man-made disaster: Nuclear Reactor Meltdown, Industrial Accidents, Oil Slicks And Spills, Outbreaks Of Disease And Epidemics, War And Conflicts.**	**5**	**15**
02	**Disaster Prone Areas In India** **Study Of Seismic Zones; Areas Prone To Floods And Droughts, Landslides And Avalanches; Areas Prone To Cyclonic And Coastal Hazards With Special Reference To Tsunami; Post-Disaster Diseases And Epidemics**	**5**	**15**
03	**Disaster Preparedness And Management** **Preparedness: Monitoring Of Phenomena Triggering A Disaster Or Hazard; Evaluation Of Risk:ApplicationOf Remote Sensing, Data FromMeteorological And Other Agencies, Media Reports: Governmental And Community Preparedness.**	**5**	**15**
04	**Risk Assessment** **Disaster Risk: Concept And Elements, Disaster Risk Reduction, Global And National Disaster Risk Situation. Techniques Of Risk Assessment, Global Co-Operation In Risk Assessment And Warning, People's Participation In Risk Assessment. Strategies for Survival.**	**5**	**10**
05	**Disaster Mitigation** **Meaning, Concept And Strategies Of Disaster Mitigation, Emerging Trends In Mitigation. Structural Mitigation And Non-Structural Mitigation, Programs Of Disaster Mitigation In India.**	**4**	**15**
	Sub Total:	**24**	**70**
	Internal Assessment Examination & Preparation of Semester Examination	**4**	**30**
	Total:	**28**	**100**

Assignments: Based on theory

List of Books
Text Books:

Name of Author	Title of the Book	Edition/ISSN/ISBN	Name of the Publisher

Reference Books:

1. R. Nishith, Singh AK,	**"Disaster Management in India: Perspectives, issues and strategies "**		**New Royal book Company.**
2. Sahni, PardeepEt.Al. (Eds.),	**" Disaster Mitigation Experiences and Reflections"**		**Prentice Hall of India, New Delhi.**
3. Goel S. L.	**Disaster Administration and Management Text and Case Studies",**		**Deep &Deep Publication Pvt. Ltd., New Delhi.**

End Semester Examination Scheme. Maximum Marks-70. Time allotted-3hrs.

Group	Unit	Objective Questions (MCQ only with the correct answer)		Subjective Questions			
		No of question to be set	Total Marks	No of question to be set	To answer	Marks per question	Total Marks
A	ALL	10	10				
B	ALL			5	3	5	70
C	ALL			5	3	15	

- Only multiple choice type question (MCQ) with one correct answer are to be set in the objective part.
- Specific instruction to the students to maintain the order in answering objective questions should be given on top of the question paper.

Examination Scheme for end semester examination:

Group	Chapter	Marks of each question	Question to be set	Question to be answered
A	**ALL**	**1**	**10**	**10**
B	**ALL**	**5**	**5**	**3**
C	**ALL**	**15**	**5**	**3**

Name of the Course: M.Tech. in Internet of Things **Subject:Sanskrit for technical knowledge**	
Course Code:PGCS(IoT)106C	
Duration: 24 hours	**Semester: 1st**
Teaching Scheme	**Maximum Marks:100**
Theory:02	**Examination Scheme**
Tutorial:0	End Semester Exam:70
Practical:0	End Semester Exam:70

Credit: 02	Attendance : 5
	Continuous Assessment: 25

Aim:	
Sl. No.	
1.	**Understanding basic Sanskrit language**
2.	**Ancient Sanskrit literature about science & technology can be understood**
3.	**Being a logical language will help to develop logic in students**

Objective:	
Sl. No.	
1.	**To get a working knowledge in illustrious Sanskrit, the scientific language in the world**
2.	**Learning of Sanskrit to improve brain functioning**
3.	**Learning of Sanskrit to develop the logic in mathematics, science & other subjects**
4.	**enhancing the memory power**
5.	**The engineering scholars equipped with Sanskrit will be able to explore the**
6.	**huge knowledge from**

Pre-Requisite:	
Sl. No.	
1.	
2.	

Contents		**Hrs./week**	
Chapter	**Name of the Topic**	**Hours**	**Marks**
01	• **Alphabets in Sanskrit,** • **Past/Present/Future Tense,** • **Simple Sentences**	**8**	**25**
02	• **Order** • **Introduction of roots** • **Technical information about Sanskrit Literature**	**8**	**25**
03	• **Technical concepts of Engineering-Electrical, Mechanical, Architecture, Mathematics**	**8**	**20**
	Sub Total:	**24**	**70**
	Internal Assessment Examination & Preparation of Semester Examination	**4**	**30**
	Total:	**28**	**100**

Assignments: Based on theory

List of Books
Text Books:

Name of Author	**Title of the Book**	**Edition/ISSN/ISBN**	**Name of the Publisher**

Reference Books:			
1. Dr.Vishwas, Samskrita-Sansthanam, New Delhi Publication	**"Abhyaspustakam" –**		**Bharti Publication, New Delhi**
2. PrathamaDeeksha-	**"Teach Yourself Sanskrit"**		**VempatiKutumbshastri, Rashtriya Sanskrit**
3. Suresh Soni,	**"India's Glorious Scientific Tradition"**		**Ocean books (P) Ltd., New Delhi.**

End Semester Examination Scheme. Maximum Marks-70. Time allotted-3hrs.

Group	**Unit**	**Objective Questions** (MCQ only with the correct answer)		**Subjective Questions**			
		No of question to be set	Total Marks	No of question to be set	To answer	Marks per question	Total Marks
A	ALL	10	10				
B	ALL			5	3	5	70
C	ALL			5	3	15	

- Only multiple choice type question (MCQ) with one correct answer are to be set in the objective part.
- Specific instruction to the students to maintain the order in answering objective questions should be given on top of the question paper.

Examination Scheme for end semester examination:

Group	**Chapter**	**Marks of each question**	**Question to be set**	**Question to be answered**
A	**ALL**	**1**	**10**	**10**
B	**ALL**	**5**	**5**	**3**
C	**ALL**	**15**	**5**	**3**

Name of the Course: M.Tech. in Internet of Things **Subject:**Value education	
Course Code:PGCS(IoT)106D	**Semester: 1st**
Duration: 36 hours	**Maximum Marks:100**
Teaching Scheme	**Examination Scheme**
Theory:02	End Semester Exam:70
Tutorial:0	End Semester Exam:70
Practical:0	Attendance : 5
Credit:02	Continuous Assessment: 25

Aim:	
Sl. No.	
1.	**Knowledge of self-development**
2.	**Learn the importance of Human values**
3.	**Developing the overall personality**

Objective:

Sl. No.	
1.	Understand value of education and self- development
2.	Imbibe good values in students
3.	Let the should know about the importance of character

Pre-Requisite:	
Sl. No.	
1.	
2.	

Contents		Hrs./week	
Chapter	Name of the Topic	Hours	Marks
01	• Values and self-development –Social values and individual attitudes. Work ethics, Indian vision of humanism. • Moral and non- moral valuation. Standards and principles. • Value judgements	6	10
02	• Importance of cultivation of values. • Sense of duty. Devotion, Self-reliance. Confidence, Concentration. Truthfulness, Cleanliness. • Honesty, Humanity. Power of faith, National Unity. • Patriotism.Love for nature,Discipline	6	20
03	• Personality and Behavior Development - Soul and Scientific attitude. Positive Thinking. Integrity and discipline. • Punctuality, Love and Kindness. • Avoid fault Thinking. • Free from anger, Dignity of labour. • Universal brotherhood and religious tolerance. • True friendship. • Happiness Vs suffering, love for truth. • Aware of self-destructive habits. • Association and Cooperation. • Doing best for saving nature	6	20
04	• Character and Competence –Holy books vs Blind faith. • Self-management and Good health. • Science of reincarnation. • Equality, Nonviolence,Humility, Role of Women. • All religions and same message. • Mind your Mind, Self-control. • Honesty, Studying effectively	6	20
	Sub Total:	24	70

	Internal Assessment Examination & Preparation of Semester Examination	**4**	**30**
	Total:	**28**	**100**

Assignments: Based on theory

List of Books
Text Books:

Name of Author	**Title of the Book**	**Edition/ISSN/ISBN**	**Name of the Publisher**

Reference Books:

Chakroborty, S.K.	**"Values and Ethics for organizations Theory and practice"**		**Oxford University Press, New Delhi**

End Semester Examination Scheme. Maximum Marks-70. Time allotted-3hrs.

Group	**Unit**	**Objective Questions** (MCQ only with the correct answer)		**Subjective Questions**			
		No of question to be set	Total Marks	No of question to be set	To answer	Marks per question	Total Marks
A	ALL	10	10				
B	ALL			5	3	5	70
C	ALL			5	3	15	

- Only multiple choice type question (MCQ) with one correct answer are to be set in the objective part.
- Specific instruction to the students to maintain the order in answering objective questions should be given on top of the question paper.

Examination Scheme for end semester examination:

Group	**Chapter**	**Marks of each question**	**Question to be set**	**Question to be answered**
A	**ALL**	**1**	**10**	**10**
B	**ALL**	**5**	**5**	**3**
C	**ALL**	**15**	**5**	**3**

Semester II

Name of the Course: M.Tech. in Internet of Things **Subject:Advanced Computer Architecture**			
Course Code: PGCS(IoT)201, PGCS(IoT)291		**Semester: 2nd**	
Duration: 48 Hrs.		**Maximum Marks:** 200	
Teaching Scheme		**Examination Scheme**	
Theory: 3		**End Semester Exam:** 70	
Tutorial: 0		**Attendance :** 5	
Practical: 4		**Continuous Assessment:** 25	
Credit: 3 + 2		**Practical Sessional internal continuous evaluation:** 40	
		Practical Sessional external examination: 60	
Aim:			
Sl. No.			
1.	**Evaluate performance of different architectures with respect to various parameters**		
2.	**Analyze performance of different ILP techniques**		
3.	**Identify cache and memory related issues in multi-processors**		
Objective:			
Sl. No.			
1.	**Understand the micro-architectural design of processors**		
2.	**Learn about the various techniques used to obtain performance improvement and power savings in current processors**		
3.			
Pre-Requisite:			
Sl. No.			
1.	**Computer Architecture**		
2.	**Distributed Computing**		
Contents		**Hrs./week**	
Chapter	**Name of the Topic**	**Hours**	**Marks**
01	**FUNDAMENTALS OF COMPUTER DESIGN** **Computer Architecture and Organization-Review, Fundamentals of Computer Design, Technology Trends Cost Performance Analysis (3L)** **Parallel Processing Architectures- Taxonomy- SISD, MISD, SIMD,MIMD, PRAM models (3L)** **Data and Resource Dependencies, Program Partitioning and Scheduling, Control Flow vs. Data Flow (3L)**	**14**	**15**

02	**INSTRUCTION LEVEL PARALLELISM** **Network topologies-Static, Dynamic, Types of Networks (3L)** **RISC vs. CISC, Memory Hierarchy, Virtual Memory (4L)** **Concepts of Pipelining, Instruction Pipelining, dynamic pipelining, arithmetic pipelines. (4L)**	**14**	**20**
03	**DATA-LEVEL PARALLELISM I** **Multiprocessors- Multistage Networks, Cache Coherence, Synchronization, Message- passing (4L)** **Vector Processing Principles- Instruction types, Compound, Vector Loops, Chaining (4L) Array Processors- Structure, Algorithms (3L)**	**10**	**20**
04	**DATA-LEVEL PARALLELISM II** **Data Flow Architecture- Graphs. Petri Nets, Static and Dynamic DFA, VLSI Computations (4L)** **Parallel Programming Models, Languages, Compilers (4L)**	**10**	**15**
	Sub Total:	**48**	**70**
	Internal Assessment Examination & Preparation of Semester Examination		**30**
	Total:		**100**

Practical: Based on Theory

Skills to be developed:

List of Practical: Sl. No. 1& 2 compulsory & at least three from the rest)

Assignments:

List of Books
Text Books:

Name of Author	Title of the Book	Edition/ISSN/ISBN	Name of the Publisher
John L Hennessey and David A Patterson,	**"Computer Architecture A Quantitative Approach",**	**Fifth Edition, 2012.**	**Morgan Kaufmann/ Elsevier,**
Kai Hwang and A. Brigggs	**Computer Architecture and Parallel Processing-**	**International Edition,**	**McGraw Hill**
D. Sima, T. fountain, P. Kacsuk,	**Advanced Computer Architecture:**		**Pearson**
D. Culler, J.P.Singh, A.Gupta,	**Parallel Computer Architecture**		**Elsevier**

Reference Books:

List of equipment/apparatus for laboratory experiments:

Sl. No.	
38.	
39.	

End Semester Examination Scheme. Maximum Marks-70. Time allotted-3hrs.

Group	Unit	Objective Questions (MCQ only with the correct answer)		Subjective Questions			
		No of question to be set	Total Marks	No of question to be set	To answer	Marks per question	Total Marks
A	ALL	10	10				
B	ALL			5	3	5	70
C	ALL			5	3	15	

- Only multiple choice type question (MCQ) with one correct answer are to be set in the objective part.
- Specific instruction to the students to maintain the order in answering objective questions should be given on top of the question paper.

Examination Scheme for end semester examination:

Group	Chapter	Marks of each question	Question to be set	Question to be answered
A	**ALL**	**1**	**10**	**10**
B	**ALL**	**5**	**5**	**3**
C	**ALL**	**15**	**5**	**3**

Examination Scheme for Practical Sessional examination:

Practical Internal Sessional Continuous Evaluation

Internal Examination:			**40**
Five No of Experiments			
External Examination: Examiner-			**60**
Signed Lab Note Book(for five experiments)		**10**	
On Spot Experiment(one for each group consisting 5 students)		**40**	
Viva voce		**10**	

Name of the Course: M.Tech. in Internet of Things **Subject:** Wireless and Sensor Networks	
Course Code: PGCS(IoT)202, PGCS(IoT)292	**Semester: 2nd**
Duration: 48 Hrs.	**Maximum Marks:** 200
Teaching Scheme	**Examination Scheme**
Theory: 3	**End Semester Exam:** 70
Tutorial: 0	**Attendance :** 5
Practical: 4	**Continuous Assessment:** 25
Credit: 3 + 2	**Practical Sessional internal continuous evaluation:** 40
	Practical Sessional external examination: 60

Aim:	
Sl. No.	
1.	**To list various applications of wireless sensor networks, describe the concepts, protocols, and differences underlying the design, implementation, and use of wireless sensor networks,**
2.	**Propose, implement, and evaluate new ideas for solving wireless sensor**

	network design issues		
3.			
Objective:			
Sl. No.			
1.	**Students should be able to list various applications of wireless sensor networks, describe the concepts, protocols, and differences underlying the design**		
2.	**Implementation, and use of wireless sensor networks. Also implement and evaluate new ideas for solving wireless sensor network design issues.**		
3.			
Pre-Requisite:			
Sl. No.			
1.	Computer Architecture		
2.	Networking		
Contents		**Hrs./week**	
Chapter	**Name of the Topic**	**Hours**	**Marks**
01	**Sensor networks overview:** **Introduction, Applications of WSN, Range of Applications, Designissues**	**4**	**10**
02	**Basic Wireless Sensor Technology:** **Sensor node architecture, Hardware and Software, Sensor Taxonomy, WSN Operating Environment, Trend**	**6**	**10**
03	**Wireless Transmission Technology and Systems:** **Introduction, Radio Technology Primer, Propagation & Propagation** **Impairments, Available Wireless Technologies**	**6**	**10**
04	**Fundamentals of MAC Protocols:** **Performance Requirements, Common Protocols,** **MAC Protocols for WSNs, Schedule-Based Protocols, Random Access-Based Protocols, Sensor-MAC Case Study, Protocol Overview, Periodic Listen and Sleep Operations, Schedule Selection** **and Coordination, Schedule Synchronization, Adaptive Listening,** **Access Control and Data Exchange.**	**6**	**10**
05	**Routing Protocols for Wireless Sensor Networks:** **Routing Challenges and Design Issues in Wireless, Sensor Networks,** **Network Scale and Time-Varying Characteristics, Resource Constraints, Sensor Applications Data Models, Routing Strategies in Wireless Sensor Networks, WSN Routing Techniques** **Flooding and its Variants, Sensor Protocols for Information via Negotiation, LowEnergy Adaptive Clustering Hierarchy, Power-Efficient Gathering in Sensor Information Systems, Directed Diffusion, Geographical Routing.**	**6**	**10**
06	**Transport Control Protocols for Wireless Sensor Networks:** **Transport Protocol Design Issues, Examples of Existing TransportControl Protocols, CODA (Congestion Detection and Avoidance),** **ESRT (Event-to-Sink Reliable Transport), RMST (Reliable**	**6**	**5**

	Multisegment Transport), PSFQ (Pump Slowly, Fetch Quickly), GARUDA, ATP (Ad Hoc Transport Protocol), Problems with Transport Control Protocols, Performance of Transport Control Protocols, Congestion, Packet Loss Recovery.		
07	**Middleware for Wireless Sensor Networks: Introduction, Network Management Requirements, Traditional Network Management Models, Simple Network Management Protocol, Telecom Operation Map, Network Management Design Issues, Example of Management Architecture: MANNA, Other Issues Related to Network Management, Naming, Localization.**	**6**	**5**
08	**Performance and Traffic Management: WSN Design Issues, MAC Protocols, Routing Protocols, Transport Protocols, Performance Modeling of WSNs, Performance Metrics, Basic Models, Network Models.**	**4**	**5**
09	**Operating Systems for Wireless Sensor Networks: Operating System Design Issues, Examples of MANTIS, SenOS, MagnetOS**	**4**	**5**
	Sub Total:	**48**	**70**
	Internal Assessment Examination & Preparation of Semester Examination		**30**
	Total:		**100**

Practical: Based on Theory

Skills to be developed:

List of Practical: Sl. No. 1& 2 compulsory & at least three from the rest)

Assignments:

List of Books
Text Books:

Name of Author	**Title of the Book**	**Edition/ISSN/ISBN**	**Name of the Publisher**
[1] Kazem Sohraby, Daniel Minoli, TaiebZnati.	**Wireless Sensor Network**		**Wiley**
[2] Ananthram Swami, Qing Zhao, YaoWin Hong, Lang Tong Pub	**Wireless Sensor Networks Signal Processing and Communications**		**John Wiley & Sons.**
[3] Murthy Pub	**Ad Hoc Wireless Networks: Architectures and Protocols**		**Pearson Education**
[4] Edited by C. S. Raghavendra Pub	**Wireless sensor networks**		**Springer**
[5]Sridhar S.Iyengar, NandanParameshw	**Fundamentals of Sensor Network Programming:**		**Wiley**

aran, Vir V. Phoha, N. Balakrishnan, Chuka D. Okoye,	**Applications and Technology**		

Reference Books:

List of equipment/apparatus for laboratory experiments:	
Sl. No.	
40.	
41.	
42.	
43.	
44.	

End Semester Examination Scheme. Maximum Marks-70. Time allotted-3hrs.

Group	**Unit**	**Objective Questions** (MCQ only with the correct answer)		**Subjective Questions**			
		No of question to be set	Total Marks	No of question to be set	To answer	Marks per question	Total Marks
A	ALL	10	10				
B	ALL			5	3	5	70
C	ALL			5	3	15	

- Only multiple choice type question (MCQ) with one correct answer are to be set in the objective part.
- Specific instruction to the students to maintain the order in answering objective questions should be given on top of the question paper.

Examination Scheme for end semester examination:

Group	**Chapter**	**Marks of each question**	**Question to be set**	**Question to be answered**
A	**ALL**	**1**	**10**	**10**
B	**ALL**	**5**	**5**	**3**
C	**ALL**	**15**	**5**	**3**

Examination Scheme for Practical Sessional examination:

Practical Internal Sessional Continuous Evaluation

Internal Examination: 40

Five No of Experiments			

External Examination: Examiner- 60

Signed Lab Note Book(for five experiments)	**10**	
On Spot Experiment(one for each group consisting 5 students)	**40**	
Viva voce	**10**	

Name of the Course: M.Tech. in Internet of Things **Subject:** Sensor Networks and Internet of Things			
Course Code: PGCS(IoT)203A, PGCS(IoT)293A		**Semester: 2nd**	
Duration: 48 Hrs.		**Maximum Marks:** 200	
Teaching Scheme		**Examination Scheme**	
Theory: 3		**End Semester Exam:** 70	
Tutorial: 0		**Attendance :** 5	
Practical: 4		**Continuous Assessment:** 25	
Credit: 3 + 2		**Practical Sessional internal continuous evaluation:** 40	
		Practical Sessional external examination: 60	
Aim:			
Sl. No.			
1.	Identify requirements from emerging WSN applications on WSN platforms, communication systems, protocols and middleware		
2.	Understand, compare and evaluate communication and network protocols used in WSNs		
3.	Discuss and evaluate mechanisms and algorithms for time synchronization and localization in WSNs		
4.	Understand and discuss requirements for the design of security mechanisms and middleware systems to be used in WSNs		
Objective:			
Sl. No.			
1.	The course gives an overview of various topics related to wireless sensor networks, which are expected to be the basis for the emerging internet-of-things.		
2.	The course covers topics with relation to various sub disciplines of computer science such as hardware, operating systems, distributed systems, networking, security and databases.		
3.	Able to understand wireless sensor network (WSN) specific issues such as localization, time synchronization, and topology control are addressed as well.		
Pre-Requisite:			
Sl. No.			
1.	Wireless Networks		
2.			
Contents		**Hrs./week**	
Chapter	**Name of the Topic**	**Hours**	**Marks**
01	**Introduction and Applications: Smart transportation, smart cities, smart living, smart energy, smart health, and smart learning. Examples of research areas include for instance: Self-Adaptive Systems, Cyber Physical Systems, Systems of Systems, Software Architectures and Connectors, Software Interoperability, Big Data and Big Data Mining, Privacy and Security**	**8**	**10**
02	**IoT Reference Architecture- Introduction, Functional View, Information View, Deployment and Operational View, Other Relevant architectural views.** **Real-World Design Constraints- Introduction, Technical Design constraints- hardware, Data representation and visualization, Interaction and remote control.**	**9**	**12**
03	**Industrial Automation- Service-oriented architecture-based device integration, SOCRADES: realizing the enterprise**	**9**	**12**

	integrated Web of Things, IMC-AESOP: from the Web of Things to the Cloud of Things, Commercial Building Automation- Introduction, Case study: phase one- commercial building automation today, Case study: phase two- commercial building automation in the future.		
04	**Hardware Platforms and Energy Consumption, Operating Systems, Time Synchronization, Positioning and Localization, Medium Access Control, Topology and Coverage Control, Routing: Transport Protocols, Network Security, Middleware, Databases**	**10**	**16**
05	**IOT Physical Devices & Endpoints: What is an IOT Device, Exemplary Device Board, Linux on Raspberry, Interface and Programming & IOT Device**	**7**	**15**
06	**Recent trends in sensor network and IOT architecture, Automation in Industrial aspect of IOT**	**5**	**5**
	Sub Total:	**40**	**70**
	Internal Assessment Examination & Preparation of Semester Examination		**30**
	Total:		**100**

Practical: Based on Theory

Skills to be developed:

List of Practical: Sl. No. 1& 2 compulsory & at least three from the rest)

Assignments:

List of Books
Text Books:

Name of Author	**Title of the Book**	**Edition/ISSN/ISBN**	**Name of the Publisher**
Reference Books:			
Mandler, B., Barja, J., Mitre Campista, M.E., Cagá ová, D., Chaouchi, H., Zeadally, S., Badra, M., Giordano, S., Fazio, M., Somov, A., Vieriu, R.-L.,	**Internet of Things. IoT Infrastructures,**		**Springer International Publishing.**

List of equipment/apparatus for laboratory experiments:	
Sl. No.	
45.	
46.	

47.	

End Semester Examination Scheme. Maximum Marks-70. Time allotted-3hrs.

Group	Unit	Objective Questions (MCQ only with the correct answer)		Subjective Questions			
		No of question to be set	Total Marks	No of question to be set	To answer	Marks per question	Total Marks
A	ALL	10	10				
B	ALL			5	3	5	70
C	ALL			5	3	15	

- Only multiple choice type question (MCQ) with one correct answer are to be set in the objective part.
- Specific instruction to the students to maintain the order in answering objective questions should be given on top of the question paper.

Examination Scheme for end semester examination:

Group	Chapter	Marks of each question	Question to be set	Question to be answered
A	**ALL**	**1**	**10**	**10**
B	**ALL**	**5**	**5**	**3**
C	**ALL**	**15**	**5**	**3**

Examination Scheme for Practical Sessional examination:

Practical Internal Sessional Continuous Evaluation

Internal Examination:			**40**
Five No of Experiments			
External Examination: Examiner-			**60**
Signed Lab Note Book(for five experiments)		**10**	
On Spot Experiment(one for each group consisting 5 students)		**40**	
Viva voce		**10**	

Name of the Course: M.Tech. in Internet of Things **Subject:** Data visualization	
Course Code: PGCS(IoT)203B, PGCS(IoT)293B	**Semester: 2nd**
Duration: 48 Hrs.	**Maximum Marks:** 200
Teaching Scheme	**Examination Scheme**
Theory: 3	**End Semester Exam:** 70
Tutorial: 0	**Attendance :** 5
Practical: 4	**Continuous Assessment:** 25
Credit: 3 + 2	**Practical Sessional internal continuous evaluation:** 40
	Practical Sessional external examination: 60

Aim:	
Sl. No.	
1.	**Familiar with the design process to develop visualization methods and visualization systems, and methods for their evaluation.**

2.	**Preparation and processing of data, visual mapping and the visualization**
3.	**Have an understanding of large-scale abstract data**
Objective:	
Sl. No.	
1.	**Familiarize students with the basic and advanced techniques of information visualization and scientific visualization,**
2.	**To learn key techniques of the visualization process**
3.	**A detailed view of visual perception, the visualized data and the actual visualization, interaction and distorting techniques**
Pre-Requisite:	
Sl. No.	
1.	
2.	

Contents		**Hrs./week**	
Chapter	**Name of the Topic**	**Hours**	**Marks**
01	**Introduction of visual perception, visual representation of data, Gestalt principles, information overloads.**	**8**	**10**
02	**Creating visual representations, visualization reference model, visual mapping, visual analytics, Design of visualization applications.**	**8**	**12**
03	**Classification of visualization systems, Interaction and visualization techniques misleading, Visualization of one, two and multi-dimensional data, text and text documents.**	**10**	**12**
04	**Visualization of groups, trees, graphs, clusters, networks, software, Metaphorical visualization**	**11**	**16**
05	**Visualization of volumetric data, vector fields, processes and simulations, Visualization of maps, geographic information, GIS systems, collaborative visualizations, Evaluating visualizations**	**7**	**15**
06	**Recent trends in various perception techniques, various visualization techniques, data structures used in data visualization.**	**4**	**5**
	Sub Total:	**48**	**70**
	Internal Assessment Examination & Preparation of Semester Examination		**30**
	Total:		**100**

Practical: Based on Theory

Skills to be developed:

List of Practical: Sl. No. 1& 2 compulsory & at least three from the rest)

Assignments:

List of Books
Text Books:

Name of Author	**Title of the Book**	**Edition/ISSN/ISBN**	**Name of the Publisher**

Reference Books:

1. WARD, GRINSTEIN, KEIM	**Interactive Data Visualization: Foundations, Techniques, and Applications.**		**Natick : A K Peters, Ltd.**
2. E. Tufte,	**The Visual Display of Quantitative Information,**		**Graphics Press.**

List of equipment/apparatus for laboratory experiments:

Sl. No.	
48.	
49.	
50.	
51.	
52.	

End Semester Examination Scheme. Maximum Marks-70. Time allotted-3hrs.

Group	**Unit**	**Objective Questions** (MCQ only with the correct answer)		**Subjective Questions**			
		No of question to be set	Total Marks	No of question to be set	To answer	Marks per question	Total Marks
A	ALL	10	10				
B	ALL			5	3	5	70
C	ALL			5	3	15	

- Only multiple choice type question (MCQ) with one correct answer are to be set in the objective part.
- Specific instruction to the students to maintain the order in answering objective questions should be given on top of the question paper.

Examination Scheme for end semester examination:

Group	**Chapter**	**Marks of each question**	**Question to be set**	**Question to be answered**
A	**ALL**	**1**	**10**	**10**
B	**ALL**	**5**	**5**	**3**
C	**ALL**	**15**	**5**	**3**

Examination Scheme for Practical Sessional examination:

Practical Internal Sessional Continuous Evaluation

Internal Examination: 40

Five No of Experiments			

External Examination: Examiner- 60

Signed Lab Note Book(for five experiments)	**10**	
On Spot Experiment(one for each group consisting 5 students)	**40**	

Viva voce	**10**	

Name of the Course: M.Tech. in Internet of Things **Subject:IoT Applications and Communication Protocols**			
Course Code: PGCS(IoT)203C, PGCS(IoT)293C	**Semester: 2nd**		
Duration: 48 Hrs.	**Maximum Marks:** 200		
Teaching Scheme	**Examination Scheme**		
Theory: 3	**End Semester Exam:** 70		
Tutorial: 0	**Attendance :** 5		
Practical: 4	**Continuous Assessment:** 25		
Credit: 3 + 2	**Practical Sessional internal continuous evaluation:** 40		
	Practical Sessional external examination: 60		
Aim:			
Sl. No.			
1.	**To understand merging technological options, platforms and case studies of IoT implementation in home & city automation**		
2.	**Determine the Market perspective of IoT.**		
3.			
Objective:			
Sl. No.			
1.	**Basic introduction of all the elements of IoT-Mechanical, Electronics/sensor platform, Wireless and wireline protocols, Mobile to Electronics integration, Mobile to enterpriseintegration**		
2.	**Open source/commercial electronics platform for IoT-Raspberry Pi, Arduino, ArmMbedLPC**		
3.	**Open source /commercial enterprise cloud platform for IoT-Ayla, iO Bridge, Libellium, Axeda, Cisco fog cloud**		
Pre-Requisite:			
Sl. No.			
1.	Computer Networks		
2.			
Contents		**Hrs./week**	
Chapter	**Name of the Topic**	**Hours**	**Marks**
01	**Basic function and architecture of a sensor — sensor body, sensor mechanism, sensor calibration, sensor maintenance, cost and pricing structure, legacy and modern sensor network.** **Development of sensor electronics — IoT vs legacy, and open source vs traditional PCB design style** **Development of sensor communication protocols, Protocols: Modbus, relay, Zigbee, Zwave, X10,Bluetooth, ANT, etc.** **Business driver for sensor deployment — FDA/EPA regulation, fraud/tempering detection, supervision, quality control and process management** **Different kind of calibration Techniques: manual, automation, infield, primary and secondary calibration — and their**	**9**	**10**

	implication in IoT **Powering options for sensors: battery, solar, Witricity, Mobile and PoE**		
02	**Zigbee and Zwave — advantage of low power mesh networking. Long distance Zigbee. Introduction to different Zigbee chips.** **Bluetooth/BLE: Low power vs high power, speed of detection, class of BLE. Introduction of Bluetooth vendors & their review.** **Wireless protocols such as Piconet and packet structure for BLE and Zigbee Other long-distance RF communication link.** **LOS vs NLOS links, Capacity and throughput calculation** **Application issues in wireless protocols:power consumption, reliability, PER, QoS, LOS**	**9**	**12**
03	**PCB vs FPGA vs ASIC design** **Prototyping electronics vs Production electronics QA certificate for IoT- CE/CSA/UL/IEC/RoHS/IP65** **Basic introduction of multi-layer PCB design and its workflow** **Electronics reliability-basic concept of FIT and early mortality rate Environmental and reliability testing-basic concepts** **Basic Open source platforms: Arduino, Raspberry Pi, Beaglebone**	**9**	**12**
04	**Introduction to Mobile app platform for IoT: Protocol stack of Mobileapp for IoT, Mobile to server integration, iBeacon in IoS,Window Azure, Linkify Mobile platform for IoT, Axeda,Xively**	**8**	**16**
05	**Database implementation for IoT: Cloud based IoT platforms, SQL vs NoSQL, Open sourced vs. Licensed Database, Available M2M cloud platform, AxedaXively, Omega NovoTech, Ayla Libellium, CISCO M2M platform, AT** **&T M2M platform, Google M2M platform 5**	**8**	**15**
06	**Recent trends in home automation, IoT-locks, Energy optimization in** **home**	**5**	**5**
	Sub Total:	**48**	**70**
	Internal Assessment Examination & Preparation of Semester Examination		**30**
	Total:		**100**

Practical: Based on Theory

Skills to be developed:

List of Practical: Sl. No. 1& 2 compulsory & at least three from the rest)

Assignments:

List of Books
Text Books:

Name of Author	Title of the Book	Edition/ISSN/ISBN	Name of the Publisher

Reference Books:			
Olivier Hersent, David Boswarthick, Omar Elloumi,	**The Internet of Things: Key Applications and Protocols**		**Wiley-Blackwell.**

List of equipment/apparatus for laboratory experiments:	
Sl. No.	
53.	
54.	
55.	
56.	
57.	

End Semester Examination Scheme. Maximum Marks-70. Time allotted-3hrs.

Group	**Unit**	**Objective Questions** (MCQ only with the correct answer)		**Subjective Questions**			
		No of question to be set	Total Marks	No of question to be set	To answer	Marks per question	Total Marks
A	ALL	10	10				
B	ALL			5	3	5	70
C	ALL			5	3	15	

- Only multiple choice type question (MCQ) with one correct answer are to be set in the objective part.
- Specific instruction to the students to maintain the order in answering objective questions should be given on top of the question paper.

Examination Scheme for end semester examination:

Group	**Chapter**	**Marks of each question**	**Question to be set**	**Question to be answered**
A	**ALL**	**1**	**10**	**10**
B	**ALL**	**5**	**5**	**3**
C	**ALL**	**15**	**5**	**3**

Examination Scheme for Practical Sessional examination:

Practical Internal Sessional Continuous Evaluation

Internal Examination: 40

Five No of Experiments			

External Examination: Examiner- 60

Signed Lab Note Book(for five experiments)	**10**	
On Spot Experiment(one for each group consisting 5 students)	**40**	
Viva voce	**10**	

Name of the Course: M.Tech. in Internet of Things **Subject:Big Data Analytics**			
Course Code:PGCS(IoT)204A		**Semester: 2nd**	
Duration: 48 Hours		**Maximum Marks: 100**	
Teaching Scheme		**Examination Scheme**	
Theory: 3		End Semester Exam: 70	
Tutorial: 0		Attendance: 05	
Practical: NA		Internal Assessment: 25	
Credit: 3		Practical Sessional internal continuous evaluation: NA	
		Practical Sessional external examination: NA	
Aim:			
Sl. No.			
1.	**Describe big data and use cases from selected business domains**		
2.	**Install, configure, and run Hadoop and HDFS**		
3.	**Perform map-reduce analytics using Hadoop**		
4.	**Use Hadoop related tools such as HBase, Cassandra, Pig, and Hive for big data analytics**		
5.	**Explain NoSQL big data management**		
Objective:			
Sl. No.			
1.	**Understand big data for business intelligence. Learn business case studies for big data analytics. Understand nosql big data management. Perform map-reduce analytics using Hadoop and related tools**		
2.			
3.			
Pre-Requisite:			
Sl. No.			
1.	**Data Structure**		
2.	**Computer Architecture and Organization**		
Contents		**Hrs./week**	
Chapter	**Name of the Topic**	**Hours**	**Marks**
01	**What is big data, why big data, convergence of key trends, unstructured data, industry examples of big data, web analytics, big data and marketing, fraud and big data, risk and big data, credit risk management, big data and algorithmic trading, big data and healthcare, big data in medicine, advertising and big data, big data technologies, introduction to Hadoop, open source technologies, cloud and big data, mobile business intelligence, Crowd sourcing analytics, inter and trans firewall analytics.**	**8**	**10**
02	**Introduction to NoSQL, aggregate data models, aggregates, key-value and document data models, relationships, graph databases, schemaless databases, materialized views, distribution models, sharding, master-slave replication, peer-peer replication, sharding and replication, consistency,**	**8**	**12**

	relaxing consistency, version stamps, map-reduce, partitioning and combining, composing map-reducecalculations.		
03	**Data format, analyzing data with Hadoop, scaling out, Hadoop streaming, Hadoop pipes, design of Hadoop distributed file system (HDFS), HDFS concepts, Java interface, data flow, Hadoop I/O, data integrity, compression, serialization, Avro, file-based data structures**	**9**	**12**
04	**MapReduce workflows, unit tests with MRUnit, test data and local tests, anatomy of MapReduce job run, classic Map-reduce, YARN, failures in classic Map-reduce and YARN, job scheduling, shuffle and sort, task execution, MapReduce types, input formats, output formats**	**10**	**16**
05	**Hbase, data model and implementations, Hbase clients, Hbase examples, praxis.Cassandra, Cassandra data model, Cassandra examples, Cassandra clients, Hadoop integration.**	**7**	**15**
06	**Pig, Grunt, pig data model, Pig Latin, developing and testing Pig Latin scripts.** **Hive, data types and file formats, HiveQL data definition, HiveQL data manipulation, HiveQL queries.**	**6**	**5**
	Sub Total:	**48**	**70**
	Internal Assessment Examination & Preparation of Semester Examination		**30**
	Total:		**100**

Practical:
Skills to be developed:
List of Practical: Sl. No. 1& 2 compulsory & at least three from the rest)
Assignments:

List of Books
Text Books:

Name of Author	**Title of the Book**	**Edition/ISSN/ISBN**	**Name of the Publisher**

Reference Books:

1. Michael Minelli, Michelle Chambers, and AmbigaDhiraj,	**"Big Data, Big Analytics: Emerging Business Intelligence and Analytic Trends for Today's Businesses",**		**Wiley, 2013.**
2. P. J. Sadalage and M. Fowler,	**"NoSQL Distilled: A Brief Guide to the Emerging World ofPolyglot Persistence",**		**Addison-Wesley Professional, 2012.**
3. Tom White,	**"Hadoop: The Definitive Guide",**	**Third Edition,**	**O'Reilley, 2012.**
4. Eric	**"Hadoop Operations",**		**O'Reilley, 2012.**

Sammer,			
5. E. Capriolo, D. Wampler, and J. Rutherglen,	**"Programming Hive",**		**O'Reilley, 2012.**
6. Lars George,	**"HBase: The Definitive Guide",**		**O'Reilley, 2011.**
7. Eben Hewitt,	**"Cassandra: The Definitive Guide",**		**O'Reilley, 2010.**
8. Alan Gates,	**"Programming Pig",**		**O'Reilley, 2011.**

List of equipment/apparatus for laboratory experiments:	
Sl. No.	
58.	
59.	
60.	
61.	
62.	

End Semester Examination Scheme. Maximum Marks-70. Time allotted-3hrs.

Group	**Unit**	**Objective Questions** (MCQ only with the correct answer)		**Subjective Questions**			
		No of question to be set	Total Marks	No of question to be set	To answer	Marks per question	Total Marks
A	ALL	10	10				
B	ALL			5	3	5	70
C	ALL			5	3	15	

- Only multiple choice type question (MCQ) with one correct answer are to be set in the objective part.
- Specific instruction to the students to maintain the order in answering objective questions should be given on top of the question paper.

Examination Scheme for end semester examination:

Group	**Chapter**	**Marks of each question**	**Question to be set**	**Question to be answered**
A	**ALL**	**1**	**10**	**10**
B	**ALL**	**5**	**5**	**3**
C	**ALL**	**15**	**5**	**3**

Examination Scheme for Practical Sessional examination:

Practical Internal Sessional Continuous Evaluation

Internal Examination: 40

Five No of Experiments			

External Examination: Examiner- 60

Signed Lab Note Book(for five experiments)		
On Spot Experiment(one for each group consisting 5 students)		
Viva voce		

Name of the Course: M.Tech. in Internet of Things **Subject:Network Security**			
Course Code:PGCS(IoT)204B		**Semester: 2nd**	
Duration: 48 Hours		**Maximum Marks: 100**	
Teaching Scheme		**Examination Scheme**	
Theory: 3		End Semester Exam: 70	
Tutorial: 0		Attendance: 05	
Practical: NA		Internal Assessment: 25	
Credit: 3		Practical Sessional internal continuous evaluation: NA	
		Practical Sessional external examination: NA	
Aim:			
Sl. No.			
1.	**To have an understanding of basics of security and issues related to it.**		
2.	**Understanding of biometric techniques available and how they are used in today's world.**		
3.	**Security issues in web and how to tackle them.**		
4.	**Learn mechanisms for transport and network security**		
Objective:			
Sl. No.			
1.	**To learn the basics of security and various types of security issues.**		
2.	**To study different cryptography techniques available and various security attacks.**		
3.	**Explore network security and how they are implemented in real world.**		
4.	**To get an insight of various issues of Web security and biometric authentication.**		
Pre-Requisite:			
Sl. No.			
1.	**Computer Networks,**		
2.	**Web Programming**		
Contents		**Hrs./week**	
Chapter	**Name of the Topic**	**Hours**	**Marks**
01	**Data security: Review of cryptography. Examples RSA, DES, ECC.**	**6**	**10**
02	**Authentication, non-repudiation and message integrity. Digital signatures and certificates. Protocols using cryptography (example Kerberos). Attacks on protocols**	**9**	**12**
03	**Network security: Firewalls, Proxy-Servers, Network intrusion detection. Transport security: Mechanisms of TLS, SSL, IPSec.**	**9**	**12**
04	**Web security – SQL injection, XSS, etc. Software security and buffer overflow. Malware types and case studies. Access Control, firewalls and host/network intrusion detection.**	**11**	**16**
05	**Other topics: Biometric authentication, Secure E-Commerce (ex. SET), Smart Cards, Security in Wireless Communication.**	**8**	**15**
06	**Recent trends in IOT security, IDS and Biometric.**	**5**	**5**
	Sub Total:	**48**	**70**
	Internal Assessment Examination & Preparation of Semester		**30**

	Examination		
	Total:		**100**

Practical:
Skills to be developed:

List of Practical: Sl. No. 1& 2 compulsory & at least three from the rest)

Assignments:

List of Books
Text Books:

Name of Author	**Title of the Book**	**Edition/ISSN/ISBN**	**Name of the Publisher**

Reference Books:

1. W. R. Cheswick and S. M. Bellovin.	**Firewalls and Internet Security.**		**Addison Wesley, 1994.**
2. W. Stallings.	**Cryptography and Network Security.**		**Prentice Hall, 1999.**
3. B. Schneier.	**Applied Cryptography.**		**Wiley, 1999.**

List of equipment/apparatus for laboratory experiments:

Sl. No.	
63.	
64.	
65.	
66.	
67.	

End Semester Examination Scheme. Maximum Marks-70. Time allotted-3hrs.

Group	**Unit**	**Objective Questions** (MCQ only with the correct answer)		**Subjective Questions**			
		No of question to be set	Total Marks	No of question to be set	To answer	Marks per question	Total Marks
A	ALL	10	10				
B	ALL			5	3	5	70
C	ALL			5	3	15	

- Only multiple choice type question (MCQ) with one correct answer are to be set in the objective part.
- Specific instruction to the students to maintain the order in answering objective questions should be given on top of the question paper.

Examination Scheme for end semester examination:

Group	**Chapter**	**Marks of each question**	**Question to be set**	**Question to be answered**

A	**ALL**	**1**	**10**	**10**
B	**ALL**	**5**	**5**	**3**
C	**ALL**	**15**	**5**	**3**
Examination Scheme for Practical Sessional examination:				
Practical Internal Sessional Continuous Evaluation				
Internal Examination:				**40**
Five No of Experiments				
External Examination: Examiner-				**60**
Signed Lab Note Book(for five experiments)				
On Spot Experiment(one for each group consisting 5 students)				
Viva voce				

Name of the Course: M.Tech. in Internet of Things **Subject:Advanced Machine Learning**	
Course Code:PGCS(IoT)204C	**Semester: 2nd**
Duration: 48 Hours	**Maximum Marks: 100**
Teaching Scheme	**Examination Scheme**
Theory: 3	End Semester Exam: 70
Tutorial: 0	Attendance: 05
Practical: NA	Internal Assessment: 25
Credit: 3	Practical Sessional internal continuous evaluation: NA
	Practical Sessional external examination: NA
Aim:	
Sl. No.	
1.	**Key concepts, tools and approaches for pattern recognition on complex data sets**
2.	**Kernel methods for handling high dimensional and non-linear patterns State-of-the-art algorithms such as Support Vector Machines and Bayesian networks**
3.	**Solve real-world machine learning tasks: from data to inference**
4.	**Theoretical concepts and the motivations behind different learning frameworks**
Objective:	
Sl. No.	
1.	**To introduce key concepts in pattern recognition and machine learning; including specific algorithms for classification, regression, clustering and probabilistic modeling.**
2.	**To give a broad view of the general issues arising in the application of algorithms to analysing data, common terms used, and common errors made if applied incorrectly.**
3.	**To demonstrate a toolbox of techniques that can be immediately applied to real world problems, or used as a basis for future research into the topic.**
Pre-Requisite:	
Sl. No.	
1.	**Machine Learning,**
2.	**Probability Theory**

Contents		Hrs./week	
Chapter	**Name of the Topic**	**Hours**	**Marks**
01	**Key concepts, Supervised/Unsupervised Learning, Loss functions and generalization, Probability Theory, Parametric vs Non-parametric methods, Elements of Computational Learning Theory Ensemble Learning, Bagging, Boosting, Random Forest**	**8**	**10**
02	**Kernel Methods for non-linear data, Support Vector Machines, Kernel Ridge Regression, Structure Kernels, Kernel PCA, Latent Semantic Analysis**	**8**	**12**
03	**Bayesian methods for using prior knowledge and data, Bayesian inference, Bayesian Belief Networks and Graphical models, Probabilistic Latent Semantic Analysis, The Expectation-Maximisation (EM) algorithm, Gaussian Processes**	**8**	**12**
04	**Dimensionality Reduction - CCA, LDA, ICA, NMF - Canonical Variates - Feature Selection vs Feature Extraction**	**10**	**16**
05	**Filter Methods - Sub-space approaches - Embedded methods Low-Rank approaches - Recommender Systems.Application areas - Security - Business - Scientific**	**9**	**15**
06	**Recent trends in supervised and unsupervised learning algorithm, dimensional reducibility, feature selection and extraction**	**5**	**5**
	Sub Total:	**40**	**70**
	Internal Assessment Examination & Preparation of Semester Examination		**30**
	Total:		**100**

Practical:
Skills to be developed:
List of Practical: Sl. No. 1& 2 compulsory & at least three from the rest)
Assignments:

List of Books
Text Books:

Name of Author	Title of the Book	Edition/ISSN/ISBN	Name of the Publisher

Reference Books:

1. Christopher M. Bishop,	**Pattern Recognition and Machine Learning.**		
2. John Shawe-Taylor and NelloCristianini,	**Kernel Methods for Pattern Analysis.**		

List of equipment/apparatus for laboratory experiments:

Sl. No.	
68.	
69.	
70.	

71.	
72.	

End Semester Examination Scheme. Maximum Marks-70. Time allotted-3hrs.

Group	**Unit**	**Objective Questions** (MCQ only with the correct answer)		**Subjective Questions**			
		No of question to be set	Total Marks	No of question to be set	To answer	Marks per question	Total Marks
A	ALL	10	10				
B	ALL			5	3	5	70
C	ALL			5	3	15	

- Only multiple choice type question (MCQ) with one correct answer are to be set in the objective part.
- Specific instruction to the students to maintain the order in answering objective questions should be given on top of the question paper.

Examination Scheme for end semester examination:

Group	**Chapter**	**Marks of each question**	**Question to be set**	**Question to be answered**
A	**ALL**	**1**	**10**	**10**
B	**ALL**	**5**	**5**	**3**
C	**ALL**	**15**	**5**	**3**

Examination Scheme for Practical Sessional examination:

Practical Internal Sessional Continuous Evaluation

Internal Examination: 40

Five No of Experiments			

External Examination: Examiner- 60

Signed Lab Note Book(for five experiments)		
On Spot Experiment(one for each group consisting 5 students)		
Viva voce		

Name of the Course: M.Tech. in Internet of Things **Subject:Constitution of India**	
Course Code:PGCS(IoT)205A	**Semester: 2nd**
Duration: 24 Hours	**Maximum Marks:** 100
Teaching Scheme	**Examination Scheme**
Theory:02	**End Semester Exam:** 70
Tutorial:	**Attendance :** 5
Practical:	**Continuous Assessment:** 25
Credit: 02	

Aim:

Sl. No.	
1.	**Discuss the growth of the demand for civil rights in India for the bulk of Indians before the arrival of Gandhi in Indian politics.**
2.	**Discuss the intellectual origins of the framework of argument that informed the**

	conceptualization of social reforms leading to revolution in India.		
3.	**Discuss the circumstances surrounding the foundation of the Congress Socialist Party [CSP] under the leadership of Jawaharlal Nehru and the eventual failure of the proposal of direct elections through adult suffrage in the Indian Constitution**		
4.	**Discuss the passage of the Hindu Code Bill of 1956.**		
Objective:			
Sl. No.			
1.	**Understand the premises informing the twin themes of liberty and freedom from a civil rights perspective**		
2.	**To address the growth of Indian opinion regarding modern Indian intellectuals' constitutional role and entitlement to civil and economic rights as well as the emergence of nationhood in the early years of Indian nationalism.**		
3.	**To address the role of socialism in India after the commencement of the BolshevikRevolution in 1917 andinitial drafting of the Indian Constitution.**		
Pre-Requisite:			
Sl. No.			
1.			
2.			
Contents		**Hrs./week**	
Chapter	**Name of the Topic**	**Hours**	**Marks**
01	**History of Making of the Indian Constitution:** HistoryDrafting Committee, (Composition & Working)	**4**	**14**
02	**Philosophy of the Indian Constitution:** Preamble Salient Features	**4**	**14**
03	**Contours of Constitutional Rights & Duties:** • Fundamental Rights • Right to Equality • Right to Freedom • Right against Exploitation • Right to Freedom of Religion • Cultural and Educational Rights • Right to Constitutional Remedies • Directive Principles of State Policy • Fundamental Duties.	**4**	**14**
04	**Organs of Governance:** • Parliament • Composition • Qualifications and Disqualifications • Powers and Functions Executive • President • Governor • Council of Ministers • Judiciary, Appointment and Transfer of Judges, Qualifications • Powers and Functions	**4**	**14**
05	**Local Administration:** • District's Administration head: Role and Importance, • Municipalities: Introduction, Mayor and role of Elected Representative CEO of Municipal Corporation. • Pachayati raj: Introduction, PRI: ZilaPachayat. • Elected officials and their roles, CEO ZilaPachayat: Position	**4**	**4**

	and role. • Block level: Organizational Hierarchy (Different departments), • Village level: Role of Elected and Appointed officials, • Importance of grass root democracy		
06	**Election Commission:** • Election Commission: Role and Functioning. • Chief Election Commissioner and Election Commissioners. • State Election Commission: Role and Functioning. • Institute and Bodies for the welfare of SC/ST/OBC and women.	**4**	**10**
07			
	Sub Total:	**24**	**70**
	Internal Assessment Examination & Preparation of Semester Examination	**4**	**30**
	Total:	**28**	**100**

Practical:
List of Books
Text Books:

Name of Author	**Title of the Book**	**Edition/ISSN/ISBN**	**Name of the Publisher**

Reference Books:

1. The Constitution of India, 1950 (Bare Act),			**Government Publication.**
2. Dr. S. N. Busi, Dr. B. R. Ambedkar	**framing of Indian Constitution,**	**1st Edition, 2015.**	
3. M. P. Jain,	**Indian Constitution Law,**	**7th Edn.,**	**Lexis Nexis, 2014.**
4. D.D. Basu,	**Introduction to the Constitution of India,**		**Lexis Nexis, 2015.**

List of equipment/apparatus for laboratory experiments:

Sl. No.	
73.	
74.	
75.	
76.	
77.	

End Semester Examination Scheme. Maximum Marks-70. Time allotted-3hrs.

Group	**Unit**	**Objective Questions** (MCQ only with the correct answer)		**Subjective Questions**			
		No of question to be set	Total Marks	No of question to be set	To answer	Marks per question	Total Marks

A	ALL	10	10				
B	ALL			5	3	5	70
C	ALL			5	3	15	

- Only multiple choice type question (MCQ) with one correct answer are to be set in the objective part.
- Specific instruction to the students to maintain the order in answering objective questions should be given on top of the question paper.

Examination Scheme for end semester examination:

Group	Chapter	Marks of each question	Question to be set	Question to be answered
A	**ALL**	**1**	**10**	**10**
B	**ALL**	**5**	**5**	**3**
C	**ALL**	**15**	**5**	**3**

Examination Scheme for Practical Sessional examination:		
Practical Internal Sessional Continuous Evaluation		
Internal Examination:		
Continuous evaluation		**40**
External Examination: Examiner-		
Signed Lab Assignments	**10**	
On Spot Experiment	**40**	
Viva voce	**10**	**60**

Name of the Course: M.Tech. in Internet of Things **Subject:Pedagogy Studies**	
Course Code:PGCS(IoT)205B	**Semester: 2nd**
Duration: 24 Hours	**Maximum Marks:** 100
Teaching Scheme	**Examination Scheme**
Theory:02	**End Semester Exam:** 70
Tutorial:0	**Attendance :** 5
Practical:0	**Continuous Assessment:** 25
Credit:02	

Aim:	
Sl. No.	
1.	**What pedagogical practices are being used by teachers in formal and informal classrooms in developing countries?**
2.	**What is the evidence on the effectiveness of these pedagogical practices, in what conditions, and with what population of learners?**
3.	**How can teacher education (curriculum and practicum) and the school curriculum and guidance materials best support effective pedagogy?**

Objective:	
Sl. No.	
1.	**Review existing evidence on the review topic to inform programme design and policy making undertaken by the DfID, other agencies and researchers.**
2.	**Identify critical evidence gaps to guide the development.**
3.	

Pre-Requisite:	
Sl. No.	

1.	
2.	

Contents		**Hrs./week**	
Chapter	**Name of the Topic**	**Hours**	**Marks**
01	**Introduction and Methodology:** • Aims and rationale, Policy background, Conceptual framework and terminology • Theories of learning, Curriculum, Teacher education. • Conceptual framework, Research questions. • Overview of methodology and Searching.	**4**	**14**
02	**Thematic overview: Pedagogical practices are being used by teachers in formal and informal classrooms in developing countries.** • Curriculum, Teacher education.	**4**	**14**
03	**Evidence on the effectiveness of pedagogical practices** • Methodology for the in-depth stage: quality assessment of included studies. • How can teacher education (curriculum and practicum) and the school curriculum and guidance materials best support effective pedagogy? • Theory of change. • Strength and nature of the body of evidence for effective pedagogical practices. • Pedagogic theory and pedagogical approaches. • Teachers' attitudes and beliefs and Pedagogic strategies.	**4**	**14**
04	**Professional development: alignment with classroom practices and follow-up support** • Peer support • Support from the head teacher and the community. • Curriculum and assessment • Barriers to learning: limited resources and large class sizes	**4**	**14**
05	**Research gaps and future directions** • **Research design** • **Contexts**	**4**	**4**
06	**Pedagogy** • Teacher education • Curriculum and assessment • Dissemination and research impact.	**4**	**10**
	Sub Total:	**24**	**70**
	Internal Assessment Examination & Preparation of Semester Examination	**4**	**30**
	Total:	**28**	**100**

Practical:

Assignments:
Based on theory

List of Books

Text Books:			
Name of Author	**Title of the Book**	**Edition/ISSN/ISBN**	**Name of the Publisher**
Reference Books:			
1. Ackers J, Hardman F	**(2001) Classroom interaction in Kenyan primary schools,**		**Compare, 31 (2): 245-261.**
2. Agrawal M	**(2004) Curricular reform in schools: The importance of evaluation,**		**Journal of Curriculum Studies, 36 (3): 361-379.**
3. Akyeampong K	**(2003) Teacher training in Ghana - does it count? Multi-site teacher education research project (MUSTER) country report 1.**		**London: DFID.**
4. Akyeampong K, Lussier K, Pryor J, Westbrook J	**(2013) Improving teaching and learning of basic maths and reading in Africa: Does teacher preparation count?**		**International Journal Educational Development, 33 (3): 272–282.**
5. Alexander RJ	**(2001) Culture and pedagogy: International comparisons in primary education.**		**Oxford and Boston: Blackwell.**
6. Chavan M	**(2003) Read India: A mass scale, rapid, 'learning to read' campaign.**		
7.	**www.pratham.org/images/resource%20working%20paper%202.pdf.**		

End Semester Examination Scheme. Maximum Marks-70. Time allotted-3hrs.

Group	**Unit**	**Objective Questions** (MCQ only with the correct answer)		**Subjective Questions**			
		No of question to be set	Total Marks	No of question to be set	To answer	Marks per question	Total Marks
A	ALL	10	10				
B	ALL			5	3	5	70

C	ALL			5	3	15	

- Only multiple choice type question (MCQ) with one correct answer are to be set in the objective part.
- Specific instruction to the students to maintain the order in answering objective questions should be given on top of the question paper.

Examination Scheme for end semester examination:

Group	Chapter	Marks of each question	Question to be set	Question to be answered
A	**ALL**	**1**	**10**	**10**
B	**ALL**	**5**	**5**	**3**
C	**ALL**	**15**	**5**	**3**

Examination Scheme for Practical Sessional examination:

Practical Internal Sessional Continuous Evaluation

Internal Examination:

Continuous evaluation			**40**

External Examination: Examiner-

Signed Lab Assignments	**10**	
On Spot Experiment	**40**	
Viva voce	**10**	**60**

Name of the Course: M.Tech. in Internet of Things
Subject:Stress management by Yoga

Course Code:PGCS(IoT)205C	**Semester: 2nd**
Duration: 24 Hours	**Maximum Marks:** 100
Teaching Scheme	**Examination Scheme**
Theory:02	**End Semester Exam:** 70
Tutorial:0	**Attendance :** 5
Practical:0	**Continuous Assessment:** 25
Credit: 02	

Aim:

Sl. No.	
1.	**Develop healthy mind in a healthy body thus improving social health**
2.	**Improve efficiency**
3.	

Objective:

Sl. No.	
1.	**To achieve overall health of body and mind**
2.	**To overcome stress**
3.	

Pre-Requisite:

Sl. No.	
1.	
2.	

Contents		**Hrs./week**	
Chapter	**Name of the Topic**	**Hours**	**Marks**
01	**Definitions of Eight parts of yog. (Ashtanga)**	**8**	**20**
02	**Yam and Niyam. Do`s and Don't's in life.**	**8**	**30**

	i) Ahinsa, satya, astheya, bramhacharya and aparigraha ii) Shaucha, santosh, tapa, swadhyay, ishwarpranidhan		
03	**Asan and Pranayam** i) Various yog poses and their benefits for mind & body ii) Regularization of breathing techniques and its effects-Types of pranayam	**8**	**20**
	Sub Total:	**24**	**70**
	Internal Assessment Examination & Preparation of Semester Examination	**4**	**30**
	Total:	**28**	**100**

Assignments: Based on theory

List of Books
Text Books:

Name of Author	Title of the Book	Edition/ISSN/ISBN	Name of the Publisher
Reference Books:			
1.Janardan Swami YogabhyasiMandal, Nagpur	**'Yogic Asanas for Group Tarining-Part-I"**		
2.Swami Vivekananda, AdvaitaAshrama	**"Rajayoga or conquering the Internal Nature"**		**(Publication Department), Kolkata**

List of equipment/apparatus for laboratory experiments:

Sl. No.	
78.	
79.	
80.	
81.	
82.	

End Semester Examination Scheme. Maximum Marks-70. Time allotted-3hrs.

Group	Unit	Objective Questions (MCQ only with the correct answer)		Subjective Questions			
		No of question to be set	Total Marks	No of question to be set	To answer	Marks per question	Total Marks
A	ALL	10	10				
B	ALL			5	3	5	70
C	ALL			5	3	15	

- Only multiple choice type question (MCQ) with one correct answer are to be set in the objective part.

- Specific instruction to the students to maintain the order in answering objective questions should be given on top of the question paper.

Examination Scheme for end semester examination:

Group	Chapter	Marks of each question	Question to be set	Question to be answered
A	**ALL**	**1**	**10**	**10**
B	**ALL**	**5**	**5**	**3**
C	**ALL**	**15**	**5**	**3**

Examination Scheme for Practical Sessional examination:		
Practical Internal Sessional Continuous Evaluation		
Internal Examination:		
Continuous evaluation		**40**
External Examination: Examiner-		
Signed Lab Assignments	**10**	
On Spot Experiment	**40**	
Viva voce	**10**	**60**

Name of the Course: M.Tech. in Internet of Things **Subject:Personality development through life enlightenment skills**	
Course Code:PGCS(IoT)205D	**Semester: 2nd**
Duration: 24 Hours	**Maximum Marks:** 100
Teaching Scheme	**Examination Scheme**
Theory:02	**End Semester Exam:** 70
Tutorial:0	**Attendance :** 5
Practical:0	**Continuous Assessment:** 25
Credit:02	

Aim:	
Sl. No.	
1.	**Study of Shrimad-Bhagwad-Geeta will help the student in developing his personality and achieve the highest goal in life**
2.	**The person who has studied Geeta will lead the nation and mankind to peace and prosperity**
3.	**Study of Neetishatakam will help in developing versatile personality of students.**

Objective:	
Sl. No.	
1.	**To learn to achieve the highest goal happily**
2.	**To become a person with stable mind, pleasing personality and determination**
3.	**To awaken wisdom in students**

Pre-Requisite:	
Sl. No.	
1.	
2.	

Contents		**Hrs./week**	
Chapter	**Name of the Topic**	**Hours**	**Marks**
01	**Neetisatakam-Holistic development of personality** • Verses- 19,20,21,22 (wisdom)	**8**	**20**

	• Verses- 29,31,32 (pride & heroism) • Verses- 26,28,63,65 (virtue) • Verses- 52,53,59 (dont's)		
02	• Verses- 71,73,75,78 (do's) • Approach to day to day work and duties. • ShrimadBhagwadGeeta : Chapter 2-Verses 41, 47,48, • Chapter 3-Verses 13, 21, 27, 35, Chapter 6-Verses 5,13,17, 23, 35,Chapter 18-Verses 45, 46, 48.	**8**	**20**
03	• Statements of basic knowledge. • ShrimadBhagwadGeeta: Chapter2-Verses 56, 62, 68 • Chapter 12 -Verses 13, 14, 15, 16,17, 18 • Personality of Role model. ShrimadBhagwadGeeta: Chapter2-Verses 17, Chapter 3-Verses 36,37,42, • Chapter 4-Verses 18, 38,39 • Chapter18 – Verses 37,38,63	**8**	**30**
	Sub Total:	**24**	**70**
	Internal Assessment Examination & Preparation of Semester Examination	**4**	**30**
	Total:	**28**	**100**

Assignments:

List of Books
Text Books:

Name of Author	**Title of the Book**	**Edition/ISSN/ISBN**	**Name of the Publisher**

Reference Books:

1.Swami SwarupanandaAdvaita Ashram	**"Srimad Bhagavad Gita"**		**(Publication Department), Kolkata**
2.P.Gopinath,	**Bhartrihari's Three Satakam (Niti-sringar-vairagya)**		**Rashtriya Sanskrit Sansthanam, New Delhi.**

List of equipment/apparatus for laboratory experiments:

End Semester Examination Scheme. Maximum Marks-70. Time allotted-3hrs.

Group	**Unit**	**Objective Questions** (MCQ only with the correct answer)		**Subjective Questions**			
		No of question to be set	Total Marks	No of question to be set	To answer	Marks per question	Total Marks
A	ALL	10	10				

B	ALL			5	3	5	70
C	ALL			5	3	15	

- Only multiple choice type question (MCQ) with one correct answer are to be set in the objective part.
- Specific instruction to the students to maintain the order in answering objective questions should be given on top of the question paper.

Examination Scheme for end semester examination:

Group	Chapter	Marks of each question	Question to be set	Question to be answered
A	**ALL**	**1**	**10**	**10**
B	**ALL**	**5**	**5**	**3**
C	**ALL**	**15**	**5**	**3**

Examination Scheme for Practical Sessional examination:		
Practical Internal Sessional Continuous Evaluation		
Internal Examination:		
Continuous evaluation		**40**
External Examination: Examiner-		
Signed Lab Assignments	**10**	
On Spot Experiment	**40**	
Viva voce	**10**	**60**

Name of the Course: M.Tech. in Internet of Things
Subject: Term Paper with Seminar

Course Code: PGCS(IoT)294	**Semester: 4th**
Duration:24 hrs	**Maximum Marks:100**
Teaching Scheme	**Examination Scheme100**
Theory:0	End Semester Exam:
Tutorial:0	Teacher's Assessment:0
Practical:04	Internal Assessment:0
Credit:2	Practical Sessional internal continuous evaluation:40
	Practical Sessional external examination:60

Contents

Students will do projects on application areas of latest technologies and current topics of societal relevance.

Semester III

Name of the Course: M.Tech. in Internet of Things **Subject:Cloud Computing**			
Course Code: PGCS(IoT)301A		**Semester: 3rd**	
Duration: 48 Hours		**Maximum Marks: 100**	
Teaching Scheme		**Examination Scheme**	
Theory: 3		End Semester Exam: 70	
Tutorial: 0		Attendance: 05	
Practical: NA		Internal Assessment: 25	
Credit: 3		Practical Sessional internal continuous evaluation: NA	
		Practical Sessional external examination: NA	
Aim:			
Sl. No.			
1.	**Identify security aspects of each cloud model**		
2.	**Develop a risk-management strategy for moving to the Cloud**		
3.	**Implement a public cloud instance using a public cloud service provider**		
4.	**Apply trust-based security model to different layer**		
Objective:			
Sl. No.			
1.	**The student will also learn how to apply trust-based security model to real-world security problems.**		
2.	**An overview of the concepts, processes, and best practices needed to successfully secure information within Cloud infrastructures.**		
3.	**Students will learn the basic Cloud types and delivery models and develop an understanding of the risk and compliance responsibilities and Challenges for each Cloud type and service delivery model.**		
Pre-Requisite:			
Sl. No.			
1.	**Networking**		
2.	**Distributed Computing**		
Contents		**Hrs./week**	
Chapter	**Name of the Topic**	**Hours**	**Marks**
01	**Introduction to Cloud Computing** **Online Social Networks and Applications, Cloud introduction and overview, Different clouds, Risks, Novel applications of cloud computing**	**4**	**10**
02	**Cloud Computing Architecture** **Requirements, Introduction Cloud computing architecture, On Demand Computing Virtualization at the infrastructure level, Security in Cloud computing environments, CPU Virtualization, A discussion on Hypervisors Storage Virtualization Cloud Computing Defined, The SPI Framework for Cloud Computing, The Traditional Software Model, The Cloud Services Delivery Model** **Cloud Deployment Models** **Key Drivers to Adopting the Cloud, The Impact of Cloud Computing on Users, Governance in the Cloud, Barriers to**	**11**	**12**

	Cloud Computing Adoption in the Enterprise		
03	**Security Issues in Cloud Computing** **Infrastructure Security, Infrastructure Security: The Network Level, The Host Level, The Application Level, Data Security and Storage, Aspects of Data Security, Data Security Mitigation Provider Data and Its Security** **Identity and Access Management** **Trust Boundaries and IAM, IAM Challenges, Relevant IAM Standards and Protocols for Cloud Services, IAM Practices in the Cloud, Cloud Authorization Management**	**4**	**12**
04	**Security Management in the Cloud** **Security Management Standards, Security Management in the Cloud, Availability Management: SaaS, PaaS, IaaS** **Privacy Issues** **Privacy Issues, Data Life Cycle, Key Privacy Concerns in the Cloud, Protecting Privacy, Changes to Privacy Risk Management and Compliance in Relation to Cloud Computing, Legal and Regulatory Implications, U.S. Laws and Regulations, International Laws and Regulations**	**8**	**16**
05	**Audit and Compliance** **Internal Policy Compliance, Governance, Risk, and Compliance (GRC), Regulatory/External Compliance, Cloud Security Alliance, Auditing the Cloud for Compliance, Security-as-a-Cloud**	**11**	**15**
06	**ADVANCED TOPICS** **Recent developments in hybrid cloud and cloud security.**	**10**	**5**
	Sub Total:	**48**	**70**
	Internal Assessment Examination & Preparation of Semester Examination		**30**
	Total:		**100**

Practical:

Skills to be developed:

List of Practical: Sl. No. 1& 2 compulsory & at least three from the rest)

Assignments:

List of Books
Text Books:

Name of Author	**Title of the Book**	**Edition/ISSN/ISBN**	**Name of the Publisher**

Reference Books:

1. John Rhoton,	**Cloud Computing Explained: Implementation Handbook for Enterprises,**	**Publication Date: November 2, 2009**	
2. Tim Mather,	**Cloud Security and**	**ISBN-10:**	**O'Reilly Media,**

	Privacy: An Enterprise Perspective on Risks and Compliance (Theory in Practice),	**0596802765,September 2009**	

List of equipment/apparatus for laboratory experiments:	
Sl. No.	
83.	
84.	
85.	
86.	
87.	

End Semester Examination Scheme. Maximum Marks-70. Time allotted-3hrs.

Group	**Unit**	**Objective Questions** (MCQ only with the correct answer)		**Subjective Questions**			
		No of question to be set	Total Marks	No of question to be set	To answer	Marks per question	Total Marks
A	ALL	10	10				
B	ALL			5	3	5	70
C	ALL			5	3	15	

- Only multiple choice type question (MCQ) with one correct answer are to be set in the objective part.
- Specific instruction to the students to maintain the order in answering objective questions should be given on top of the question paper.

Examination Scheme for end semester examination:

Group	**Chapter**	**Marks of each question**	**Question to be set**	**Question to be answered**
A	**ALL**	**1**	**10**	**10**
B	**ALL**	**5**	**5**	**3**
C	**ALL**	**15**	**5**	**3**

Examination Scheme for Practical Sessional examination:

Practical Internal Sessional Continuous Evaluation

Internal Examination:			**40**
Five No of Experiments			
External Examination: Examiner-			**60**
Signed Lab Note Book(for five experiments)			
On Spot Experiment(one for each group consisting 5 students)			
Viva voce			

Name of the Course: M.Tech. in Internet of Things **Subject:Real Time Operating system**			
Course Code:PGCS(IoT)301B		**Semester: 3rd**	
Duration: 48 Hours		**Maximum Marks: 100**	
Teaching Scheme		**Examination Scheme**	
Theory: 3		End Semester Exam: 70	
Tutorial: 0		Attendance: 05	
Practical: NA		Internal Assessment: 25	
Credit: 3		Practical Sessional internal continuous evaluation: NA	
		Practical Sessional external examination: NA	
Aim:			
Sl. No.			
1.	**· Explain fundamental principles for programming of real time systems with time and resource limitations.**		
2.	**· Describe the foundation for programming languages developed for real time programming.**		
3.	**· Account for how real time operating systems are designed and functions.**		
4.	**· Describe what a real time network is.**		
5.	**· Use real time system programming languages and real time operating systems for real time applications.**		
6.	**· Analyse real time systems with regard to keeping time and resource restrictions.**		
Objective:			
Sl. No.			
1.	**Real-time scheduling and schedule ability analysis.**		
2.	**Formal specification and verification of timing constraints and properties.**		
3.	**Design methods for real-time systems.**		
4.	**Development and implementation of new techniques to advance the state-of-the-art real-time systems research.**		
Pre-Requisite:			
Sl. No.			
1.	**Operating system**		
2.			
Contents		**Hrs./week**	
Chapter	**Name of the Topic**	**Hours**	**Marks**
01	**Real Time Systems:** Introduction to Real Time Systems, Classification of Real Time System, Concept of Computer Control, Types of Real Time Operating Systems	**4**	**5**
02	**Requirements for Real Time Systems:** Human Computer Interaction in Real Time Systems, Hardware Requirement for Real time Systems, Specialized Processors, Interfaces & Communications	**4**	**10**
03	**Modeling Real-Time Systems and Real Time Languages:**	**4**	**5**

	Purpose of the Model, Structural Elements, Interfaces, Event-Triggered versus Time-Triggered, Interrupts, Overview of Real Time Languages, Few Real Time Languages, Modula 2 as Real Time Language, Ada as Real Time Language.		
04	**Real Time Operating Systems – 1:** RTOS Overview, RTOS Components, Task Management & Memory Management, Scheduling Strategies, Commercial Real-time Operating Systems	**6**	**10**
05	**Real Time Operating Systems – 2:** **Inter task Communication and Synchronization, Real Time Kernels, Practical Real Time Operating Systems**	**6**	**10**
06	**Design of Real Time Systems:** Planning and Development Phase, Specification for Real-Time Systems, Preliminary Design, Basic Software Engineering Principles, Basic Design Using an RTOS	**6**	**10**
07	**Multi- Processing Systems and Development Methodologies:** Parallel Processing, Vector Computers, Multiple Tasks, Dispatcher, Yourdon Systems Method (YSM), The Ward and Mellor Essential Model, The Hatley and Pirbhai Requirements Model	**6**	**5**
08	**Design Analysis:** Petri Nets, Petri Nets and the Modeling of Systems, Properties of Petri Nets, Scheduler Characteristics, Real Time vs. General Purpose Database, Transactions and Serializability, Scheduling RTDB Transactions, Disk Scheduling	**6**	**5**
09	**Fault Tolerance Techniques and Security in RTOS:** Failures, Errors, and Faults, Error Detection, Testing Techniques, A Model for Network Security, Potential Attacks to Real Time Systems, Cryptography, Authentication, Design Principles.	**6**	**10**
	Sub Total:	**48**	**70**
	Internal Assessment Examination & Preparation of Semester Examination		**30**
	Total:		**100**

Practical:
Skills to be developed:

List of Practical: Sl. No. 1& 2 compulsory & at least three from the rest)

Assignments:

List of Books
Text Books:

Name of Author	Title of the Book	Edition/ISSN/ISBN	Name of the Publisher
Reference Books:			
Jane Liu,	**Real-Time Systems,**		**Prentice Hall, 2000.**
List of equipment/apparatus for laboratory experiments:			

Sl. No.	
88.	
89.	
90.	

End Semester Examination Scheme. Maximum Marks-70. Time allotted-3hrs.

Group	**Unit**	**Objective Questions** (MCQ only with the correct answer)		**Subjective Questions**			
		No of question to be set	Total Marks	No of question to be set	To answer	Marks per question	Total Marks
A	ALL	10	10				
B	ALL			5	3	5	70
C	ALL			5	3	15	

- Only multiple choice type question (MCQ) with one correct answer are to be set in the objective part.
- Specific instruction to the students to maintain the order in answering objective questions should be given on top of the question paper.

Examination Scheme for end semester examination:

Group	**Chapter**	**Marks of each question**	**Question to be set**	**Question to be answered**
A	**ALL**	**1**	**10**	**10**
B	**ALL**	**5**	**5**	**3**
C	**ALL**	**15**	**5**	**3**

Examination Scheme for Practical Sessional examination:

Practical Internal Sessional Continuous Evaluation

Internal Examination: 40

Five No of Experiments			

External Examination: Examiner- 60

Signed Lab Note Book(for five experiments)		
On Spot Experiment(one for each group consisting 5 students)		
Viva voce		

Name of the Course: M.tech. in Internet of Things **Subject:Emulation and Simulation Methodologies**	
Course Code:PGCS(IoT)301C	**Semester: 3rd**
Duration: 48 Hours	**Maximum Marks: 100**
Teaching Scheme	**Examination Scheme**
Theory: 3	End Semester Exam: 70
Tutorial: 0	Attendance: 05
Practical: NA	Internal Assessment: 25
Credit: 3	Practical Sessional internal continuous evaluation: NA
	Practical Sessional external examination: NA

Aim:

Sl. No.	
1.	**Key concepts, tools and approaches for pattern recognition on complex data sets**

2.	**Kernel methods for handling high dimensional and non-linear patterns**
3.	**State-of-the-art algorithms such as Support Vector Machines and Bayesian networks**
4.	**Theoretical concepts and the motivations behind different learning frameworks**
5.	**Be able to solve real-world machine learning tasks: from data to inference**
Objective:	
Sl. No.	
1.	**This module teaches the fundamentals of simulation and emulation methodologies providing guidance on how to design a performance evaluation campaign,**
2.	**Set up a test scenario, select the appropriate models, level of granularity metrics for statistical correctness, and discuss the differences between simulation**
3.	**Emulation platforms and how to use them for accurate performance evaluation of communications.**
Pre-Requisite:	
Sl. No.	
1.	**Probability Theory,**
2.	**Computer Networks**

Contents		**Hrs./week**	
Chapter	**Name of the Topic**	**Hours**	**Marks**
01	**Fundamentals of Discrete Event Simulations (DES)**	**8**	**10**
02	**Model-based representationfor DES, from communication andnetworking, to mobility and data traffic.**	**8**	**12**
03	**Application-based Granularity Requirements: from bit-level, packet-level, to system-level evaluation, and theirappropriate selection as a function of the application requirements.**	**8**	**12**
04	**Fundamentals on Random Numbers, Fundamentals on Statistical Toolsfor Performance Evaluation, Simulation vs. Emulations**	**12**	**16**
05	**Case study for the evaluation of communications for ITS.**	**8**	**15**
06	**Recent trends in simulation and emulation for IOT, model based andapplication-based granularity presentation**	**4**	**5**
	Sub Total:	**48**	**70**
	Internal Assessment Examination & Preparation of Semester Examination		**30**
	Total:		**100**

Practical:

Skills to be developed:

List of Practical: Sl. No. 1& 2 compulsory & at least three from the rest)

Assignments:

List of Books
Text Books:

Name of Author	**Title of the Book**	**Edition/ISSN/ISBN**	**Name of the Publisher**

Reference Books:			
List of equipment/apparatus for laboratory experiments:			
Sl. No.			
91.			

End Semester Examination Scheme. Maximum Marks-70. Time allotted-3hrs.

Group	**Unit**	**Objective Questions** (MCQ only with the correct answer)		**Subjective Questions**			
		No of question to be set	Total Marks	No of question to be set	To answer	Marks per question	Total Marks
A	ALL	10	10				
B	ALL			5	3	5	70
C	ALL			5	3	15	

- Only multiple choice type question (MCQ) with one correct answer are to be set in the objective part.
- Specific instruction to the students to maintain the order in answering objective questions should be given on top of the question paper.

Examination Scheme for end semester examination:

Group	**Chapter**	**Marks of each question**	**Question to be set**	**Question to be answered**
A	**ALL**	**1**	**10**	**10**
B	**ALL**	**5**	**5**	**3**
C	**ALL**	**15**	**5**	**3**

Examination Scheme for Practical Sessional examination:

Practical Internal Sessional Continuous Evaluation

Internal Examination: 40

Five No of Experiments			

External Examination: Examiner- 60

Signed Lab Note Book(for five experiments)		
On Spot Experiment(one for each group consisting 5 students)		
Viva voce		

Name of the Course: M.Tech. in Internet of Things **Subject:Business Analytics**	
Course Code:PGCS(IoT)302A	**Semester: 3rd**
Duration: 36 Hours	**Maximum Marks:100**
Teaching Scheme	**Examination Scheme**
Theory:03	**End Semester Exam:** 70
Tutorial:0	**Attendance :** 5
Practical:0	**Continuous Assessment:** 25

Credit: 03			
Aim:			
Sl. No.			
1.	**Understand the role of business analytics within an organization.**		
2.	**Analyze data using statistical and data mining techniques and understand relationships between the underlying business processes of an organization.**		
3.	**To gain an understanding of how managers use business analytics to formulate and solve business problems and to support managerial decision making.**		
4.	**To become familiar with processes needed to develop, report, and analyze business data.**		
5.	**Use decision-making tools/Operations research techniques.**		
6	**Mange business process using analytical and management tools.**		
7.	**Analyze and solve problems from different industries such as manufacturing, service, retail, software, banking and finance, sports, pharmaceutical, aerospace etc.**		
Objective:			
Sl. No.			
1.	**Students will demonstrate knowledge of data analytics.**		
2.	**Students will demonstrate the ability of think critically in making decisions based on data and deep analytics.**		
3.	**Students will demonstrate the ability to use technical skills in predicative and prescriptive modelling to support business decision-making.**		
4.	**Students will demonstrate the ability to translate data into clear, actionable insights.**		
Pre-Requisite:			
Sl. No.			
1.			
2.			
Contents		**Hrs./week**	
Chapter	**Name of the Topic**	**Hours**	**Marks**
01	**Unit1:** **Business analytics: Overview of Business analytics, Scope of Business analytics, Business Analytics Process, Relationship of Business Analytics Process and organisation, competitive advantages of Business Analytics.** **Statistical Tools: Statistical Notation, Descriptive Statistical methods, Review of probability distribution and data modelling, sampling and estimation methods overview.**	**6**	**14**
02	**Trendiness and Regression Analysis: Modelling Relationships and Trends in Data, simple Linear Regression.** **Important Resources, Business Analytics Personnel, Data and models for Business analytics, problem solving, Visualizing and Exploring Data, Business Analytics Technology.**	**6**	**14**
03	**Organization Structures of Business analytics, Team management, Management Issues, Designing Information Policy, Outsourcing, Ensuring Data Quality, measuring contribution of Business analytics, Managing Changes.** **Descriptive Analytics, predictive analytics, predicative Modelling, Predictive analytics analysis, Data Mining, Data Mining Methodologies, Prescriptive analytics and its step in**	**6**	**14**

	the business analytics Process, Prescriptive Modelling, nonlinear Optimization.		
04	**Forecasting Techniques: Qualitative and Judgmental Forecasting, Statistical Forecasting Models, Forecasting Models for Stationary Time Series, Forecasting Models for Time Series with a Linear Trend, Forecasting Time Series with Seasonality, Regression Forecasting with Casual Variables, Selecting Appropriate Forecasting Models.** **Monte Carlo Simulation and Risk Analysis: Monte Carle Simulation Using Analytic Solver Platform, New-Product Development Model, Newsvendor Model, Overbooking Model, Cash Budget Model.**	**6**	**14**
05	**Decision Analysis: Formulating Decision Problems, Decision Strategies with the without OutcomeProbabilities,Decision Trees, The Value ofInformation, Utility and Decision Making.**	**6**	**10**
06	**Recent Trends in : Embedded and collaborative business intelligence, Visual data recovery, Data Storytelling and Data journalism.**	**6**	**4**
	Sub Total:	**36**	**70**
	Internal Assessment Examination & Preparation of Semester Examination	**4**	**30**
	Total:	**40**	**100**

Practical:
Assignments: Based on theory

List of Books
Text Books:

Name of Author	**Title of the Book**	**Edition/ISSN/ISBN**	**Name of the Publisher**
Reference Books:			
1.Marc J. Schniederjans, Dara G. Schniederjans, Christopher M. Starkey,	**Business analytics Principles, Concepts, and Applications**		**Pearson FT Press.**
2.James Evans,	**Business Analytics**		**persons Education.**

End Semester Examination Scheme. Maximum Marks-70. Time allotted-3hrs.

Group	**Unit**	**Objective Questions** (MCQ only with the correct answer)		**Subjective Questions**			
		No of question	Total Marks	No of question	To answer	Marks per question	Total Marks

		to be set		to be set			
A	ALL	10	10				
B	ALL			5	3	5	70
C	ALL			5	3	15	

- Only multiple choice type question (MCQ) with one correct answer are to be set in the objective part.
- Specific instruction to the students to maintain the order in answering objective questions should be given on top of the question paper.

Examination Scheme for end semester examination:

Group	Chapter	Marks of each question	Question to be set	Question to be answered
A	**ALL**	**1**	**10**	**10**
B	**ALL**	**5**	**5**	**3**
C	**ALL**	**15**	**5**	**3**

Examination Scheme for Practical Sessional examination:		
Practical Internal Sessional Continuous Evaluation		
Internal Examination:		
Continuous evaluation		**40**
External Examination: Examiner-		
Signed Lab Assignments	**10**	
On Spot Experiment	**40**	
Viva voce	**10**	**60**

Name of the Course: M.Tech. in Internet of Things **Subject:Industrial Safety**	
Course Code:PGCS(IoT)302B	**Semester: III**
Duration: 36 Hours	**Maximum Marks:100**
Teaching Scheme	**Examination Scheme**
Theory:03	**End Semester Exam:** 70
Tutorial:0	**Attendance :** 5
Practical:0	**Continuous Assessment:** 25
Credit: 03	

Aim:	
Sl. No.	
1	
2	
3.	

Objective:	
Sl. No.	
1.	
2.	
3.	

Pre-Requisite:	
Sl. No.	
1.	
2.	

Contents		**Hrs./week**	
Chapter	**Name of the Topic**	**Hours**	**Marks**
01	**Industrial safety: Accident, causes, types, results and control, mechanical and electrical hazards, types, causes and preventive steps/procedure, describe salient points of factories act 1948 for health and safety, wash rooms, drinking water layouts, light, cleanliness, fire, guarding, pressure vessels, etc, Safety color codes. Fire prevention and firefighting, equipment and methods.**	**8**	**14**
02	**Fundamentals of maintenance engineering: Definition and aim of maintenance engineering, Primary and secondary functions and responsibility of maintenance department, Types of maintenance, Types and applications of tools used for maintenance, Maintenance cost & its relation with replacement economy, Service life of equipment.**	**8**	**14**
03	**Wear and Corrosion and their prevention: Wear- types, causes, effects, wear reduction methods, lubricants-types and applications, Lubrication methods, general sketch, working and applications, i. Screw down grease cup, ii. Pressure grease gun, iii. Splash lubrication, iv. Gravity lubrication, v. Wick feed lubrication vi. Side feed lubrication, vii. Ring lubrication, Definition, principle and factors affecting the corrosion. Types of corrosion, corrosion prevention methods.**	**8**	**14**
04	**Fault tracing: Fault tracing-concept and importance, decision tree concept, need and applications, sequence of fault-finding activities, show as decision tree, draw decision tree for problems in machine tools, hydraulic, pneumatic, automotive, thermal and electrical equipment's like, I. Any one machine tool, ii. Pump iii. Air compressor, iv. Internal combustion engine, v. Boiler,** **vi. Electrical motors, Types of faults in machine tools and their general causes.**	**8**	**14**
05	**Periodic and preventive maintenance: Periodic inspection-concept and need, degreasing, cleaning and repairing schemes, overhauling of mechanical components, overhauling of electrical motor, common troubles and remedies of electric motor, repair complexities and its use, definition, need, steps and advantages of preventive maintenance. Steps/procedure for periodic and preventive maintenance of: I. Machine tools, ii. Pumps, iii. Air compressors, iv. Diesel generating (DG) sets, Program and schedule of preventive maintenance of mechanical and electrical equipment, advantages of preventive maintenance. Repair cycle concept and importance**	**4**	**14**
	Sub Total:	**36**	**70**
	Internal Assessment Examination & Preparation of Semester Examination	**4**	**30**
	Total:	**40**	**100**
Assignments: Based on theory			

List of Books
Text Books:

Name of Author	Title of the Book	Edition/ISSN/ISBN	Name of the Publisher

Reference Books:

1.Higgins & Morrow,	**Maintenance Engineering Handbook,**		**Da Information Services.**
2.H. P. Garg,	**Maintenance Engineering,**		**S. Chand and Company.**
3.Audels,	**Pump-hydraulic Compressors,**		**Mcgrew Hill Publication.**
4.Winterkorn, Hans,	**Foundation Engineering Handbook,**		**Chapman & Hall London.**

End Semester Examination Scheme. Maximum Marks-70. Time allotted-3hrs.

Group	Unit	Objective Questions (MCQ only with the correct answer)		Subjective Questions			
		No of question to be set	Total Marks	No of question to be set	To answer	Marks per question	Total Marks
A	ALL	10	10				
B	ALL			5	3	5	70
C	ALL			5	3	15	

- Only multiple choice type question (MCQ) with one correct answer are to be set in the objective part.
- Specific instruction to the students to maintain the order in answering objective questions should be given on top of the question paper.

Examination Scheme for end semester examination:

Group	Chapter	Marks of each question	Question to be set	Question to be answered
A	**ALL**	**1**	**10**	**10**
B	**ALL**	**5**	**5**	**3**
C	**ALL**	**15**	**5**	**3**

Examination Scheme for Practical Sessional examination:

Practical Internal Sessional Continuous Evaluation

Internal Examination:

Continuous evaluation			**40**

External Examination: Examiner-

Signed Lab Assignments	**10**	
On Spot Experiment	**40**	
Viva voce	**10**	**60**

Name of the Course: M.Tech. in Internet of Things **Subject:Operations Research**			
Course Code:PGCS(IoT)302C		**Semester: 3rd**	
Duration: 36 Hours		**Maximum Marks:100**	
Teaching Scheme		**Examination Scheme**	
Theory:03		**End Semester Exam:** 70	
Tutorial:0		**Attendance :** 5	
Practical:0		**Continuous Assessment:** 25	
Credit: 03			
Aim:			
Sl. No.			
1.			
2.			
3.			
Objective:			
Sl. No.			
1.	**Students should able to apply the dynamic programming to solve problems of discreet and continuous variables.**		
2.	**Students should able to apply the concept of non-linear programming**		
3.	**Students should able to carry out sensitivity analysis**		
4.	**Student should able to model the real world problem and simulate it.**		
Pre-Requisite:			
Sl. No.			
1.			
2.			
Contents		**Hrs./week**	
Chapter	**Name of the Topic**	**Hours**	**Marks**
01	**Optimization Techniques, Model Formulation, models, General L.R Formulation, Simplex Techniques, Sensitivity Analysis, Inventory Control Models**	**7**	**14**
02	**Formulation of a LPP - Graphical solution revised simplex method - duality theory - dual simplex method - sensitivity analysis - parametric programming**	**8**	**14**
03	**Nonlinear programming problem - Kuhn-Tucker conditions min cost flow problem - max flow problem - CPM/PERT**	**7**	**14**
04	**Scheduling and sequencing - single server and multiple server models - deterministic inventory models - Probabilistic inventory control models - Geometric Programming.**	**7**	**14**
05	**Competitive Models,Single and Multi-channel Problems, Sequencing Models, Dynamic Programming, Flow in Networks, Elementary Graph Theory, Game TheorySimulation**	**7**	**14**
	Sub Total:	**36**	**70**
	Internal Assessment Examination & Preparation of Semester Examination	**4**	**30**

	Total:	**40**	**100**

Practical:

Assignments: Based on theory

List of Books
Text Books:

Name of Author	**Title of the Book**	**Edition/ISSN/ISBN**	**Name of the Publisher**

Reference Books:

1.H.A. Taha,	**Operations Research, An Introduction,**		**PHI, 2008**
2.H.M. Wagner,	**Principles of Operations Research,**		**PHI, Delhi, 1982.**
3.J.C. Pant,	**Introduction to Optimisation: Operations Research,**		**Jain Brothers, Delhi, 2008**
4.Hitler	**Libermann Operations Research**		**McGraw Hill Pub. 2009**
5.Pannerselvam,	**Operations Research**		**Prentice Hall of India 2010**
6.Harvey M Wagner,	**Principles of Operations Research**		**Prentice Hall of India 2010**

List of equipment/apparatus for laboratory experiments:

End Semester Examination Scheme. Maximum Marks-70. Time allotted-3hrs.

Group	**Unit**	**Objective Questions** (MCQ only with the correct answer)		**Subjective Questions**			
		No of question to be set	Total Marks	No of question to be set	To answer	Marks per question	Total Marks
A	ALL	10	10				
B	ALL			5	3	5	70
C	ALL			5	3	15	

- Only multiple choice type question (MCQ) with one correct answer are to be set in the objective part.
- Specific instruction to the students to maintain the order in answering objective questions should be given on top of the question paper.

Examination Scheme for end semester examination:

Group	**Chapter**	**Marks of each**	**Question to be**	**Question to be**

		question	set	answered
A	**ALL**	**1**	**10**	**10**
B	**ALL**	**5**	**5**	**3**
C	**ALL**	**15**	**5**	**3**

Examination Scheme for Practical Sessional examination:		
Practical Internal Sessional Continuous Evaluation		
Internal Examination:		
Continuous evaluation		**40**
External Examination: Examiner-		
Signed Lab Assignments	**10**	
On Spot Experiment	**40**	
Viva voce	**10**	**60**

Name of the Course: M.Tech. in Internet of Things **Subject: Cost Management of Engineering Projects**	
Course Code:PGCS(IoT)302D	**Semester: 3rd**
Duration: 36 Hours	**Maximum Marks:100**
Teaching Scheme	**Examination Scheme**
Theory:03	**End Semester Exam:** 70
Tutorial:0	**Attendance :** 5
Practical:0	**Continuous Assessment:** 25
Credit: 03	

Aim:	
Sl. No.	
1.	
2.	
3.	

Objective:	
Sl. No.	
1.	
2.	
3.	

Pre-Requisite:	
Sl. No.	
1.	
2.	

Contents		**Hrs./week**	
Chapter	**Name of the Topic**	**Hours**	**Marks**
01	**Introduction and Overview of the Strategic Cost Management Process**	**4**	**4**
02	**Cost concepts in decision-making; Relevant cost, Differential cost, Incremental cost and Opportunity cost. Objectives of a Costing System; Inventory valuation; Creation of a Database for operational control; Provision of data for Decision-Making.**	**6**	**6**
03	**Project: meaning, Different types, why to manage, cost overruns centres, various stages of project execution: conception to commissioning. Project execution as**	**6**	**10**

	conglomeration of technical and non- technical activities.		
04	**Detailed Engineering activities. Pre project execution main clearances and documents Project team: Role of each member. Importance Project site: Data required with significance. Project contracts. Types and contents. Project execution Project cost control. Bar charts and Network diagram. Project commissioning: mechanical and process Cost Behavior and Profit Planning Marginal Costing; Distinction between Marginal Costing and Absorption Costing; Break-even Analysis, Cost-Volume-Profit Analysis.**	**8**	**20**
05	**Various decision-making problems. Standard Costing and Variance Analysis. Pricing strategies: Pareto Analysis.**	**3**	**10**
06	**Target costing, Life Cycle Costing. Costing of service sector. Just-in-time approach, Material Requirement Planning, Enterprise Resource Planning, Total Quality Management and Theory of constraints. Activity-Based Cost Management, Bench Marking; Balanced Score Card and Value-Chain Analysis. Budgetary Control; Flexible Budgets; Performance budgets; Zero-based budgets. Measurement of Divisional profitability pricing decisions including transfer pricing.**	**5**	**10**
07	**Quantitative techniques for cost management, Linear Programming, PERT/CPM, Transportation problems, Assignment problems, Simulation, Learning Curve Theory.**	**4**	**10**
	Sub Total:	**36**	**70**
	Internal Assessment Examination & Preparation of Semester Examination	**4**	**30**
	Total:	**40**	**100**

Assignments: Based on theory

List of Books
Text Books:

Name of Author	**Title of the Book**	**Edition/ISSN/ISBN**	**Name of the Publisher**

Reference Books:

1.	**Cost Accounting A Managerial Emphasis,**		**Prentice Hall of India, New Delhi**
2. Charles T. Horngren and George Foster,	**Advanced Management Accounting**		
3. Robert S Kaplan Anthony A. Alkinson,	**Management & Cost Accounting**		
4. Ashish K. Bhattacharya,	**Principles & Practices of Cost Accounting A. H.**		**Wheeler publisher**
5. N.D. Vohra,	**Quantitative Techniques in**		**Tata McGraw Hill Book Co. Ltd.**

	Management,		

List of equipment/apparatus for laboratory experiments:

End Semester Examination Scheme. Maximum Marks-70. Time allotted-3hrs.

Group	**Unit**	**Objective Questions** (MCQ only with the correct answer)		**Subjective Questions**			
		No of question to be set	Total Marks	No of question to be set	To answer	Marks per question	Total Marks
A	ALL	10	10				
B	ALL			5	3	5	70
C	ALL			5	3	15	

- Only multiple choice type question (MCQ) with one correct answer are to be set in the objective part.
- Specific instruction to the students to maintain the order in answering objective questions should be given on top of the question paper.

Examination Scheme for end semester examination:

Group	**Chapter**	**Marks of each question**	**Question to be set**	**Question to be answered**
A	**ALL**	**1**	**10**	**10**
B	**ALL**	**5**	**5**	**3**
C	**ALL**	**15**	**5**	**3**

Examination Scheme for Practical Sessional examination:		
Practical Internal Sessional Continuous Evaluation		
Internal Examination:		
Continuous evaluation		**40**
External Examination: Examiner-		
Signed Lab Assignments	**10**	
On Spot Experiment	**40**	
Viva voce	**10**	**60**

Name of the Course: M.Tech. in Internet of Things **Subject:Composite Materials**	
Course Code:PGCS(IoT)302E	**Semester: III**
Duration: 36 Hours	**Maximum Marks:100**
Teaching Scheme	**Examination Scheme**
Theory:03	**End Semester Exam:** 70
Tutorial:0	**Attendance :** 5
Practical:0	**Continuous Assessment:** 25
Credit: 03	

Aim:

Sl. No.	
1.	
2.	
3.	

Objective:

Sl. No.	
1.	
2.	
3.	

Pre-Requisite:	
Sl. No.	
1.	
2.	

Contents		Hrs./week	
Chapter	Name of the Topic	Hours	Marks
01	INTRODUCTION: Definition – Classification and characteristics of Composite materials. Advantages and application of composites. Functional requirements of reinforcement and matrix. Effect of reinforcement (size, shape, distribution, volume fraction) on overall composite performance.	7	14
02	REINFORCEMENTS: Preparation-layup, curing, properties and applications of glass fibers, carbon fibers, Kevlar fibers and Boron fibers. Properties and applications of whiskers, particle reinforcements. Mechanical Behavior of composites: Rule of mixtures, Inverse rule of mixtures. Isostrain and Isostress conditions.	7	14
03	Manufacturing of Metal Matrix Composites: Casting – Solid State diffusion technique, Cladding – Hot isostatic pressing. Properties and applications. Manufacturing of Ceramic Matrix Composites: Liquid Metal Infiltration – Liquid phase sintering. Manufacturing of Carbon – Carbon composites: Knitting, Braiding, Weaving. Properties and applications.	7	14
04	Manufacturing of Polymer Matrix Composites: Preparation of Moulding compounds and prepregs – hand layup method – Autoclave method – Filament winding method – Compression moulding – Reaction injection moulding. Properties and applications.	8	14
05	Strength: Laminar Failure Criteria-strength ratio, maximum stress criteria, maximum strain criteria, interacting failure criteria, hygrothermal failure. Laminate first play failure-insight strength; Laminate strength-ply discount truncated maximum strain criterion; strength design using caplet plots; stress concentrations.	7	14
	Sub Total:	36	70
	Internal Assessment Examination & Preparation of Semester Examination	4	30
	Total:	40	100

Assignments: Based on theory

List of Books
Text Books:

Name of Author	Title of the Book	Edition/ISSN/ISBN	Name of the Publisher

Examination Scheme for Practical Sessional examination:			
Practical Internal Sessional Continuous Evaluation			
Internal Examination:			
Continuous evaluation			**40**
External Examination: Examiner-			
Signed Lab Assignments	**10**		
On Spot Experiment	**40**		
Viva voce	**10**		**60**

1. R.W.Cahn	**Material Science and Technology**	**Vol 13**	**VCH, West Germany.**
2.WD Callister, Jr., Adapted by R. Balasubramaniam,	**Materials Science and Engineering, An introduction.**	**Indian edition, 2007.**	**John Wiley & Sons, NY,**

Reference Books:

1. Lubin.	**Hand Book of Composite Materials**		
2. K.K.Chawla.	**Composite Materials**		
3. Deborah D.L. Chung.	**Composite Materials Science and Applications**		
4.Danial Gay, Suong V. Hoa, and Stephen W. Tasi.	**Composite Materials Design and Applications**		

End Semester Examination Scheme. Maximum Marks-70. Time allotted-3hrs.

Group	**Unit**	**Objective Questions** (MCQ only with the correct answer)		**Subjective Questions**			
		No of question to be set	Total Marks	No of question to be set	To answer	Marks per question	Total Marks
A	ALL	10	10				
B	ALL			5	3	5	70
C	ALL			5	3	15	

- Only multiple choice type question (MCQ) with one correct answer are to be set in the objective part.
- Specific instruction to the students to maintain the order in answering objective questions should be given on top of the question paper.

Examination Scheme for end semester examination:

Group	**Chapter**	**Marks of each question**	**Question to be set**	**Question to be answered**
A	**ALL**	**1**	**10**	**10**
B	**ALL**	**5**	**5**	**3**
C	**ALL**	**15**	**5**	**3**

Name of the Course: M.Tech. in Internet of Things **Subject:Waste to Energy**	
Course Code:PGCS(IoT)302F	**Semester: 3rd**
Duration: 36 Hours	**Maximum Marks:100**

Teaching Scheme	Examination Scheme
Theory:03	**End Semester Exam:** 70
Tutorial:0	**Attendance :** 5
Practical:0	**Continuous Assessment:** 25
Credit: 03	

Aim:	
Sl. No.	
1.	
2.	
3.	

Objective:	
Sl. No.	
1.	
2.	
3.	

Pre-Requisite:	
Sl. No.	
1.	
2.	

Contents		**Hrs./week**	
Chapter	**Name of the Topic**	**Hours**	**Marks**
01	**Introduction to Energy from Waste: Classification of waste as fuel – Agro based, Forest residue, Industrial waste - MSW – Conversion devices – Incinerators, gasifiers, digestors**	**7**	**14**
02	**Biomass Pyrolysis: Pyrolysis – Types, slow fast – Manufacture of charcoal – Methods - Yields and application – Manufacture of pyrolytic oils and gases, yields and applications.**	**7**	**14**
03	**Biomass Gasification: Gasifiers – Fixed bed system – Downdraft and updraft gasifiers – Fluidized bed gasifiers – Design, construction and operation – Gasifier burner arrangement for thermal heating – Gasifier engine arrangement and electrical power – Equilibrium and kinetic consideration in gasifier operation.**	**7**	**14**
04	**Biomass Combustion: Biomass stoves – Improved chullahs, types, some exotic designs, Fixed bed combustors, Types, inclined grate combustors, Fluidized bed combustors, Design, construction and operation - Operation of all the above biomass combustors.**	**7**	**14**
05	**Biogas: Properties of biogas (Calorific value and composition) - Biogas plant technology and status - Bio energy system - Design and constructional features - Biomass resources and their classification - Biomass conversion processes - Thermo chemical conversion - Direct combustion - biomass gasification - pyrolysis and liquefaction - biochemical conversion - anaerobic digestion - Types of biogas Plants – Applications - Alcohol production from biomass - Bio diesel production - Urban waste to energy conversion - Biomass energy programme in India.**	**8**	**14**
	Sub Total:	**36**	**70**

	Internal Assessment Examination & Preparation of Semester Examination	**4**	**30**
	Total:	**40**	**100**

Practical:
Assignments: Based on theory

List of Books
Text Books:

Name of Author	**Title of the Book**	**Edition/ISSN/ISBN**	**Name of the Publisher**

Reference Books:

1.Desai, Ashok V.,	**Non-Conventional Energy,**		**Wiley Eastern Ltd., 1990.**
2.Khandelwal, K. C. and Mahdi, S. S.,	**Biogas Technology - A Practical Hand Book -**	**Vol. I & II,**	**Tata McGraw Hill Publishing Co. Ltd., 1983.**
3.Challal, D. S.,	**Food, Feed and Fuel from Biomass,**		**IBH Publishing Co. Pvt. Ltd., 1991.**
4.C. Y. WereKo-Brobby and E. B. Hagan,	**Biomass Conversion and Technology,**		**John Wiley & Sons, 1996.**

List of equipment/apparatus for laboratory experiments:

Sl. No.	
92.	
93.	
94.	
95.	
96.	

End Semester Examination Scheme. Maximum Marks-70. Time allotted-3hrs.

Group	**Unit**	**Objective Questions** (MCQ only with the correct answer)		**Subjective Questions**			
		No of question to be set	Total Marks	No of question to be set	To answer	Marks per question	Total Marks
A	ALL	10	10				
B	ALL			5	3	5	70
C	ALL			5	3	15	

- Only multiple choice type question (MCQ) with one correct answer are to be set in the objective part.
- Specific instruction to the students to maintain the order in answering objective questions should be given on top of the question paper.

Examination Scheme for end semester examination:

Group	**Chapter**	**Marks of each question**	**Question to be set**	**Question to be answered**
A	**ALL**	**1**	**10**	**10**

B	**ALL**	**5**	**5**	**3**
C	**ALL**	**15**	**5**	**3**

Examination Scheme for Practical Sessional examination:			
Practical Internal Sessional Continuous Evaluation			
Internal Examination:			
Continuous evaluation			**40**
External Examination: Examiner-			
Signed Lab Assignments	**10**		
On Spot Experiment	**40**		
Viva voce	**10**		**60**

Name of the Course: M.Tech. in Internet of Things **Subject: Dissertation-I /Industrial Project**	
Course Code:PGCS(IoT)392	**Semester: 3rd**
Teaching Scheme	**Examination Scheme100**
Theory:0	End Semester Exam:
Tutorial:0	Teacher's Assessment:0
Practical:20	Internal Assessment:0
Credit:10	Practical Sessional internal continuous evaluation:40
	Practical Sessional external examination:60

Content

The dissertation / project topic should be selected / chosen to ensure the satisfaction of the urgent need to establish a direct link between education, national development and productivity and thus reduce the gap between the world of work and the world of study. The dissertation should have the following

Relevance to social needs of society
Relevance to value addition to existing facilities in the institute
Relevance to industry need
Problems of national importance
Research and development in various domain The

student should complete the following:

Literature survey Problem Definition
Motivation for study and Objectives
Preliminary design / feasibility / modular approaches
Implementation and Verification
Report and presentation

The dissertation stage II is based on a report prepared by the students on dissertation allotted to them. It may be based on:

Experimental verification / Proof of concept.
Design, fabrication, testing of Communication System.

The viva-voce examination will be based on the above report and work.

Semester IV

Name of the Course:M.Tech. in Internet of Things **Subject:Dissertation II**	
Course Code:PGCS(IoT)491	**Semester: 3rd**
Teaching Scheme	**Examination Scheme100**
Theory:0	End Semester Exam:
Tutorial:0	Teacher's Assessment:0
Practical:32	Internal Assessment:0
Credit:16	Practical Sessional internal continuous evaluation:40
	Practical Sessional external examination:60
Contents Students will do projects on application areas of latest technologies and current topics of societal relevance.	

Guidelines for Dissertation Phase–I and II

As per the AICTE directives, the dissertation is a yearlong activity, to be carried out and evaluated in two phases i.e. Phase – I: July to December and Phase – II: January to June.
The dissertation may be carried out preferably in-house i.e. department's laboratories and centers OR in industry allotted through department's T & P coordinator.

After multiple interactions with guide and based on comprehensive literature survey, the student shall identify the domain and define dissertation objectives. The referred literature should preferably include IEEE/IET/IETE/Springer/Science Direct/ACM journals in the areas of Computing and Processing (Hardware and Software), Circuits-Devices and Systems, Communication-Networking and Security, Robotics and Control Systems, Signal Processing and Analysis and any other related domain. In case of Industry sponsored projects, the relevant application notes, while papers, product catalogues should be referred and reported.

Student is expected to detail out specifications, methodology, resources required, critical issues involved in design and implementation and phase wise work distribution, and submit the proposal within a month from the date of registration.

Phase – I deliverables: A document report comprising of summary of literature survey, detailed objectives, project specifications, paper and/or computer aided design, proof of concept/functionality, part results, A record of continuous progress.

Phase – I evaluation: A committee comprising of guides of respective specialization shall assess the progress/performance of the student based on report, presentation and Q & A. In case of unsatisfactory performance, committee may recommend repeating the Phase-I work.

During phase – II, student is expected to exert on design, development and testing of the proposed work as per the schedule. Accomplished results/contributions/innovations should be published in terms of research papers in reputed journals and reviewed focused conferences OR IP/Patents.

Phase – II deliverables: A dissertation report as per the specified format, developed system in the form of hardware and/or software, A record of continuous progress.

Phase – II evaluation: Guide along with appointed external examiner shall assess the progress/performance of the student based on report, presentation and Q & A. In case of unsatisfactory performance, committee may recommend for extension or repeating the work