

#### FOURTH SEMESTER

Subject Code	SUBJECTS	Teaching Load Per Week			Credit *	Examination Marks							
						Max. Marks				Min. Marks			
		L	T	P		Th	Ses	Pr	Total	Th	Ses	Pr	Total
M.Sc.(CS) 401	Cloud Computing	3	1	-	4	100	50	-	150	40	30	-	70
M.Sc.(CS) 402	Network Security and Cryptography	3	1	-	4	100	50	-	150	40	30	-	70
M.Sc.(CS) 403	Internet of Things	3	1	-	4	100	50	-	150	40	30	-	70
M.Sc.(CS) 404	Project Based Seminar	-	-	2x1	1	-	50	-	50	-	30	-	30
M.Sc.(CS) 405	Internship: Major Project/ Research Project (Dissertation)	-	-	3x2	3	-	100	200	300	-	60	100	160
M.Sc.(CS) 406	MOOC	Non Credit but mandatory course											
	<b>TOTAL</b>	09	3	8	16	300	300	200	800	120	180	100	400

\* **L+T+(P/2)**

- \* The work done by the students should be enough to justify the duration of project as 6 to 8 weeks.
- \* The certificate of Company/institute must specify the duration of at least 6 weeks.
- \* Students having undergoing Project will have to send the confirmation letter from the company/institute within 1 week of joining. This letter will have to consist of the information regarding Company/institute name, Guide Name, Project Title, Project Starting Date etc.
- \* The student will have to deliver Seminar and will have to submit two copies of Project Reports after completion of Project Work.
- \* Preferably, independent work should be carried out by each student.
- \* Participating in Workshops, Conferences and Seminars or publishing Research Papers will be given weightage in the Research Project.
- \* Students should register for any one MOOC course from SWAYAM/NPTEL/RSU LMS. under the guidance of a mentor and a certificate of completion must be submitted to the mentor.

**M.Sc. (CS) Semester-IV**

Program	Subject	Year	Semester
M.Sc.	Computer Science	2	IV
Course Code	Course Title		Course Type
MSc(CS)401	Cloud Computing		Core
Credit	Hours Per Week (L-T-P)		
	L	T	P
4	3	1	0
Maximum Marks	Sessional		Theory
150	50		100

**Learning Objective (LO):**

Student will learn the concepts of cloud computing and develops analytical skills and critical thinking for better programming.

**Course Outcomes (CO):**

CO No.	Expected Course Outcomes	CL
	At the end of the course, the students will be able to :	
1	Perform cloud oriented analysis.	Ap
2	Model cloud candidate derived from existing business documentation.	Ap
3	Design the composition of a cloud services and also to design application services for technology abstraction.	Ap
4	Appreciate the cloud computing paradigm, recognize its various forms and able to implement some cloud computing features.	Ap
5	Design application services for technology abstraction	Ap

CL: Cognitive Levels (**R**-Remember; **U**-Understanding; **Ap**-Apply; **An**-Analyze; **E**-Evaluate; **C**-Create).

**CO-PO/PSO Mapping for the course:**

CO \ PO	POs											PSO				
	1	2	3	4	5	6	7	8	9	10	11	1	2	3	4	5
CO1	3	3	3	-	1	-	3	1	-	-	-	3	1	-	-	-
CO2	3	3	3	1	1	1	3	-	-	-	-	3	2	-	-	3
CO3	3	3	3	1	1	1	3	-	-	2	-	3	2	-	-	2
CO4	3	3	3	1	1	2	3	1	-	2	1	3	2	-	-	-
CO5	3	3	3	1	1	-	2	-	-	2	2	3	2	3	-	-

"3" - Strong; "2" - Moderate; "1"- Low; "-" No Correlation



**Detailed Syllabus:**  
**MSc(CS)401**  
**Cloud Computing**

Unit No.	Topics	No. of Hours	CO No.
I	<b>Unit – I</b> <b>Introduction:</b> Cloud Computing: Vision, Definition, Reference Model, Characteristics, Benefits and Challenges, Historical Developments, Cloud Computing Environments, Cloud Platforms and Technologies; The Evolution of Cloud Computing: Parallel Computing vs. Distributed Computing, Elements of Parallel Computing, Elements of Distributed Computing, Technologies for Distributed Computing, Introduction of Grid Computing.	10	1
II	<b>Unit – II</b> <b>Virtualization:</b> Introduction, Characteristics, Taxonomy of Virtualization, Levels of Virtualization, Structure and Mechanism of Virtualization, Virtualization and Cloud Computing, Advantages and Disadvantages, Virtualization Technology Examples: Xen, VMware, Microsoft Hyper-V.	10	2
III	<b>Unit – III</b> <b>Cloud Computing Architecture:</b> Service Oriented Architecture, Infrastructure-as-a-Service (IaaS), Platform-as-a-Service (PaaS), Software-as-a-Service (SaaS), Data Storage as a Service (DSaaS). Types of Clouds; Economics of the Cloud and Open Challenges; <b>Security and Organizational aspects:</b> Host Security and Data Security.	10	3
IV	<b>Unit – IV</b> <b>Migration to the Cloud:</b> Adoption and use of Cloud by Businesses (Small and Enterprise), Pace of Adoption, Benefits and Phases of Adoption, Cloud Service Provider's Capabilities and Liabilities, Success factors and Issues. <b>Migrating Applications:</b> Key Aspects, Migration Techniques, Phases of Migration. <b>Service Level Agreement (SLA):</b> Aspects and Requirements, Availability and Outages, Credit Calculations, SLA Samples.	10	4
V	<b>Unit – V</b> <b>Industry Platforms:</b> Amazon Web Services, Google AppEngine, Microsoft Azure; <b>Cloud Applications:</b> Scientific Applications, Business and Consumer Applications; Advanced Topics: Energy Efficiency in Clouds, Market Based Management, Federated Clouds / InterCloud, Third Party Cloud Services.	10	5

**Books Recommended:**

- **Mastering Cloud Computing**, Rajkumar Buyya, Christian Vecchiola, S. Thamarai Selvi, McGraw Hill Education
- **Cloud Computing: Black Book**, Kailash Jayaswal et al., Kogent Learning Solutions, Dreamtech Press
- **Cloud Computing: Principals and Paradigms**, Rajkumar Buyya et al., Wiley India
- **Cloud Computing: Concepts, Technology & Architecture**, Erl, Pearson Education India
- **Cloud Computing Bible**, Barrie Sosinsky, O'Reilly Media
- **Cloud Computing: A Practical Approach**, Toby Velt, Anthony Vote and Robert Elsenpeter, McGraw Hill
- **Cloud Application Architectures: Building Applications and Infrastructures in the Cloud**, George Reese, O'Reilly Media.
- **Cloud Security and Privacy: An Enterprise Perspective on Risks and Compliance**, Tim Matherm Subra Kumaraswamy and Shahed Latif, O'Reilly Media.

**M.Sc. (CS) Semester-IV**

Program	Subject	Year	Semester
M.Sc.	Computer Science	2	IV
Course Code	Course Title		Course Type
MSc(CS)402	Network Security and Cryptography		Core
Credit	Hours Per Week (L-T-P)		
	L	T	P
4	3	1	0
Maximum Marks	Sessional		Theory
150	50		100

**Learning Objective (LO):**

Students will be able understand how to connect and control physical devices through the internet to gather and gather and exchange data. It involves learning about sensors, connectivity, data analysis, and the integration of devices to create smart and interconnected systems.

**Course Outcomes (CO):**

CO No.	Expected Course Outcomes	CL
	At the end of the course, the students will be able to :	
1	Acknowledge about the cybercrime, cyber criminal, and intellectual property rights. Protection and resilience of Critical Information Infrastructure.	U
2	Enable effective prevention, investigation and prosecution of cybercrime and enhancement of law enforcement capabilities through appropriate legislative intervention.	U
3	Learn basics about computer, Network and Data Security, threats to any network and data security.	U
4	Know how to secure any network, computer and data in it, security goals to secure any network.	An
5	Learn internal details of security mechanism so that they could adopt it in their programming.	An

CL: Cognitive Levels (**R**-Remember; **U**-Understanding; **Ap**-Apply; **An**-Analyze; **E**-Evaluate; **C**-Create).

**CO-PO/PSO Mapping for the course:**

PO \ CO	POs											PSO				
	1	2	3	4	5	6	7	8	9	10	11	1	2	3	4	5
CO1	3	3	3	-	1	-	3	1	-	-	-	3	1	-	-	-
CO2	3	3	3	1	1	1	3	-	-	-	-	3	2	-	-	3
CO3	3	3	3	1	1	1	3	-	-	2	-	3	2	-	-	2
CO4	3	3	3	1	1	2	3	1	-	2	1	3	2	-	-	-
CO5	3	3	3	1	1	-	2	-	-	2	2	3	2	3	-	-

"3" – Strong; "2" – Moderate; "1"- Low; "-" No Correlation



**Detailed Syllabus:**  
**MSc(CS)402**  
**Network Security and Cryptography**

Unit No.	Topics	No. of Hours	CO No.
I	<b>Unit - I Introduction &amp; Symmetric Key Cryptography</b> Computer Security Concepts, The Challenges of Computer Security, The OSI Security Architecture, Security Attacks, Security Services, Security Mechanism, A model for network Security, <b>Symmetric Encryption Principal:</b> Cryptography, Cryptanalysis, Feistel Cipher Structure, DES, Random and Pseudorandom Numbers, Symmetric Block Modes of Operation (ECB, CBC, CFB, CTR).	10	1
II	<b>Unit - II Public Key Cryptography</b> Approaches to Message Authentication, <b>Hash Functions:</b> Hash Functions Requirement, Security of Hash Functions, The SHA Secure Hash Function, <b>Public Key Cryptography:</b> Public -Key Encryption Structure, Applications for Public Key Cryptosystem, RSA, Attacks on RSA, OAEP.	10	2
III	<b>Unit - III Integrity and Authentication</b> <b>Message Integrity:</b> Document and Finger Printing, Message and Message Digest, Cryptographic Hash Function Criteria Random Oracle Model, Birthday Problems and Summary of solutions, <b>Message Authentication:</b> Modification Detection Code, Message Authentication Code, Introduction of HMAC & CMAC, <b>Digital Signature:</b> Comparison, Process, Services, Attacks on Digital Signature.	10	3
IV	<b>Unit - IV Malicious Software</b> <b>Intruders:</b> Intruder Behavior Patterns, Intrusion Techniques, Intrusion Detection by Audit Records, Statistical Intrusion Detection, Distributed Intrusion Detection, Honeypot Types of Malicious Software, Nature of Viruses, Virus Classification, Antivirus Approaches, Worms and its Propagation model, DDoS Attack.	10	4
V	<b>Unit - V FireWall and Security Softwares</b> <b>Firewall:</b> Need & Characteristics of Firewall, Types of Firewall, Firewall Basing, Firewall Location and Configuration, Introduction to Kali Linux ,Tools Available in Kali Linux and Its Usage. WireShark Packet Analyzer and Its Features. Cyber Security Policy, Domain of Cyber Security Policies.	10	5

**Books Recommended:**

- Network Security Essentials, William Stallings, PEARSON
- Cryptography and Network Security, William Stallings, PHI.
- Cryptography and Network Security, AtulKahate, Tata McGraw Hill
- Cryptography and Network Security, B.A. FOROUZAN, TMH
- Cyber Security policy Guidebook, Jennifer Jason Paul, Marcus Jeffery Joseph. Wiley Publication, 2012
- Network Security: The Complete Reference, Robertra Bragg, Tata McGraw Hill.
- Cyber Security Essentials, James Graham, Richard Ryan, CRC press

**M.Sc. (CS) Semester-IV**

Program	Subject	Year	Semester
M.Sc.	Computer Science	2	IV
Course Code	Course Title		Course Type
MSc(CS)403	Internet of Things		Core
Credit	Hours Per Week (L-T-P)		
	L	T	P
4	3	1	0
Maximum Marks	Sessional		Theory
150	50		100

**Learning Objective (LO):**

Students will be able understand how to connect and control physical devices through the internet to gather and gather and exchange data. It involves learning about sensors, connectivity, data analysis, and the integration of devices to create smart and interconnected systems.

**Course Outcomes (CO):**

CO No.	Expected Course Outcomes	CL
	At the end of the course, the students will be able to :	
1	Describe what IoT is and how it works today and recognise the factors that contributed to the emergence of IoT.	An
2	Design and program IoT devices and use real IoT protocols for communication.	Ap
3	Secure the elements of an IoT device.	Ap
4	Design an IoT device to work with a Cloud Computing infrastructure.	Ap
5	Transfer IoT data to the cloud and in between cloud providers.	Ap

CL: Cognitive Levels (**R**-Remember; **U**-Understanding; **Ap**-Apply; **An**-Analyze; **E**-Evaluate; **C**-Create).

**CO-PO/PSO Mapping for the course:**

CO \ PO	POs											PSO				
	1	2	3	4	5	6	7	8	9	10	11	1	2	3	4	5
CO1	3	3	3	-	1	-	3	1	-	-	-	3	1	-	-	-
CO2	3	3	3	1	1	1	3	-	-	-	-	3	2	-	-	3
CO3	3	3	3	1	1	1	3	-	-	2	-	3	2	-	-	2
CO4	3	3	3	1	1	2	3	1	-	2	1	3	2	-	-	-
CO5	3	3	3	1	1	-	2	-	-	2	2	3	2	3	-	-

"3" – Strong; "2" – Moderate; "1"- Low; "-" No Correlation



**Detailed Syllabus:**  
**MSc(CS)403**  
**Internet of Things**

Unit No.	Topics	No. of Hours	CO No.
I	<b>UNIT-I: Introduction of IOT:</b> Basics of IOT, Origin of Terminology, Definition, Characteristics, Evolution of Devices, Modern Day IOT Application, An IOT architectural outline, IOT Reference Architecture, Baseline Technologies: M2M, CPS, WOT, Device & gateway.	10	1
II	<b>UNIT-II: Basics of IOT Networking:</b> Convergence of Domain, Connectivity Terminologies, IPv4 vs IPv6, IOT Component, IOT & Associated Technologies. <b>Functionality Based IOT Protocol:</b> 6LowPAN, RPL, Wi-Fi, Bluetooth, LPWAN, MQTT, CoAP, AMQP.	10	2
III	<b>Unit-III: Transport Layer Protocol</b> Transmission Control Protocol, User Datagram Protocol, Datagram Congestion Control Protocol (DCCP) Stream Control Transmission Protocol (SCTP), Transport Layer Security (TLS), Datagram Transport Layer Security (DTLS)	10	3
IV	<b>Unit -IV: Sensing &amp; Actuation:</b> Sensor, Features, Sensor Resolution, Sensor Classes, Sensor Types, Sensorial Deviation, Actuators, Actuator Types. <b>Sensor Networks:</b> WSNs, Basic Component of Sensor Node, Constrained on Sensor Node, Sensor Web, Co-operation Wireless Ad Hoc & Sensor Networks, Application of WSNs.	10	4
V	<b>UNIT- V: Elements of IoT</b> Hardware Components- Computing (Raspberry Pi), Communication, Sensing, Actuation, I/O interfaces. Software Components- Programming API's (using Python) for Communication Protocols-MQTT, ZigBee, Bluetooth, CoAP, UDP, TCP.	10	5

**Books Recommended:**

- Peter Waher, "Learning Internet of Things", PACKT Publishing.
- Adrian McEwen, "Designing the Internet of Things", Wiley
- Raj Kamal, "Internet of Things: Architecture and Design", McGraw Hill
- Bernd Schloz-Reiter, "Getting Started with the Internet of Things", Florian Michahellas, Springer.
- NPTEL, "Internet of Things"

**M.Sc. (CS) Semester-IV**

Program	Subject	Year	Semester
M.Sc.	Computer Science	2	IV
Course Code	Course Title		Course Type *
MSc(CS)404	Seminar		Core
Credit	Hours Per Week (L-T-P)		
	L	T	P
1	-	-	2
Maximum Marks	Sessional		-
50	50		00

**Learning Objective (LO):**

Students will be able to polish their communication skill and presentation skills.

**Course Outcomes (CO):**

CO No.	Expected Course Outcomes	CL
	At the end of the course, the students will be able to :	
1	Learn how to make presentation PPT.	Ap
2	Learn how to present effectively.	Ap
3	Becomes confident for their knowledge expression.	Ap
4	Develop interpersonal communication skill.	Ap
5.	Overcome from hesitation.	Ap

CL: Cognitive Levels (**R**-Remember; **U**-Understanding; **Ap**-Apply; **An**-Analyze; **E**-Evaluate; **C**-Create).

**CO-PO/PSO Mapping for the course:**

CO \ PO	POs											PSO				
	1	2	3	4	5	6	7	8	9	10	11	1	2	3	4	5
CO1	3	3	3	-	1	-	3	1	-	-	-	3	1	-	-	-
CO2	3	3	3	1	1	1	3	-	-	-	-	3	2	-	-	3
CO3	3	3	3	1	1	1	3	-	-	2	-	3	2	-	-	2
CO4	3	3	3	-	1	-	3	1	-	-	-	3	1	-	-	-
CO5	3	3	3	1	1	1	3	-	-	-	-	3	2	-	-	3

"3" – Strong; "2" – Moderate; "1"- Low; "-" No Correlation



**M.Sc. (CS) Semester-IV**

Program	Subject	Year	Semester
M.Sc.	Computer Science	2	IV
Course Code	Course Title		Course Type
MSc(CS)405	Major Project / Research Project		Core
Credit	Hours Per Week (L-T-P)		
	L	T	P
3	-	-	6
Maximum Marks	Sessional		Project
300	100		200

**Learning Objective (LO):**

To make students skilled and employable for industry requirement and to make them understand latest knowledge in their domain.

**Course Outcomes (CO):**

CO No.	Expected Course Outcomes	CL
	At the end of the course, the students will be able to :	
1	Develop software for organizations..	C
2	Analyse and design a system	C
3	Relate their knowledge and its implementation.	C
4	Find practical exposure to industry.	C
5	Understand current trends in technology.	U

CL: Cognitive Levels (**R**-Remember; **U**-Understanding; **Ap**-Apply; **An**-Analyze; **E**-Evaluate; **C**-Create).

**CO-PO/PSO Mapping for the course:**

CO \ PO	POs											PSO				
	1	2	3	4	5	6	7	8	9	10	11	1	2	3	4	5
CO1	3	3	3	-	1	-	3	1	-	-	-	3	1	-	-	-
CO2	3	3	3	1	1	1	3	-	-	-	-	3	2	-	-	3
CO3	3	3	3	1	1	1	3	-	-	2	-	3	2	-	-	2
CO4	3	3	3	1	1	2	3	1	-	2	1	3	2	-	-	-
CO5	3	3	3	1	1	-	2	-	-	2	2	3	2	3	-	-

"3" – Strong; "2" – Moderate; "1"- Low; "-" No Correlation

**M.Sc.(CS)**  
**Skill Enhancement/Value Added Courses**

Program	Subject	Year	Semester
M.Sc.(CS)	Computer Science	1	II
Course Code	Course Title		Course Type
MSCCS-VAC-01	Cyber Crimes and Law		Skill Enhancement
Credit	Hours Per Week (L-T-P)		
	L	T	P
2	2	0	0
Maximum Marks	Sessional		Theory
100	25		75

**Learning Objective (LO):**

- The course objective is to make Understand and describe the major types of cybercrime. Identify cybercrime vulnerabilities and exploitations of the Internet.

**Course Outcomes (CO):**

CO No.	Expected Course Outcomes	CL
	At the end of the course, the students will be able to :	
1	Understand and describe the major types of cybercrime.	Ap
2	Identify cybercrime vulnerabilities and exploitations of the Internet.	Ap
3	Understand tools and methods used by Cybercriminals.	U
4	Understand the law with regards to the investigation and prosecution of cyber criminals.	Ap
5	Understand the law with regards to the investigation and prosecution of cyber criminals	U

CL: Cognitive Levels (**R**-Remember; **U**-Understanding; **Ap**-Apply; **An**-Analyze; **E**-Evaluate; **C**-Create).

**CO-PO/PSO Mapping for the course:**

CO \ PO	Pos											PSO				
	1	2	3	4	5	6	7	8	9	10	11	1	2	3	4	5
CO1	2	3	3	2	2	1	2	1	-	2	2	3	1	2	-	1
CO2	3	1	3	2	3	2	2	1	-	2	1	1	1	2	2	3
CO3	2	3	3	2	2	1	1	-	-	3	2	3	1	2	-	2
CO4	3	2	3	3	2	3	2	1	-	2	1	2	2	2	1	2
CO5	1	3	3	1	2	1	2	1	-	2	2	3	1	2	-	-

"3" – Strong; "2" – Moderate; "1"- Low; "-" No Correlation

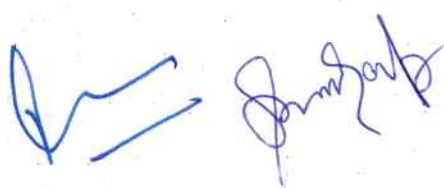


**Detailed Syllabus:**  
**M.Sc.(CS)-( Skill Enhancement/Value Added Courses)**  
**Cyber Crimes and Law**

Unit No.	Topics	No. of Hours	CO No.
I	<b>Cyber Crime:</b> Definition and Origin of the Word, Cyber Crime and Security, E-mail Spoofing, Spamming, Cyber Defamation, Internet Time Theft, Salami Attack, Salami technique Data Diddling, Forgery, Web Jacking, Newsgroup Spam, Industrial Spying, Hacking, Online Frauds, Pornographic Offenders, Software Piracy, Computer Sabotage Email Bombing, Computer Network Intrusion, Password Sniffing, Credit Card Frauds.	6	1
II	<b>Cyber Offenders:</b> Who are cyber criminals?, Categories of Cyber Crimes, How Criminal Plans to Attack: Active Attacks, Passive Attacks, Social Engineering, Classification of Social Engineering, Cyber Stalking: types of Stalkers, Hackers and types of hackers, Cyber Cafe and Cyber Crimes, Botnets, Cyber Crime and Cloud Computing	6	2
III	<b>Tools and Methods used by Cybercriminals:</b> Proxy server and Anonymizers, phishing: How Phishing works? How password cracking works? Keyloggers and Spywares, Reconnaissance, Virus and Worms, Trojan Horses and Backdoors, Dos and DDOS Attacks, SQL Injection, Buffer Overflow, An Attacks on Wireless Networks. What is Nmap tool	6	3
IV	<b>Phishing, Identity Theft and Cyber Act:</b> Phishing: Methods of Phishing, Phishing Techniques, Types of Phishing Scams, Phishing countermeasures, Identity theft, Types and Techniques of identity thefts and its counter measures. <b>IT ACT, Offenses and Penalties:</b> Offences under the Information and Technology Act 2000 - Penalty and adjudication - Punishments for contraventions under the Information Technology Act 2000 (Case Laws, Rules and recent judicial pronouncements to be discussed) - Limitations of Cyber Law	6	4
V	<b>Cyber Laws:</b> The legal perspectives Cybercrimes and the legal Landscape around the world, why do we need cyber laws: The Indian context, The Indian IT ACT: Admissibility of Electronic records, Amendments made in Indian ITA 2000, Positive Aspects and weak areas of ITA 2000, Challenges to Indian law and cybercrime scenario in India, Digital signatures and the Indian ITA act, Cybercrime and punishment, Cyber law Technology and students: Indian Scenario	6	5

**BOOKS RECOMMENDED:**

1. Cyber Security: Understanding Cyber Crimes, Computer Forensics and Legal Perspectives By Nina Godbole, Sunit Belapur, Wiley.
2. Understanding Cybercrime: Phenomena, and Legal Challenges Response, ITU 2012





**M.Sc.(CS)**  
**Skill Enhancement/Value Added Courses**

Program	Subject	Year	Semester
M.Sc.(CS)	Computer Science	1	III
Course Code	Course Title		Course Type
MSCCS-VAC-02	Green Computing		Skill Enhancement
Credit	Hours Per Week (L-T-P)		
	L	T	P
2	2	0	0
Maximum Marks	Sessional		Theory
100	25		75

**Learning Objective (LO):**

- The course objective is to learn the fundamentals of Green Computing and to analyze the Green computing Grid Framework. To understand the issues related with Green compliance and study and develop various case studies.

**Course Outcomes (CO):**

CO No.	Expected Course Outcomes	CL
	At the end of the course, the students will be able to :	
1	Acquire knowledge to adopt green computing practices to minimize negative impacts on the environment.	Ap
2	Enhance the skill in energy saving practices in their use of hardware.	Ap
3	Understand the issues related with Green compliance.	U
4	Evaluate technology tools that can reduce paper waste and carbon footprint by the stakeholders.	Ap
5	Understand the ways to minimize equipment disposal requirements.	U

CL: Cognitive Levels (**R**-Remember; **U**-Understanding; **Ap**-Apply; **An**-Analyze; **E**-Evaluate; **C**-Create).

**CO-PO/PSO Mapping for the course:**

CO \ PO	Pos											PSO				
	1	2	3	4	5	6	7	8	9	10	11	1	2	3	4	5
CO1	2	3	3	2	2	1	2	1	-	2	2	3	1	2	-	1
CO2	3	1	3	2	3	2	2	1	-	2	1	1	1	2	2	3
CO3	2	3	3	2	2	1	1	-	-	3	2	3	1	2	-	2
CO4	3	2	3	3	2	3	2	1	-	2	1	2	2	2	1	2
CO5	1	3	3	1	2	1	2	1	-	2	2	3	1	2	-	-

"3" - Strong; "2" - Moderate; "1"- Low; "-" No Correlation



**Detailed Syllabus:**  
**M.Sc.(CS)-( Skill Enhancement/Value Added Courses)**  
**Green Computing**

Unit No.	Topics	No. of Hours	CO No.
I	<b>Green Fundamentals:</b> Introduction, Green Computing: Benefits And Important, Growth Statistics Of Internet Usages, Formal Approach To Green Computing: Green Design, Green Manufacturing, Green Management, Green Purchasing, Green Use, Green Disposal And Recycle. Environmentally Sound Practices For Computing, Green Computing Standardizations And Compliances.	6	1
II	<b>GREEN ASSETS AND MODELING :</b> Green Assets: Buildings, Data Centers, Networks, and Devices – Green Business Process Management: Modeling, Optimization, and Collaboration – Green Enterprise Architecture – Environmental Intelligence – Green Supply Chains – Green Information Systems: Design and Development Models.	6	2
III	<b>GRID FRAMEWORK :</b> Virtualization of IT systems – Role of electric utilities, Telecommuting, teleconferencing and teleporting – Materials recycling – Best ways for Green PC – Green Data center – Green Grid framework.	6	3
IV	<b>GREEN COMPLIANCE :</b> Socio-cultural aspects of Green IT – Green Enterprise Transformation Roadmap – Green Compliance: Protocols, Standards, and Audits – Emergent Carbon Issues: Technologies and Future.	6	4
V	<b>CASE STUDIES:</b> The Environmentally Responsible Business Strategies (ERBS) – Case Study Scenarios for Trial Runs – Case Studies – Applying Green IT Strategies and Applications to a Home, Hospital, Packaging Industry and Telecom Sector.	6	5

**BOOKS RECOMMENDED:**

**TEXT BOOKS:** 1. Bhuvan Unhelkar, —Green IT Strategies and Applications-Using Environmental Intelligencel, CRC Press, June 2014.

3. Woody Leonhard, Katherine Murray, —Green Home computing for dummiesl, August 2012.

**REFERENCES**

1. Alin Gales, Michael Schaefer, Mike Ebberts, —Green Data Center: steps for the Journeyl, Shroff/IBM rebook, 2011.

2. John Lamb, —The Greening of ITl, Pearson Education, 2009.

3. Jason Harris, —Green Computing and Green IT- Best Practices on regulations & industryl, Lulu.com, 2008

4. Carl speshocky, —Empowering Green Initiatives with ITl, John Wiley & Sons, 2010.

5. Wu Chun Feng (editor), —Green computing: Large Scale energy efficiencyl, CRC Press