Government of Karnataka
Department of Technical Education
Bengaluru

	**Course Title: Green Computing**		
	Scheme (L:T:P) : **4:0:0**	Total Contact Hours: **52**	Course Code: **15CS54T**
	Type of Course: **Lectures, Self Study & Student Activity.**	Credit **:04**	Core/ Elective: **Core**
CIE- 25 Marks			SEE- 100 Marks

Prerequisites:

Knowledge of basic IT trends and technologies.

Course Objectives

Study the concepts related to Green IT, Green devices and hardware along with software methods, green enterprise activities, managing the green IT and various laws, standards, protocols along with outlook of green IT.

Course Outcome

On successful completion of the course, the students will be able to attain below Course Outcome (CO):

Course outcome		CL	Linked PO	Teaching Hours
CO1	Discuss Green IT with its different dimensions and Strategies.	***R,U***	**1,2,3,7,8,9,10**	**08**
CO2	Describe Green devices and hardware along with its green software methodologies.	***R,U***	**1,2,3,7,8,9,10**	**12**
CO3	Discuss the various green enterprise activities, functions and their role with IT.	***R,U***	**1,2,3,7,8,9,10**	**08**
CO4	Describe the concepts of how to manage the green IT with necessary components.	***R,U***	**1,2,3,7,8,9,10**	**08**
CO5	Discuss the various laws, standards and protocols for regulating green IT.	***R,U***	**1,2,3,7,8,9,10**	**08**
CO6	Identify the various key sustainability and green IT trends.	***R,U***	**1,2,3,7,8,9,10**	**08**
			Total	**52**

Legends: R = Remember U= Understand; A= Apply and above levels (Bloom's revised taxonomy)

Course-PO Attainment Matrix

Course	Programme Outcomes									
	1	2	3	4	5	6	7	8	9	10
Green Computing	**3**	**3**	**3**	**-**	**-**	**-**	**3**	**3**	**3**	**3**

Level 3- Highly Addressed, Level 2-Moderately Addressed, Level 1-Low Addressed.

Method is to relate the level of PO with the number of hours devoted to the COs which address the given PO.
If ≥40% of classroom sessions addressing a particular PO, it is considered that PO is addressed at Level 3
If 25 to 40% of classroom sessions addressing a particular PO, it is considered that PO is addressed at Level 2
If 5 to 25% of classroom sessions addressing a particular PO, it is considered that PO is addressed at Level 1
If < 5% of classroom sessions addressing a particular PO, it is considered that PO is considered not-addressed.

Course Content and Blue Print of Marks for SEE

Unit No	Unit Name	Hour	Questions to be set for SEE			Marks Weightage	Marks Weightage (%)
			R	U	A	A	
I	Green IT: An Overview	**08**	05	10	-	15	10.34
II	Green Devices and Hardware with Green Software	**12**	10	20	-	30	20.68
III	Green Enterprises and the Role of IT	**08**	05	20	-	25	17.24
IV	Managing Green IT	**08**	05	20	-	25	17.24
V	Regulating the Green IT: Laws, Standards and Protocols	**08**	05	20	-	25	17.24
VI	Green IT: An Outlook	**08**	05	20	-	25	17.24
	Total	**52**	**35**	**110**	**-**	**145**	**100**

UNIT I : Green IT: An Overview 08 Hrs

Introduction, Environmental Concerns and Sustainable Development, Environmental Impacts of IT, Green IT, Holistic Approach to Greening IT, Greening IT, Applying IT for enhancing Environmental sustainability, Green IT Standards and Eco-Labelling of IT, Enterprise Green IT strategy, Green IT: Burden or Opportunity?

UNIT II: Green Devices and Hardware with Green Software 12 Hrs

Green Devices and Hardware: Introduction, Life Cycle of a device or hardware, Reuse, Recycle and Dispose.

Green Software: Introduction, Energy-saving software techniques, Evaluating and Measuring software Impact to platform power.

UNIT III: Green Enterprises and the Role of IT 08 Hrs

Introduction, Organization and Enterprise Greening, Information systems in Greening Enterprises, Greening Enterprise: IT Usage and Hardware, Inter-Organizational Enterprise activities and Green Issues, Enablers and making the case for IT and Green Enterprise.

UNIT IV: Managing Green IT 08 Hrs

Introduction, Strategizing Green Initiatives, Implementation of Green IT, Information Assurance, Communication and Social media.

UNIT V: Regulating the Green IT: Laws, Standards and Protocols 08 Hrs

Introduction, The regulatory environment and IT manufacturers, Non regulatory government initiatives, Industry associations and standards bodies, Green building standards, Green data centers, Social movements and Greenpeace.

UNIT VI: Green IT: An Outlook 08 Hrs

Introduction, Awareness to implementations, Greening by IT, Green IT: A megatrend?, A seven-step approach to creating green IT strategy, Research and Development directions.

Text books

1. **Harnessing Green IT Principles and Practices** , San Murugesan, G.R. Gangadharan Wiley Publication, ISBN:9788126539680

Suggested list of student activities

Note: the following activities or similar activities for assessing CIE (IA) for 5 marks (Any one)

Student activity like mini-project, surveys, quizzes, etc.

1. Each individual student should do any one of the following type activity or any other similar activity related to the course and before conduction, get it approved from concerned course coordinator and programme coordinator.
2. Each group should conduct different activity and no repeating should occur

1	Any two discussion question to be solved given at the end of each chapter of the text book.
2	Quiz

Course Delivery

The course will be delivered through lectures and Power point presentations/ Video

Course Assessment and Evaluation Scheme

Method	What		To whom	When/Where (Frequency in the course)	Max Marks	Evidence collected	Course outcomes
Direct Assessment	CIE	IA	Students	Three IA tests (Average of three tests will be computed)	20	Blue books	1 to 6
				Student activities	05	Report	1 to 6
				Total	**25**		
	SEE	End Exam		**End of the course**	**100**	Answer scripts at BTE	1 to 6
Indirect Assessment			Students	Middle of the course		Feedback forms	1, 2, 3 Delivery of course
	End of Course Survey			End of the course		Questionnaires	1 to 6 Effectiveness of Delivery of instructions & Assessment Methods

Note: I.A. test shall be conducted for 20 marks. Average marks of three tests shall be rounded off to the next higher digit.

Questions for CIE and SEE will be designed to evaluate the various educational components (Bloom's taxonomy) such as:

Sl. No	Bloom's Category	%
1	Remembrance	24
2	Understanding	76

Note to IA verifier*: *The following documents to be verified by CIE verifier at the end of semester

1. Blue books (20 marks)
2. Student suggested activities report for 5 marks
3. Student feedback on course regarding Effectiveness of Delivery of instructions & Assessment Methods.

FORMAT OF I A TEST QUESTION PAPER (CIE)

Test/Date and Time	Semester/year	Course/Course Code	Max Marks
Ex: I test/6 th week of sem 10-11 AM	V SEM		20
	Year:		

Name of Course coordinator : Units:__ CO's:___

Question no	Question	MARKS	CL	CO	PO
1					
2					
3					
4					

Note: Internal choice may be given in each CO at the same cognitive level (CL).

MODEL QUESTION PAPER (CIE)

Test/Date and	Semester/year	Course/Course Code	Max Marks

Time			
Ex: I test/6 th week of sem 10-11 AM	V SEM	Green Computing	20
	Year: 2017-18	Course code: **15CS54T**	

Name of Course coordinator :
Units:1,2 Co: 1,2

Note: Answer all questions

Question no	Question	CL	CO	PO
1	Define Green IT and list the benefits of Green IT.(5) **OR** Explain the 3Rs of Green IT. (5)	R,U	1	1,2
2	Explain different types of processor power states. (5) **OR** Discuss the impacts of various chemicals used in manufacturing process of electronic devices. (5)	U	2	1,2
3	Explain the life cycle of a device or hardware with diagram.(10)	U	2	1,2

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Format for Student Activity Assessment

DIMENSION	Unsatisfactory 1	Developing 2	Satisfactory 3	Good 4	Exemplary 5	Score
Collection of data	Does not collect any information relating to the topic	Collects very limited information; some relate to the topic	Collects some basic information; refer to the topic	Collects relevant information; concerned to the topic	Collects a great deal of information; all refer to the topic	3
Fulfill team's roles & duties	Does not perform any duties assigned to the team role	Performs very little duties	Performs nearly all duties	Performs all duties	Performs all duties of assigned team roles with presentation	4
Shares work equally	Always relies on others to do the work	Rarely does the assigned work; often needs reminding	Usually does the assigned work; rarely needs reminding	Does the assigned job without having to be reminded.	Always does the assigned work without having to be reminded and on given time frame	3
Listen to other Team mates	Is always talking; never allows anyone else to speak	Usually does most of the talking; rarely allows others to speak	Listens, but sometimes talk too much	Listens and contributes to the relevant topic	Listens and contributes precisely to the relevant topic and exhibit leadership qualities	3
					TOTAL	**13/4=3.25=4**

Note: This is only an example. Appropriate rubrics/criteria may be devised by the concerned faculty (Course Coordinator) for assessing the given activity

MODEL QUESTION PAPER Code: **15CS54T**

Diploma in Computer Science & Engineering

V- Semester

Course Title: Green Computing

Time: **3 Hours** Max Marks**: 100**

PART-A

Answer any SIX questions. Each carries 5 marks. 5X6=30 Marks

1. Define Green IT and list the benefits of Green IT.
2. Explain the 3Rs of Green IT.
3. Explain different types of processor power states.
4. Discuss the impacts of various chemicals used in manufacturing process of electronic devices.
5. Explain the four major categories of enablers for Green IT.
6. List the different issues in integrating ERP with EMIS system.
7. Give the differences between strategic thinking and strategic planning.
8. List the steps of Risk Assessment.
9. Discuss the various functions of Green-IT based applications.
10. List any five principles of Green Engineering.

PART-B

Answer any SEVEN full questions each carries 10 marks. 10X7=70 Marks

1. Explain the life cycle of a device or hardware with diagram.
2. Discuss the different methods of data efficiency.
3. Explain with diagram ERP system with modules and relationships.
4. Explain different software and database aspects of an EMIS.
5. Explain Enterprise Architecture Planning with different layers.
6. Explain the continuous Risk Management with a neat diagram.
7. Give the differences between RoHS, REACh and WEEE.
9. Explain with diagram for the global regulatory environment for the electrical, electronic and IT sectors.
10. Explain seven-step approach to create Green IT strategy.

MODEL QUESTION BANK

Diploma in Computer Science & Engineering

V Semester

Course Title: Green Computing

CO	Question	CL	Marks

I	Define Green IT and list the benefits of Green IT.	R	05
	Define climate change, global warming, greenhouse gases and greenhouse effect.	R	
	Explain how the software impact the environment and the energy consumption of computing systems.	U	
	Describe different dimensions or directions of Green IT.	U	
	Mention six holistic approaches that addresses Green IT.	R	
	Discuss whether Green IT is burden or Opportunity?	U	
	Explain the 3Rs of Green IT.	U	
II	Discuss the impacts of various chemicals used in manufacturing process of electronic devices.	U	05
	Explain the various e-waste disposal techniques and which is the most effective among them and why?	U	
	Explain different types of processor power states.	U	
	Write a note on context awareness in computers.	U	
	Explain how data buffering can save energy.	U	
	Explain the life cycle of a device or hardware with diagram.	U	10
	Describe Reuse, Recycle and Disposal methods of an electronic device.	U	
	Explain the different programming methods used to achieve computational efficiency.	U	
	Discuss the different methods of data efficiency.	U	
III	List the different issues in integrating ERP with EMIS system.	R	05
	Explain the four major categories of enablers for Green IT.	U	
	Write a note on Greening the Enterprise: IT Usage and Hardware.	U	
	Describe the major categories of information systems within an organization? Provide examples of greening enterprise activities at each level.	U	10
	Explain different software and database aspects of an EMIS.	U	
	Explain with diagram ERP system with modules and relationships.	U	
	Explain with diagram the flows and operations of a de-manufacturing facility.	U	
IV	Give the differences between strategic thinking and strategic planning.	R	5
	Explain the different enterprise architecture planning levels.	U	
	List the four key components of Green IT management.	R	
	List the steps of Risk Assessment.	R	
	Explain the three steps GQM paradigm.	U	
	Write a note on communication and social media.	U	
	Explain Enterprise Architecture Planning with different layers.	U	10
	Explain the continuous Risk Management with a neat diagram.	U	
V	Discuss the various functions of Green-IT based applications.	U	05
	Mention the several key standards for process and product of Green IT.	R	
	Mention the four criteria to evaluate electronics manufacturers employed by Greenpeace.	U	
	Write a note on Industry associations and Standard bodies.	U	
	Write a note on RoHS.	U	
	Write a note on REACh.	U	
	Write a note on WEEE.	U	
	Give the differences between RoHS, REACh and WEEE.	U	10
	Explain with diagram for the global regulatory environment for the electrical, electronic and IT sectors.	U	
	Write a note on Green Engineering.	U	

VI	List any five principles of Green Engineering.	**R**	**05**
	Mention the various features for a modern smart Grid.	**R**	
	Explain the key benefits of smart Grid.	**U**	
	Discuss the general guidelines for making an enterprise's functional units green.	**U**	
	Mention the various measures adopted by an organization to green their supply chain.		
	Explain the various key sustainability and Green IT trends.	**U**	**10**
	Explain seven-step approach to create Green IT strategy.	**U**