

COMPUTER SCIENCE DEPARTMENT INU

Commitment to Meaningful Education for SDGs for Computer Science Department.

Part-I

1. SDG 4: Quality Education

Subject: Educational Technology, Learning Management Systems (LMS)

Prerequisite: Basic programming, Databases

Relevance: Students learn how to develop and enhance digital platforms and tools that improve accessibility to education globally.

Management Information System		
Credit Hours:	3(3,0)	Prerequisites:
Course Learning Outcomes (CLOs):		
At the end of the course the students will be able to:	Domain	BT Level*
1. Understand and articulate concepts of information technology management.	C	2
2. Assess and apply IT to solve common business problems.	C	2
3. Suggest and defend effective solutions to business problems, and design a database application to solve a business problem.	C	3
4. Explain in details the ethical aspects of information technology use in the organization and its governance issues.	C	2
* BT= Bloom's Taxonomy, C=Cognitive domain, P=Psychomotor domain, A= domain		Affective

Course Content:

Introduction to Information Systems in Organizations; Business Process and Decision Making; Productivity, Innovation and Strategy; Database and Content Management; Decision Making and Business Intelligence; Competitive Advantage and Business Processes; Networks and Collaboration; ERP and E-commerce, Social Networking, and Web 3.0; Acquiring Information Systems Through Projects; Structure, Governance, and Ethics; Managing Information Security and Privacy

2. SDG 7: Affordable and Clean Energy

Subject: Energy efficient Computing, IoT for Smart Grids

Prerequisite: Internet of Things (IoT), Cloud Computing

Relevance: This subject involves building systems that optimize energy use through smart technologies, contributing to cleaner and more affordable energy solutions.

3. SDG 9: Industry, Innovation, and Infrastructure

Subject: **Software Engineering**, Blockchain, AI and Automation

Prerequisite: Advanced Programming, Data Structures

Relevance: Students work on innovative technologies like blockchain, automation, and AI, which help industries grow while remaining sustainable.

Introduction to Software Engineering

Course Content: Nature of Software, Overview of Software Engineering, Professional software development, Software engineering practice, Software process structure, Software process models, Agile software Development, Agile process models, Agile development techniques, Requirements engineering process, Functional and non-functional requirements, Context models, Interaction models, Structural models, behavioral models, model driven engineering, Architectural design, Design and implementation, UML diagrams, Design patterns, Software testing and quality assurance, Software evolution, Project management and project planning, configuration management, Software Process improvement.

4. SDG 11: Sustainable Cities and Communities

Subject: Smart Cities, Urban Computing

Prerequisite: Machine Learning, IoT

Relevance: Designing systems for managing smart cities, optimizing transportation, energy use, and housing to make urban spaces more sustainable.

5. SDG 12: Responsible Consumption and Production

Subject: Green Computing, Ethical AI

Prerequisite: Operating Systems, Data Science

Relevance: Students explore ways to reduce the carbon footprint of computing systems, promote recycling in tech, and create AI models that encourage ethical production and consumption.

6. SDG 13: Climate Action

Subject: Data Science for Climate Change, Environmental Monitoring Systems

Prerequisite: Data Mining, Geographic Information Systems (GIS)

Relevance: Leveraging data science to analyze environmental trends and create technological solutions that contribute to climate change mitigation.

7. SDG 16: Peace, Justice, and Strong Institutions

Subject: **Cyber security**, Privacy, Digital Governance

Prerequisite: Network Security, Cryptography

Relevance: The focus is on developing secure and transparent systems for digital governance, which supports peace, justice, and strong institutions.

8. SDG 17: Partnerships for the Goals

Subject: Open Source Software Development, Collaborative Systems

Prerequisite: Software Engineering, Distributed Systems

Relevance: Encourages the development of collaborative tools and systems that enable partnerships between different sectors and countries to achieve the SDGs.

Part-II

Based on the uploaded curriculum for Computer Science, Software Engineering, and Information Technology programs, here's how the education for Sustainable Development Goals (SDGs) can be integrated across the entire curriculum:

Integration of SDGs Across Curriculum:

1. **SDG 4: Quality Education**
 - The curriculum itself promotes quality education by offering a structured learning path for computer science and related fields. The "**Professional Practices**" and "**Technical & Business Writing**" courses help students gain valuable communication and ethical skills, improving their capability to contribute meaningfully in both technical and social contexts.
2. **SDG 3: Good Health and Well-being**
 - Courses like "**Artificial Intelligence**" and "**Data Science**" can be linked to health-related projects like analyzing healthcare data or developing predictive models for diseases. Students can work on capstone projects focusing on health tech, promoting well-being using technological advancements.
3. **SDG 9: Industry, Innovation, and Infrastructure**
 - Subjects such as "**Computer Networks**", "**Operating Systems**", and "**Software Engineering**" contribute directly to infrastructure development, particularly in the digital space. These courses can integrate projects where students develop or simulate sustainable IT infrastructure solutions for smart cities.
4. **SDG 11: Sustainable Cities and Communities**
 - "**Database Systems**" and "**Information Security**" courses could be integrated with the concept of managing smart urban areas. Students could learn to design secure databases that manage urban planning data, enhancing the efficiency of services in smart cities.
5. **SDG 13: Climate Action**
 - Courses like "**Parallel & Distributed Computing**" can be used for climate modeling and simulation. Assigning projects where students simulate climate data

using parallel computing techniques can give practical exposure to addressing environmental challenges.

6. **SDG 10: Reduced Inequalities**
 - The course "**Human-Computer Interaction**" can be tailored to include projects focusing on accessibility, aiming to reduce inequalities by creating technology that is accessible to people with disabilities, hence fostering inclusion.
7. **SDG 16: Peace, Justice, and Strong Institutions**
 - "**Cybersecurity**" and "**Information Security**" courses directly contribute to SDG 16 by preparing students to create secure and robust digital environments, which is essential for maintaining peace and justice in increasingly digitized institutions.

Curriculum Integration Examples:

- **Capstone Projects:**
 - Encourage final year projects that address SDGs directly, such as developing e-health applications (SDG 3) or creating an app to promote waste management (SDG 12: Responsible Consumption and Production).
- **Workshops and Seminars:**
 - Organize seminars on "**Technology for Social Good**" highlighting the role of computer science in achieving the SDGs. Invite industry experts to discuss how technology can contribute to sustainable development.
- **Ethics and Professional Practices:**
 - Courses like "**Professional Practices**" should include discussions on ethical use of technology in the context of sustainable development, promoting a mindset where students develop technology responsibly to benefit society.

- **Mapping Specific Courses to SDGs:**

Subject	Related SDG(s)
Artificial Intelligence	SDG 3 (Good Health), SDG 4 (Quality Education), SDG 9
Human-Computer Interaction	SDG 10 (Reduced Inequalities)
Data Science	SDG 3 (Good Health), SDG 13 (Climate Action)
Cybersecurity	SDG 16 (Peace & Justice)
Parallel & Distributed Computing	SDG 13 (Climate Action)
Software Engineering	SDG 9 (Industry & Innovation), SDG 12 (Responsible Consumption)
Database Systems	SDG 11 (Sustainable Cities)

Part-III

Based on the uploaded curriculum for Computer Science, Software Engineering, and Information Technology programs, here's how the education for Sustainable Development Goals (SDGs) can be integrated across the entire curriculum:

Integration of SDGs Across Curriculum:

8. **SDG 4: Quality Education**
 - The curriculum itself promotes quality education by offering a structured learning path for computer science and related fields. The "**Professional Practices**" and "**Technical & Business Writing**" courses help students gain valuable communication and ethical skills, improving their capability to contribute meaningfully in both technical and social contexts.
9. **SDG 3: Good Health and Well-being**
 - Courses like "**Artificial Intelligence**" and "**Data Science**" can be linked to health-related projects like analyzing healthcare data or developing predictive models for diseases. Students can work on capstone projects focusing on health tech, promoting well-being using technological advancements.
10. **SDG 9: Industry, Innovation, and Infrastructure**
 - Subjects such as "**Computer Networks**", "**Operating Systems**", and "**Software Engineering**" contribute directly to infrastructure development, particularly in the digital space. These courses can integrate projects where students develop or simulate sustainable IT infrastructure solutions for smart cities.
11. **SDG 11: Sustainable Cities and Communities**
 - "**Database Systems**" and "**Information Security**" courses could be integrated with the concept of managing smart urban areas. Students could learn to design secure databases that manage urban planning data, enhancing the efficiency of services in smart cities.
12. **SDG 13: Climate Action**
 - Courses like "**Parallel & Distributed Computing**" can be used for climate modeling and simulation. Assigning projects where students simulate climate data using parallel computing techniques can give practical exposure to addressing environmental challenges.
13. **SDG 10: Reduced Inequalities**
 - The course "**Human-Computer Interaction**" can be tailored to include projects focusing on accessibility, aiming to reduce inequalities by creating technology that is accessible to people with disabilities, hence fostering inclusion.
14. **SDG 16: Peace, Justice, and Strong Institutions**
 - "**Cybersecurity**" and "**Information Security**" courses directly contribute to SDG 16 by preparing students to create secure and robust digital environments, which is essential for maintaining peace and justice in increasingly digitized institutions.

Curriculum Integration Examples:

- **Capstone Projects:**
 - Encourage final year projects that address SDGs directly, such as developing e-health applications (SDG 3) or creating an app to promote waste management (SDG 12: Responsible Consumption and Production).
- **Workshops and Seminars:**
 - Organize seminars on “**Technology for Social Good**” highlighting the role of computer science in achieving the SDGs. Invite industry experts to discuss how technology can contribute to sustainable development.
- **Ethics and Professional Practices:**
 - Courses like “**Professional Practices**” should include discussions on ethical use of technology in the context of sustainable development, promoting a mindset where students develop technology responsibly to benefit society.

- **Mapping Specific Courses to SDGs:**

Subject	Related SDG(s)
Artificial Intelligence	SDG 3 (Good Health), SDG 4 (Quality Education), SDG 9
Human-Computer Interaction	SDG 10 (Reduced Inequalities)
Data Science	SDG 3 (Good Health), SDG 13 (Climate Action)
Cybersecurity	SDG 16 (Peace & Justice)
Parallel & Distributed Computing	SDG 13 (Climate Action)
Software Engineering	SDG 9 (Industry & Innovation), SDG 12 (Responsible Consumption)
Database Systems	SDG 11 (Sustainable Cities)

Integration of SDGs Across the Full Curriculum

1. **SDG 4: Quality Education**
 - The curriculum itself aims to provide quality education that meets international standards. It includes a broad range of foundational and advanced courses in computing disciplines that ensure all students receive a comprehensive education, preparing them to be competitive in global job markets.
 - General education courses such as **English Composition & Comprehension**, **Technical & Business Writing**, and **Professional Practices** develop essential communication skills and professional ethics, which are critical for fostering quality education.
2. **SDG 9: Industry, Innovation, and Infrastructure**

- Core computing courses like **Software Engineering**, **Operating Systems**, and **Database Systems** align with SDG 9 by equipping students with skills to contribute to innovations in technology and the development of digital infrastructure.
- The inclusion of **Artificial Intelligence**, **Computer Networks**, and **Information Security** courses prepares students to develop solutions that can support modern industry needs, emphasizing the role of technology in enhancing infrastructure.
- 3. **SDG 11: Sustainable Cities and Communities**
 - Courses like **Database Systems**, **Computer Networks**, and **Information Security** can be used to develop smart city solutions. Students can learn to design systems that optimize urban resources, enhance security, and improve community resilience.
- 4. **SDG 13: Climate Action**
 - Subjects such as **Parallel & Distributed Computing** and **Artificial Intelligence** can be utilized for climate modeling, optimizing resource use, and improving efficiency in energy management. Students can work on projects that contribute to understanding climate change and reducing environmental impacts.
- 5. **SDG 16: Peace, Justice, and Strong Institutions**
 - Courses in **Cybersecurity** and **Information Security** contribute to SDG 16 by providing students with knowledge and skills to create secure digital environments, which are crucial for maintaining trust, transparency, and strong institutions in an increasingly connected world.

Mandatory Education for All Students

- **Common Courses:** Courses such as **Programming Fundamentals**, **Data Structures & Algorithms**, and **Software Engineering** are required for all students across computing disciplines (Computer Science, Software Engineering, and Information Technology). These courses lay the foundation for technical proficiency that can be directed towards addressing SDGs.
- **Professional and Ethical Education:** The **Professional Practices** course is mandatory for all computing students, emphasizing the ethical implications of technology development and its societal impact, directly relating to SDG 4 (Quality Education) and SDG 16 (Peace, Justice, and Strong Institutions).

Curriculum Components Supporting SDGs

- **General Education and University Electives:** Courses in **social sciences**, **management**, and **economics** help students understand the broader impact of technology on society and the economy, supporting SDGs like SDG 8 (Decent Work and Economic Growth) and SDG 10 (Reduced Inequalities).
- **Capstone Projects:** The **Final Year Project** is mandatory for all students and can be directed towards solving real-world problems related to SDGs, such as developing an e-health platform (SDG 3: Good Health and Well-being) or creating a platform for renewable energy management (SDG 7: Affordable and Clean Energy).

Part-VI

1. Embedding Sustainability into Learning Outcomes

- Each course can include **sustainability-related learning outcomes**. For example:
 - In **Software Engineering**, students would demonstrate understanding of how software can support sustainable infrastructure (aligning with SDG 9: Industry, Innovation, and Infrastructure).
 - In **Data Science**, students would learn how data analytics can help address environmental challenges, such as predicting climate impacts or optimizing resource usage (aligning with SDG 13: Climate Action).

2. Assessments and Projects Related to SDGs

- **Course Assignments and Projects:** Each course could include assignments or projects focused on applying computing knowledge to solve sustainability-related problems. This would allow for evaluating the student's understanding of SDGs and their application to technology solutions. Examples include:
 - **Final Year Project:** Students are required to choose a project that addresses at least one SDG, such as developing an energy-efficient algorithm (SDG 7: Affordable and Clean Energy) or creating a smart city solution for waste management (SDG 11: Sustainable Cities and Communities).
 - **Case Study Assignments:** In courses like **Human-Computer Interaction (HCI)** or **Artificial Intelligence**, students could complete case studies that evaluate how technology impacts sustainability, for instance, by improving educational tools for marginalized groups (SDG 4: Quality Education) or enhancing accessibility (SDG 10: Reduced Inequalities).

3. Sustainability Modules in Core Courses

- Specific **sustainability modules** can be added to core computing courses to explicitly link the content to SDGs.
 - For instance, **Information Security** courses could include a module on the role of cybersecurity in ensuring just and resilient institutions (SDG 16).
 - In **Database Systems**, a module could be added on managing environmental data for sustainable urban planning (SDG 11).

4. Pre- and Post-Literacy Tests

- Conduct **pre- and post-tests** to evaluate students' sustainability literacy at the beginning and end of relevant courses.
 - These tests could cover basic concepts of sustainability, how technology impacts the environment, and ways in which computing can contribute to sustainable development.
 - The results of these tests can provide insight into how well students understand sustainability concepts after completing the courses, and measure the impact of integrating sustainability content.

5. Reflective Essays and Surveys

- **Reflective Essays:** Students could write reflective essays on how the skills they are learning in their computing courses could be used to contribute to specific SDGs.
 - For example, in the **Professional Practices** course, students could discuss the ethical implications of technology development and how it aligns with sustainability goals, such as creating responsible AI systems (SDG 12: Responsible Consumption and Production).
- **Surveys:** Surveys could be conducted to gauge students' awareness and attitudes towards sustainability before and after completing specific modules or courses, assessing their understanding and interest in contributing to sustainable development.

6. Rubrics for Evaluating Sustainability Competence

- Develop **evaluation rubrics** for each course that include sustainability literacy as a component.
 - In **Software Development** courses, rubrics could assess the environmental impact of the software design and the students' ability to articulate how their design choices contribute to sustainability.
 - In **Web Technologies**, students could be evaluated on how they create web applications that raise awareness about social issues, contributing to sustainability literacy.

7. Interdisciplinary Collaboration Projects

- **Cross-disciplinary Projects:** Students could collaborate on projects that involve both computing and other fields, such as environmental science or health. This interdisciplinary approach would promote a deeper understanding of how computing solutions can contribute to broader sustainability efforts.
 - For example, **collaborative projects** between Computer Science and Environmental Science could focus on building data-driven solutions for climate monitoring (SDG 13: Climate Action).

8. Workshops and Seminars

- **Workshops:** Conduct workshops that introduce key concepts of sustainability and SDGs. These workshops could be compulsory for first-year students and serve as an introduction to sustainability literacy.

- **Guest Lectures:** Invite professionals working on sustainability in technology to give guest lectures, which would help students understand real-world applications of their skills in contributing to the SDGs.

Example Mapping: Measuring Literacy Across Courses

Course	Sustainability Literacy Components	Related SDG(s)
Data Science	Ability to analyze environmental or health data for social impact	SDG 3 (Health), SDG 13 (Climate Action)
Human-Computer Interaction	Designing for accessibility, inclusivity, and social impact	SDG 10 (Reduced Inequalities)
Software Engineering	Knowledge of creating energy-efficient software	SDG 7 (Affordable and Clean Energy), SDG 12
Information Security	Understanding security's role in resilient institutions	SDG 16 (Peace, Justice, and Strong Institutions)