

The mapping of IS courses to UN Sustainable Development Goals

Introduction

Within the efforts to establish a solid framework to ensure the sustainable development for all its member nations, United Nations (UN) adopted the 2030 UN agenda for sustainable development, which relies on 17 core Sustainable Development Goals (SDGs). UN aims through these 17 SDGs to ensure equitable life for everyone in this planet by addressing all the major challenges facing the humanity and crucially effect their life .Table.1 lists the 17 SDG with short descriptions.

Table 1: UN SDGs with short Description

No.	SDG name	SDG content
SDG.1	No Poverty	End poverty in all its forms everywhere
SDG.2	Zero Hunger	End hunger, achieve food security and improved nutrition and promote sustainable agriculture
SDG.3	Good Health and Well-Being	Ensure healthy lives and promote well-being for all at all ages
SDG.4	Quality Education	Ensure inclusive and equitable quality education and promote lifelong learning opportunities for all
SDG.5	Gender Equality	Achieve gender equality and empower all women and girls
SDG.6	Clean Water and Sanitation	Ensure availability and sustainable management of water and sanitation for all
SDG.7	Affordable and Clean Energy	Ensure access to affordable, reliable, sustainable and clean energy for all
SDG.8	Decent Work and Economic Growth	Promote sustained, inclusive and sustainable economic growth, full and productive employment and decent work for all
SDG.9	Industry, Innovation and Infrastructure	Build resilient infrastructure, promote inclusive and sustainable industrialization and foster innovation
SDG.10	Reduced Inequalities	Reduce inequality within and among countries
SDG.11	Sustainable Cities and Communities	Make cities and human settlements inclusive, safe, resilient and sustainable
SDG.12	Responsible Consumption and Production	Ensure sustainable consumption and production patterns
SDG.13	Climate Action	Take urgent action to combat climate change and its impacts
SDG.14	Life below Water	Conserve and sustainably use the oceans, seas and marine resources for sustainable development
SDG.15	Life on Land	Protect, restore and promote sustainable use of terrestrial ecosystems, sustainably manage forests, combat desertification, and halt and reverse land degradation and halt biodiversity loss

SDG.16	Peace, Justice and Strong Institutions	Promote peaceful and inclusive societies for sustainable development, provide access to justice for all and build effective, accountable and inclusive institutions at all levels
SDG.17	Partnerships for the Goals	Strengthen the means of implementation and revitalize the global partnership for sustainable development

In order to achieve these goals, every member country in UN should contribute in different levels: governmental level, institutional level, and societal level. All these efforts need to be harmonized to ensure the optimal achievement of the goals and enhance the life quality in the earth. As a part of these efforts UNESCO implemented a detailed guidelines for higher educational institutions to guide the educational practitioners on embedding the sustainable development in their curriculum. This guide entitled “Education for Sustainable development goals: Learning Objectives”. In this guide, UNESCO suggested learning objectives that might be used in university curricula to ease the mapping process of SDGs.

IS Curriculum Review Process

In this report, we reviewed UNESCO guidelines in order to come out with a clear understanding of how to do the mapping of our courses in IS department with SDGs. As per UNESCO Learning Objectives, the SDGs 4, 9, and 17 are most related to Information Systems courses. Table.2 shows the relevant SDGs and corresponding UNESCO learning objectives.

Table 2: Relevant SDGs to IS courses with corresponding UNESCO learning objectives.

SDG name	Learning objectives
SDG4 Quality Education	<ul style="list-style-type: none"> The learner understands the important role of education and lifelong learning opportunities for all (formal, non-formal and informal learning) as main drivers of sustainable development, for improving people’s lives and in achieving the SDGs.
SDG 9 Industry, Innovation and Infrastructure	<ul style="list-style-type: none"> The learner understands the local, national and global challenges and conflicts in achieving sustainability in infrastructure and industrialization. The learner is aware of new opportunities and markets for sustainability innovation, resilient infrastructure and industrial development
SDG16 Peace, Justice and Strong Institutions	The learner understands the importance of individuals and groups in upholding justice, inclusion and peace and supporting strong institutions in their country and globally.
SDG 17 Partnerships for the Goals	<ul style="list-style-type: none"> The learner recognizes the importance of cooperation on and access to science, technology and innovation, and knowledge sharing.

The UNESCO learning objectives have been analyzed based on the highlighted keywords. Then, the extracted keywords have been compared with all the CLOs and course descriptions of IS courses to find the similarities between UNESCO learning objectives and CLOs for each IS course.

Table.3 shows the mapping of IS courses to the selected SDGs according to UNESCO learning Objectives.

Table 3: mapping of IS courses to the selected SDGs according to UNESCO learning Objectives

Course	SDG	Relevant CLOs	Course description
IS201 Introducti on to Informati on Systems	SDG 4: Quality Education	CLO5: Accept responsibility for own learning and development within given time (lifelong learning).	This course presents an overview of information systems including the introduction to systems, development concepts, information technology, and application software. The major role of information systems (IS) is to support organizational personnel, regardless of their functional area or level in the organization. The main focus of this course is not merely learning the concepts of IS but the learning of the competitive advantage, timelines, and improvement in quality which information technology provides to equip students with skills of lifelong learning. The theory is complemented by practical work aimed at gaining basic proficiency with different types of widely used application software.
	SDG16: Peace, Justice and Strong Institutions	CLO2: Design the process of developing and implementing information systems in organizations.	
IS205 Business Process Managem ent	SDG16: Peace, Justice and Strong Institutions	CLO 1: Describe the concept of BPM through its lifecycle, maturity, and issues in its implementation, and its effective implementation in organizations CLO 3: Identify workflow and the role of business processes within numerous applications in an organization	Business process management is a course which is based on both theories and practices in understanding and analyzing business processes, as well as suggest ways for development and improvement and automation solution in the organizations. Students work individually and in team project that requires analyzing business processes through modelling and field work. The project gives them good experience with basic modelling using BPMN 2.0. Active lifelong learning is introduced by case analysis and presentation, class exercises, hands on workshop through tutorials and discussions into the course.
	SDG 4: Quality Education	CLO 5: Examine best practices for modelling the business	

		processes through case studies	
	SDG17:Partnerships for the Goals	CLO 6: Design and analyze business process through team work and field research in real organization and suggest ways for improvement	
IS231 System Analysis & Design	SDG 9: Industry, Innovation and Infrastructure	CLO 3: Analyze various systems using object oriented diagrams and techniques. CLO 4: Design a system using appropriate software tools with limited supervision and defense in depth approach adapted to solve a particular problem.	This course provides an overview of requirements and system analysis using the object-oriented paradigm with emphasis on the models provided by the unified Modelling Language (UML) aiming at enhancing the IS infrastructure in the organizations. Topics include: the structured approach to system analysis and design; foundations and elements of the object-oriented approach; approached to identifying classes and objects, requirements and system modeling using UML diagrams relevant for the analysis phase; system design concepts, introducing various architectural design approaches and object-oriented design methodology. Students work on team project that requires designing a system and making use of the available CASE tools such as Rational Software.
	SDG17:Partnerships for the Goals	CLO 6: Create and present professional level developed project report.	
IS241 Database Management & Applications	SDG 9: Industry, Innovation and Infrastructure	CLO3: Design a relational database system conceptually, logically and physically	This course introduces database fundamentals and covers SQL using Oracle system. It teaches the process for designing and developing relational database infrastructure in the organizational level. Students will gain the required skills to use Entity Relationship Diagrams to conceptual design of databases, Relational model for the logical design and Oracle for the physical layer of DBMS. Database creation and manipulation is assured by an exhaustive coverage of SQL statements. Moreover, It helps to prepare for the Oracle certification
	SDG17:Partnerships for the Goals	CLO6: Implement a full real size database system in a group	
IS321 Enterprise Architecture	SDG 9: Industry, Innovation and Infrastructure	CLO4 Design EA solutions with business continuity taken into consideration CLO5 Apply EA to integrate strategy, business and technology	This course explores the design, selection, implementation and management of enterprise architecture solutions. The focus is on the utilization of enterprise architectures to meet business requirements. Students learn what is an enterprise architecture, its components, how to implement it and how to create an enterprise architecture solution for an organization. These

	SDG16: Peace, Justice and Strong Institutions	CLO2: Analyze organizational structural and security issues	topics are addressed both within and beyond the local situation, with attention paid to managing skills, standards and security within an organization.
IS361 IS Project Management	SDG 4: Quality Education	CLO 2: Create a project plan, including scope definition, task breakdown (WBS), team selection, quality, communication mechanisms and progress evaluation and reporting using an appropriate project lifecycle.	This course provides students with the knowledge and required skills they need in their carrier in the long term for planning, scheduling, monitoring, and controlling the process of developing information systems. Topics covered include project management concepts, project planning, risk analysis, WBS and task analysis, time scheduling, PERT and GANTT charts, project effort and cost estimation techniques, resources allocation, project tracking and monitoring, and process management methodologies.
	SDG17: Partnerships for the Goals	CLO 5: Apply a team-based collaborative approach to software project management and enhance the probability of project success using appropriate software “Microsoft Project™”. CLO 6: Employ teamwork and leadership qualities to accept responsibility for own learning and developing an application with limited supervision.	
IS371 Quantitative Analysis	SDG 9: Industry, Innovation and Infrastructure	CLO3: Use linear programming to model complex optimization problems.	This course introduces fundamental quantitative methods used to analyse and solve various models of business problems. The course presents a set of fundamental theories and concepts including probability theory, time series, mathematical programming, and Markov processes. Such tools are then used model and solve a variety of business problems in finance, transportation, inventory management, etc. The course aims to equip the student with the necessary knowledge and skills allowing them to perform quantitative analysis to
	SDG 4: Quality Education	CLO5: Select appropriate quantitative methods and tools (matlab, Excel solver, Excel QM, etc.) to analyze	

		business problems and related datasets.	solve some business models including forecasting, distribution, transportation, and inventory models. After completing this course, students are expected to use software tools to solve these common management problems as well as constrained optimization problems. Students will gain some experience in applying these quantitative tools to real-world problems.
	SDG17:Partnerships for the Goals	CLO6:Work effectively with a team to analyze data and solve variety of business problems.	
IS461 INNOVATION & TECHNOLOGIES IN BUSINESS	SDG 9: Industry, Innovation and Infrastructure	CLO2 Apply techniques and methodologies used to create useful technologies. CLO3 Identify challenges associated with the new innovations and rapid growth of the industry. CLO4 Recognize how businesses can use technologies to innovate and redesign its conduct	This course provides an opportunity to prepare the students to acquire knowledge, develop understanding and gain skills to efficiently manage new technology and innovation in both public and private sectors. The aim of the course is twofold, the students learn how to incorporate and promote the management of new technology in industry with the purpose to improve industrial productivity and global competitiveness, and how to develop skills and knowledge to integrate the power of research, innovation, technology, and service development/new product and commercialization in business.
IS478 Information Systems Security	SDG 4: Quality Education	CLO6: Apply information security standards and tools to real-world applications in both the private and public sector in different case scenarios.	The course aims to provide the knowledge of the basic principles of computer security, focusing on system elements. This course provides students with the necessary level of skills and knowledge in the areas of information security that they will need to function within an organization. The focus is to review concepts, theory, methodologies and techniques incorporating industry standards and practices with a focus on confidentiality, availability, and integrity aspects of information systems discussed in the IS security literature and current practice. Students will undertake case studies exercises using the University's computing facilities and laboratories to provide them with a better understanding of computerized security techniques used in practice. The course covers fundamentals of authentication, and encryption technologies in a networked environment, in particular in the wide-area internet environment. The main emphasis of the course is the management of information systems security efforts. At the completion of the course students should be able to complete the activities listed in the learning objectives at the specified level of proficiency.
	SDG 9: Industry, Innovation and Infrastructure	CLO4: Apply how businesses/organizations apply cryptography in maintaining information security.	

Recommendations and Future Enhancements

Embedding Sustainable Development Goals into university curriculum is a new for many university and according to (Chang & Lien, 2020), the universities need a substantial work to integrate the SDGs into the curricula. In PSU, we need further investigation to ensure the integration of SDGs with considering all the learning objectives proposed by UNESCO. Particularly, IS courses content should be revised to let the lecturers and students be aware of SDGs and feel these SDGs in the syllabi and other learning activities.

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