



# **BITS College**

**School of Systems and Technology**

**Curriculum for  
Graduate Program  
in**

***Enterprise Systems Engineering***

**Revised  
January 2021  
Addis Ababa, Ethiopia**

*Promoting excellence in learning and teaching*

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# 1. Introduction

## *1.1 BITS College*

BITS College is a private higher learning institution with a vision of promoting excellence in the production, growth and dissemination of advanced scientific knowledge through teaching and research. The College is conceived, established and run by caring and committed educators and innovators who seek to improve the quality of higher education in the country through the introduction of innovative and enlightened education programs that help students realize their potential. It aims at realizing this by engaging a management team experienced in education and business, a dedicated team of faculty and staff, well-designed academic programs, world class educational facilities and cutting-edge technologies. The senior management team comes with over 30 years' combined experience in teaching at tertiary level (at Addis Ababa University (AAU)), holding senior management positions at AAU (education management), unique and proven track record in corporate management in technology (IT service) industries.

Among the founders of the College is a focused and well-reputed system development and training company, with proven track record in business process management and enterprise software development and support. Founded in 2012, the IT Company mainly involves in the design and development of innovative and high-quality web-based business applications for the logistics, construction, and health sectors. In fact, BITS had its genesis in this IT Company.

BITS plans to engage in mutually rewarding collaborations and strategic partnerships with national, international, public, and private higher learning and research institutions so as to grow and become a full-fledged university that offers undergraduate and graduate degree programs in business and technology related fields.

The executive officer of the College is the President assisted by the Vice President for Academic Affairs and Research (VPAAR) and the Vice President for Business and Administration (VPBA).

The highest decision-making body of the College is the Academic Board (AB). However, most academic and administration activities are carried out by the Executive Management (EM). The College Academic Affairs and Research Council (CAARC) is a standing committee accountable to the EM. The CAARC, working under the chairmanship of the Vice President

for Academic Affairs and Research (VPAAR), deliberates and decides on all academic matters of the College on behalf of the EM. At School level, the Head, program coordinators and staff members deliberate on the day-to-day academic matters in their respective academic committees.

Currently, the School of Systems and Technology is established under the College to offer four academic programs, namely:

- Master of Science Degree in Enterprise Systems Engineering
- Master of Science Degree in Information Technology Management
- Bachelor of Science Degree in Information Technology and Systems
- Bachelor of Science Degree in Software Engineering

The main purpose of this document is to present the required narratives to establish the **Graduate Program in Enterprise Systems Engineering**. Accordingly, the document is organized as follows. The remaining part of this section presents the rationale for the graduate program in Enterprise Systems Engineering. The second section of the document presents the curriculum. The third section details the resource requirements of the program. Section four presents the course offering schedule and the last section briefly outlines the mechanisms that would be adopted for quality assurance.

## ***1.2 Rationale***

ICT has taken the centre stage in almost every aspect of human endeavour. It helps improve the efficiency and effectiveness of services offered to customers, and enhance business processes, managerial decision making, and workgroup collaborations, which strengthens competitive positions in rapidly changing and emerging economies. These needs have created demands for skilled workforce in various IT professions. It is also realized that software and technical development have been remarkably increasing in the last few decades. Particularly software applications have profoundly transformed markets, industries and the society in general. Not only is the dependence on software increasing but the character of software production itself is changing and with it the demands of the industry. Furthermore, with the huge investment in business industries such as Banking and Telecom, there is a greater demand for an ICT workforce of world standard. Specializations in various technical knowledge such as Enterprise Resource planning, enterprise systems design, management of enterprise IT projects, are in demand. With the increasing competition and customer demand, business

organizations will be required to allocate greater resources into Enterprise governance and security infrastructure. The growing impact of ICT innovation on financial services will likely create new skill requirements for ICT professionals looking to work in the rapidly evolving intersection between technology and Enterprises. As such, both the software and business industries expect students to be educated in courses and projects that are professionally relevant and that prepare them well for the work place.

On the other hand, everyone agrees that the country's future lies in educating its people to the highest possible standards. In order for the country to reach its economic and social goals, a thriving and successful higher education system is essential. The increasing enrolment and graduates in recent years also indicate the commitment in this country to further expand and modernize tertiary level education - to provide greater opportunities for all citizens. We also observe in the job market, that a college degree is becoming the preferred currency of the job application processes more and more - those without degrees are being given less and less preference by employers.

Despite such encouraging developments of increasing the number of college degree holders, much serious concerns are being expressed with regard to the quality of graduates.

- There is widespread dissatisfaction among both graduates and their employers on the performances of the graduates in the work area.
- The enrolled and graduates feel not necessarily better educated in employable skills, problem solving skills, critical thinking skills, etc.
- Employers feel that current graduates are deficient in thinking and problem-solving skills and hence inadequate for the demands of the workplace.
- In the case of IT graduates, for instance, graduates lack the ability to link technology and information systems with business processes and strategic objectives of organizations.
- There is a growing awareness among employers that graduates entering the workforce with such deficiencies would have a great repercussion on the ability to be competitive in a global marketplace.

Taking cognizance of this, as of recent, the need to introduce initiatives to improve/increase the quality of education is being advocated widely. Deliberations are underway at various forums on the whys and wherefores of the deficiencies. Among the issues under consideration are: revisiting college entrance preparations and exams; exploring ways and means of considering employable skills in the design and delivery of curricula; redesigning the national education roadmap, et cetera.

To this end, in the wake of the numerous challenges facing education in the country, and motivated by some of the national initiatives in this connection, BITS College is established to make its share of contribution to the on-going efforts of quality improvement. The College seizes this chance to address the challenge of providing education that meets high quality standards and whose contents are aligned to the needs of the country's economy and society.

The proposed graduate programs in Enterprise Systems Engineering is designed to prepare personnel well equipped to manage enterprise systems and planning of large business and financial companies.

## **2. Master of Science in Enterprise Systems Engineering (M.Sc. ESE)**

### ***2.1 Program Objectives***

The objective of the Master of Science in Enterprise Systems Engineering program is to produce graduates who have a broad and detailed knowledge in Systems Theory and Systems Thinking, business Process Analysis and Enterprise Systems Architecture and Design. This program is aimed at students who have already had first degree in IT related field of studies.

### ***2.2 Graduate Profiles***

The graduates of the program will be able to:

- Demonstrate a high level of intellectual competency in the field of Enterprise Systems Engineering;
- Demonstrate good problem-solving ability and be able to apply their knowledge to real-world tasks;

- Become experts to develop resilient enterprise architectures capable of defending, detecting, and responding to advanced cyber-attacks;
- Lead projects as a Technical Lead and/or Project Manager to develop and engineer resilient systems for operational Enterprise networks;
- Give high quality verbal presentations on scientific to topics in Enterprise Systems Engineering and related topics;
- Have the knowledge and skills to act as lecturers in higher education institutions;
- Have a professional and ethical attitude to their work, and possess good leadership qualities.

### ***2.3 Admission Requirements***

The Master of Science in Enterprise Systems Engineering is intended for students with computing undergraduate degree or postgraduate diploma, or first degree in any discipline with experience in the software industry. Particularly the following requirements must be fulfilled:

- A first degree in fields related to IT (computer science, Information Science/Systems, Software Engineering and Computer Engineering, from an accredited institution);

OR

- A first degree in any discipline with a minor in computer science or related fields like Information Science/Systems, Software Engineering and Computer Engineering, from an accredited institution.

AND

- A passing mark in the College's entrance exam

### ***2.4 Graduation Requirements***

#### ***2.4.1 Course Offering Sketch***

Experiences from similar programs indicate that a large number of technical and other supporting courses should not be the first subjects of study. Accordingly, core courses suggested for offering during the first semester of the first year are considered essential/fundamental in terms of preparing the students for the field of study.

In the second semester of the first year, students will be required to take more specific courses

that consist of a set of selected topics and practicum designed to help students to further deepen their knowledge in Enterprise Systems Engineering.

In the first semester of the second year, students will be required to take two more core courses and select one elective course. The elective courses are designed to prepare students for an independent but guided research project in the field of Enterprise Systems Engineering. The last semester of the program will be fully devoted to the research project.

### ***2.4.2 Course Requirements***

The program features 30 credit hours (70 ECTS) of compulsory courses, 3 credit hours (7 ECTS) of elective courses and 6 credit hours (14 ECTS) of thesis. Therefore, the minimum number of credit hours for graduation is 39 (91 ECTS). Lists of compulsory and elective courses are given below.

#### **(i) Compulsory Courses (30 Credit Hrs. – 70 ECTS)**

Students must take and pass all of the following courses to graduate from the program:

<b>Code</b>	<b>Course Title</b>	<b>Credit Hrs.</b>	<b>ECTS</b>
ES611	Business Information Systems	3	7
ES613	Foundations of Enterprise Architecture	3	7
ES621	Systems Theory and Systems Thinking	3	7
IT631	Research Methods in IT and Systems	3	7
ES618	Business Process Analysis & Engineering	3	7
ES622	Enterprise Systems Design	3	7
IT646	IT Security Management	3	7
IT656	IT Project Management	3	7
ES731	Business Intelligence and Analytics	3	7
ES723	Enterprise Resource Planning Systems	3	7
		<b>30</b>	<b>70</b>



**(ii) Elective Courses (3 Credit Hrs. – 7 ECTS):**

In order to graduate from the program, students must take and pass a minimum of 3 credit hours of courses from the following list to graduate from the program:

Code	Course Title	Cr, Hrs.	ECTS
ES725	Organizational Behaviour	3	7
ES727	Innovation, Entrepreneurship and Change Management	3	7
ES729	Special Topics in Enterprise Systems Engineering	3	7

**(iii) Thesis / Project (6 Credit Hrs. – 14 ECTS)**

All students will be required to conduct research and produce a report as partial fulfilment of the requirement for M.Sc. program in Enterprise Systems Engineering.

**2.4.3 Cumulative Grade Point Requirements**

To graduate from the program, students must pass every compulsory course, and at least 3 credit hours (7 ECTS) of elective courses with a cumulative grade point average of at least 3.0. A pass grade for a course is considered to be A, B+, B, C+ or C.

**2.5 Duration of Study**

The duration for the completion of a graduate program shall range from a minimum of one and half years to a maximum of two years. The maximum allowable period to complete the program is four years.

**2.6 Degree Award and Nomenclature**

The Degree Awarded upon successful completion of the requirements of the program is

***“Master of Science in Enterprise Systems Engineering”***

Degree Nomenclature

English:

***Master of Science in “Enterprise Systems Engineering”***

Amharic:

**“የ ማስትሬት ዲግሪ በ “ኢንተርፕራይዝ ሲስተምስ ኢንጅነሪንግ”**

## 2.7 Description of Core Courses

### 2.7.1 ES611 Business Information Systems

<b>Prerequisites:</b>	None	
<b>Credit Hours:</b>	3 (7 ECTS)	
<b>Description</b>	The course provides students with a practical and theoretical insight into the processes and practices of developing information systems within organizations. It addresses the conceptual foundation of organizations, provides a framework to understand the relationship between organizational systems and information technology. It provides practical skills of using tools for modelling and managing organizational information systems, focusing on the changing architectures of Internet and web-based systems, open-source development, and Software as a Service. Particular attention is given to problem structuring and problem design issues using systems approach, integrating concepts and perspectives related to information technology innovation and organizational change.	
<b>Learning Outcome:</b>	Upon successful completion of this course, students will be able to: <ul style="list-style-type: none"> <li>• demonstrate their knowledge of organization and web-based information systems,</li> <li>• feel confidence in designing, implementing and managing organizational information systems</li> <li>• participate in real-world information system development project work</li> </ul>	
<b>Course Content</b>		
Unit	Topic	Week
1	Introduction to Information Systems <ul style="list-style-type: none"> <li>• Data, information, knowledge</li> <li>• Organizations and systems</li> <li>• Information systems and organizational infrastructure</li> </ul>	1
2	Organizational Strategy and Information Systems <ul style="list-style-type: none"> <li>• Organizational strategy</li> <li>• Competitive advantage</li> <li>• Aligning IS with business objectives</li> </ul>	2
3	Data Management <ul style="list-style-type: none"> <li>• Data governance</li> <li>• Data architecture</li> <li>• Data modelling</li> <li>• Database and storage management</li> </ul>	3-4
4	Network Applications and Emerging Technologies <ul style="list-style-type: none"> <li>• Networks</li> <li>• Wireless, mobile computing and mobile commerce</li> <li>• Emerging types of enterprise computing technology</li> <li>• Intelligence systems</li> <li>• Internet of Things</li> </ul>	5-6

5	Enterprise Information Systems <ul style="list-style-type: none"> <li>• Functional Information systems</li> <li>• The roles of Enterprise Systems in organizations</li> <li>• Enterprise Systems Architectures</li> <li>• Mainframe, Client-Server, SOA</li> <li>• Types of Enterprise Systems</li> <li>• Customer relationship management</li> <li>• Supply chain management</li> <li>• ERP</li> </ul>	7-8
6	E-Commerce, E-Business, and Mobile Commerce <ul style="list-style-type: none"> <li>• Digital markets and digital goods</li> <li>• Components of e-commerce</li> <li>• Models of e-commerce</li> </ul>	9-10
7	Social Networks and Businesses Intelligence <ul style="list-style-type: none"> <li>• Social media and data analytics</li> <li>• Use of social media for competitive advantage</li> </ul>	11
8	Ethics, Privacy, Security and Controls <ul style="list-style-type: none"> <li>• Information systems and ethical issues</li> <li>• Business value of security</li> <li>• Information systems vulnerability and controls</li> </ul>	12
Book review, Case illustration, Team case project		13-14
<b>Recommended References:</b>	<p>Business Information Systems, 2013, by <u>Paul Beynon-Davies</u>  <u>Essentials of Business Processes and Information Systems</u>, 2009, by Simha R. Magal and <u>Jeffrey Word</u>  Principles of Information Systems (MindTap Course List), 2017, by Ralph Stair and George Reynolds  Business Information Systems: Analysis, Design &amp; Practice, 2005, by <u>Graham Curtis</u> and David Cobham</p> <p>There will also be supplemental readings beyond the References, such as articles or web pages, which will be assigned by the instructor throughout the semester.</p>	
<b>Teaching Strategy:</b>	Lectures, discussion forums, tutorials, reading assignments and term papers,	
<b>Assessment:</b>	<p>Guideline: 30%: Continuous Assessment, 30%: Critiques of selected readings and research papers, 40%: Final Examination.</p> <p><i>Should be noted that the instructor has the freedom to determine student assessment techniques based on the nature of the course and/or his/her approach.</i></p>	

### 2.7.2 ES613 Foundations of Enterprise Architecture

<b>Prerequisites:</b>	None	
<b>Credit Hours:</b>	3 (7 ECTS)	
<b>Description</b>	Information Technology has become an integral part of successful business strategy. Enterprise architecture (EA) is fast emerging as a key function that enables synergy between IT and business strategy and delivery. This course covers foundational aspects of both enterprise and architectural thinking, the evolution of enterprise architecture concepts in terms of the business, technology and strategy perspectives, the role of enterprise architecture in business and IT alignment, architectural styles and techniques for capturing and documenting architectures.	
<b>Learning Outcome:</b>	<p>Upon successful completion of this course, students will be able to:</p> <ul style="list-style-type: none"> <li>• Explain the role of information technology in shaping and delivering business goals and strategies;</li> <li>• Understand the concepts and components of business architecture. [SEP]</li> <li>• Understand architectural styles and patterns used in IT solution development [SEP]</li> <li>• Effectively participate in a team effort to analyse and develop architectural viewpoints and architecture models</li> </ul>	
<b>Course Content</b>		
<b>Unit</b>	<b>Topic</b>	<b>Week</b>
1	<p>Introduction to enterprise architecture</p> <ul style="list-style-type: none"> <li>• Role of IT in modern organizations</li> <li>• Enterprises and their challenges</li> <li>• Problem of business and IT alignment</li> <li>• Enterprise architecture as a solution</li> <li>• Need for enterprise architecture</li> <li>• Benefits of practicing enterprise architecture</li> </ul>	1-2
2	<p>Key concepts of enterprise architecture</p> <ul style="list-style-type: none"> <li>• Enterprise and architectural thinking</li> <li>• Stakeholders and their concerns</li> <li>• Principles, models, views &amp; perspectives</li> <li>• Core processes, patterns, styles and techniques</li> </ul>	3-4
3	<p>Related governance instruments</p> <ul style="list-style-type: none"> <li>• Business Architecture</li> <li>• Quality Management</li> <li>• IT Governance</li> <li>• Change management and architecture compliance</li> </ul>	5
4	<p>Foundational aspects</p> <ul style="list-style-type: none"> <li>• Business process integration &amp; standardization</li> <li>• Business processes and IT infrastructure</li> <li>• IT engagement model</li> </ul>	6
5	<p>Enterprise architecture methods and frameworks</p> <ul style="list-style-type: none"> <li>• The IEEE 1471-2000/ISO/IEC 42010 Standard</li> <li>• Zachman Framework</li> <li>• Open Group's Architecture Framework</li> <li>• Information architecture operational model</li> <li>• Enterprise architecture maturity model</li> </ul>	7-8

6	Instruments for enterprise architecture <ul style="list-style-type: none"> <li>• Architecture Analysis</li> <li>• Architecture Alignment</li> <li>• Modeling languages</li> <li>• Software tools</li> </ul>	9-10
7	Translating architecture to projects <ul style="list-style-type: none"> <li>• Identifying projects</li> <li>• Selecting projects</li> <li>• Project implementing strategies</li> </ul>	11
8	The Enterprise Architect <ul style="list-style-type: none"> <li>• Key architectural roles</li> <li>• Competencies</li> <li>• Responsibilities</li> <li>• Teams</li> <li>• Professional development</li> </ul>	12
Book review, Case illustration, Team case project		13-14
<b>Recommended References:</b>	<ol style="list-style-type: none"> <li>1. Enterprise Architecture, 2007, by Johnson, P and Ekstedt, M</li> <li>2. Enterprise Architecture As Strategy: Creating a Foundation for Business Execution, 2006, by <u>Jeanne W. Ross</u> and <u>Peter Weill</u></li> <li>3. <u>Enterprise Architecture and Information Assurance: Developing a Secure Foundation</u>, 2013, by <u>James A. Scholz</u></li> <li>4. Enterprise Architecture at Work: Modelling, Communication and Analysis (The Enterprise Engineering Series), 2012, by Marc Lankhorst</li> </ol> <p>There will also be supplemental readings beyond the references such as articles or web pages, which will be assigned by the instructor throughout the semester.</p>	
<b>Teaching Strategy:</b>	Lectures, discussion forums, tutorials, reading assignments and term papers,	
<b>Assessment:</b>	<p>Guideline: 30%: Continuous Assessment, 30%: Critiques of selected readings and research papers, 40%: Final Examination.</p> <p><i>Should be noted that the instructor has the freedom to determine student assessment techniques based on the nature of the course and/or his/her approach.</i></p>	

### 2.7.3 ES621 Systems Theory and Systems Thinking

<b>Prerequisites:</b>	None	
<b>Credit Hours:</b>	3 (7 ECTS)	
<b>Description</b>	The course covers systems theory; wholeness, interrelationships and dynamics in systems thinking; systems thinking vs. process thinking. Taking the systems view of organizations and systems thinking as a management discipline, the course helps students in understanding and clarifying organizational situation with systems thinking, as well as exploring foundational concepts of organizational learning and systems approach to identify leverage points for systemic interventions.	
<b>Learning Outcome:</b>	<p>On successful completion of this course, students will be able to:</p> <ul style="list-style-type: none"> <li>• Gain an understanding of the language and concepts of systems, systems thinking, and complexity, and their implications for the workplace</li> <li>• Gain an understanding of specific types of systems, that may be at play within complex problems</li> <li>• Practice using a comprehensive Systems Thinking Guide to apply in understanding of systems thinking to a challenging situation and opportunity</li> <li>• Develop an action plan to deal with the organizational problem and opportunity</li> <li>• Gain an understanding of how to use systems thinking in a variety of situations</li> </ul>	
<b>Course Content</b>		
<b>Unit</b>	<b>Topic</b>	<b>Week</b>
1	Overview <ul style="list-style-type: none"> <li>• Systems thinking overview</li> <li>• Systems thinking and complexity</li> <li>• Systems thinking and soft\hard systems</li> <li>• Systems thinking versus conventional thinking</li> <li>• Systems thinking as a management discipline</li> <li>• Synthesis &amp; Analysis</li> </ul>	1-2
2	General Concepts <ul style="list-style-type: none"> <li>• Objects &amp; Events</li> <li>• Deeper structure, behaviour and discipline</li> <li>• Understanding multiple perspectives</li> <li>• System boundary &amp; environment</li> <li>• Synergic relations</li> <li>• Emergence</li> <li>• System hierarchy &amp; abstraction</li> <li>• System dynamics</li> </ul>	3-5
3	Model of a System <ul style="list-style-type: none"> <li>• Sets &amp; systems</li> <li>• System function</li> <li>• System efficiency</li> </ul>	6
4	Systems Approaches and Methods <ul style="list-style-type: none"> <li>• The hard\soft traditions</li> <li>• Experience-action cycle</li> <li>• Methods and tools</li> </ul>	7-9

	<ul style="list-style-type: none"> <li>• Abstraction</li> <li>• Modelling and simulation diagrams</li> <li>• Soft systems methodology</li> </ul>	
5	<p>Applying Systems Thinking</p> <ul style="list-style-type: none"> <li>• For understanding organizational situation</li> <li>• For change management</li> <li>• For strategic planning</li> <li>• For evaluation</li> </ul>	10-11
Book review, Case illustration, Team case project		12-14
<b>Recommended References:</b>	<ol style="list-style-type: none"> <li>1. Systems Thinking For Social Change: A Practical Guide to Solving Complex Problems, Avoiding Unintended Consequences, and Achieving Lasting Results, 2015, by <u>David Peter Stroh</u></li> <li>2. Gharakhani Bahar (2014) System and Systems Thinking: (Whole Review)</li> <li>3. Jimmy Brown (2012) Systems Thinking Strategy: The New Way to Understand Your Business and Drive Performance</li> <li>4. David Kerr ( 2012) An Introductory Guide to Systems Thinking</li> <li>5. <u>Jamshid Gharajedaghi</u> (2011). Systems Thinking, Third Edition: Managing Chaos and Complexity: A Platform for Designing Business Architecture</li> </ol> <p>There will also be supplemental readings beyond the References such as articles or web pages, which will be assigned by the instructor throughout the semester.</p>	
<b>Teaching Strategy:</b>	Lectures, discussion forums, tutorials, reading assignments and term papers,	
<b>Assessment:</b>	<p>Guideline: 30%: Continuous Assessment, 30%: Critiques of selected readings and research papers, 40%: Final Examination.</p> <p><i>Should be noted that the instructor has the freedom to determine student assessment techniques based on the nature of the course and/or his/her approach.</i></p>	

### 2.7.4 IT631 Research Methods in IT and Systems

<b>Prerequisites:</b>	None	
<b>Credit Hours:</b>	3 (7 ECTS)	
<b>Description</b>	This course aims at building skills of students in research design. It will focus on statistical concepts and also on design science IS Research Framework which considers: theoretical framework - situated practices, learning practices and work-around practices. Topics covered include, fundamentals of research; relationships between theory and data; operationalization and measurement; ontology and epistemology of research; types of research methods; case study methods; design science research paradigm; Design Research Method: problem identification and motivation, definition of the objectives for a solution, design and development, demonstration, evaluation, and communication; Design Science Research Patterns; preparing a research proposal; reading and assessing literature; research ethics; report writing, publication and presentation.	
<b>Learning Outcome</b>	<p>Upon successful completion of this course, students will be able to:</p> <ul style="list-style-type: none"> <li>• demonstrate competent use of a series of research strategies and methods</li> <li>• identify research problems and review related scientific literature;</li> <li>• have understanding of the current state and trends in design research in information systems,</li> <li>• get awareness on design paradigms, frameworks, theories, methods, patterns, evaluation approaches, and rationales.</li> <li>• use these design techniques for reviewing papers, sketching research proposals, and writing articles and theses.</li> <li>• work effectively and comfortably within a community of researchers.</li> <li>• present and communicate their research project to their peer community</li> <li>• write research proposal and research report;</li> </ul>	
<b>Course Content</b>		
<b>Unit</b>	<b>Topic</b>	<b>Week</b>
1	Fundamentals of research <ul style="list-style-type: none"> <li>• relationships between theory and data;</li> <li>• The Research Process.</li> <li>• Types of research methods;</li> </ul>	1
2	Statistical concepts <ul style="list-style-type: none"> <li>• Why study statistics</li> <li>• Application of statistics</li> <li>• Collecting Data</li> </ul>	2-3
3	Data Description <ul style="list-style-type: none"> <li>• Describing data on a single variable graphical method</li> <li>• Describing data on a single variable measure of variability</li> <li>• Summarizing data for more than one variable</li> <li>• Graphing and Correlation</li> </ul>	4-5
4	Design science research paradigm <ul style="list-style-type: none"> <li>• Placing Design Science Research in Context.</li> <li>• Difference between routine design practice and design science research.</li> <li>• The key properties of four design science research paradigms:</li> </ul>	6



	○ Ontology, epistemology, methods, and ethics;	
5	Design Science Research Frameworks <ul style="list-style-type: none"> <li>• Understanding the Natural and Artificial Worlds</li> <li>• Systems Development in Information Systems Research</li> <li>• The general design cycle</li> <li>• Action research framework</li> <li>• Design Research Methodology</li> </ul>	7
6	The Science of Design for Software-intensive System Design Science <ul style="list-style-type: none"> <li>• The Science of Design Challenges</li> <li>• Software-intensive systems</li> <li>• Science of design principles</li> <li>• Categories of software-intensive system</li> </ul>	8-9
7	Systematic Literature Review and DSR <ul style="list-style-type: none"> <li>• Definition, Origins and Needs</li> <li>• Conceptual Framework</li> <li>• Search Strategy</li> <li>• Quality Assessment</li> </ul>	10
8	People and Design <ul style="list-style-type: none"> <li>• Designing for Consumers</li> <li>• Practice of Ethnography in Design</li> <li>• Reflection in Action</li> <li>• The use of focus groups in design science research</li> </ul>	11
9	Design and Creativity <ul style="list-style-type: none"> <li>• Creativity concepts</li> <li>• Group creativity</li> <li>• Experiential learning</li> <li>• Creativity, Design and IT</li> </ul>	12
10	Design Science Looking to the Future <ul style="list-style-type: none"> <li>• Exploration of design and problem solving within business;</li> <li>• Design Science in the management disciplines</li> <li>• Design of Emerging Digital Services</li> </ul>	13-14
<b>Recommended References:</b>	<ol style="list-style-type: none"> <li>1. Aline Dresch • Daniel Pacheco Lacerda. Jose Antonio Valle Antunes Jr. (2015). Design Science Research: A Method for Science and Technology Advancement</li> <li>2. Williamson, Kirsty and Johanson, Graeme (2013) <u>Research Methods: Information, Systems and Contexts</u></li> <li>3. King, Ronald S. (2012). Research Methods for Information Systems</li> <li>4. Kuechler, W. and Vaishnavi, V., (2008). The emergence of design research in information systems in north america. Journal of Design Research, 7(1):1–16.</li> <li>5. Peffers, K., Tuunanen, T., Rothenberger, M., and Chatterjee, S., (2008). A design science research methodology for information systems research. Journal of Management Information Systems, 24(3):45–77.</li> </ol>	
<b>Teaching Strategy:</b>	Lectures, discussion forums, tutorials, reading assignments and term papers,	
<b>Assessment:</b>	Guideline: Guideline: 30%: Continuous Assessment, 30%: Critiques of selected readings and research papers, 40%: Final Examination  <i>Should be noted that the instructor has the freedom to determine student assessment techniques based on the nature of the course and/or his/her approach.</i>	

### 2.7.5 ES618 Business Process Analysis and Engineering

<b>Prerequisites:</b>	ES611, ES621	
<b>Credit Hours:</b>	3 (7 ECTS)	
<b>Description</b>	<p>Today's business processes are often complex and multi-disciplinary in nature. Conventional business processes are often sub-optimized for the purposes of meeting the needs of the functional organization and/or its management structure. The course provides students with practical and theoretical insights into the processes and practices of business process engineering to meet the true needs of the customers and the business. Topics covered included: perspectives on and methods for business process analysis, modelling and integration; systematic approaches of reviewing, documenting and analyzing and redesigning business processes to enhance performance; approaches to workflow modelling and design to implement cross-functional processes; business process management.</p>	
<b>Learning Outcome</b>	<p>Upon successful completion of this course, students will be able to:</p> <ul style="list-style-type: none"> <li>• understand the structure and functionality of a business processes within an organization;</li> <li>• take a holistic view of the needs of the business and how they are fulfilled by the processes, systems and resources within the organization;</li> <li>• create models of business processes in service organizations.</li> <li>• determine when business process redesign interventions are needed and how they are best applied; and</li> <li>• understand process change management programs.</li> </ul>	
<b>Course Content</b>		
<b>Unit</b>	<b>Topic</b>	<b>Week</b>
1	Introduction to Business Processes <ul style="list-style-type: none"> <li>• Functional organizations</li> <li>• Process thinking</li> <li>• Business processes</li> <li>• BPR</li> </ul>	1
2	Process Identification & Selection <ul style="list-style-type: none"> <li>• Process Architecture</li> <li>• Selection criteria</li> </ul>	2
3	Process Modeling <ul style="list-style-type: none"> <li>• Processes &amp; business rules</li> <li>• Process decomposition and model reuse</li> <li>• Handling events and exceptions</li> </ul>	3
4	Process Modeling Method <ul style="list-style-type: none"> <li>• Modeling languages</li> <li>• Process boundaries</li> <li>• Activities &amp; events</li> <li>• Resources &amp; handoffs</li> <li>• Control flow</li> <li>• Patterns of process modeling</li> </ul>	4
5	Process Analysis <ul style="list-style-type: none"> <li>• Systems analysis</li> <li>• Workflow and process flow</li> </ul>	5-6

	<ul style="list-style-type: none"> <li>• Workflow and transaction processing</li> <li>• Qualitative analysis</li> </ul>	
6	Process Design & Redesign <ul style="list-style-type: none"> <li>• Product versus process innovation</li> <li>• Business process performance indicators</li> <li>• Redesign concepts &amp; approaches</li> <li>• Transactional methods</li> <li>• Transformational methods</li> <li>• Information-based business process design</li> </ul>	7-8
7	Process-Aware Information Systems (PAIS) <ul style="list-style-type: none"> <li>• From programs and data to processes</li> <li>• PAIS: definition &amp; rationale</li> <li>• Conceptual foundation</li> <li>• Tools and techniques</li> </ul>	9
8	Business Process Management (BMP) <ul style="list-style-type: none"> <li>• Business process improvement and automation</li> <li>• Approaches to BMP</li> <li>• Technology standards</li> <li>• Embedding BMP in the organization</li> </ul>	10-11
9	Business Process Maturity Model	12
Book review, Case illustration, Team case project		13-14
<b>Recommended References:</b>	<ol style="list-style-type: none"> <li>1. Business Process Management: Practical Guidelines to Successful Implementations, 2018 by John Jeston</li> <li>2. Business process reengineering: A Comprehensive Primer, 2017, by Gerard Blokdijk</li> <li>3. Business Process Reengineering: Text and Cases, Jan 30, 2010, by R. Radhakrishnan</li> <li>4. Business Process Analysis including Architecture, Engineering, Management, and Maturity, 2012, by Geoffrey Darnton</li> <li>5. Fundamentals of Business Process Management, 2018, by Marlon Dumas and Marcello La Rosa</li> </ol> <p>There will also be supplemental readings beyond the References such as articles or web pages, which will be assigned by the instructor throughout the semester.</p>	
<b>Teaching Strategy:</b>	Lectures, discussion forums, tutorials, reading assignments and term papers,	
<b>Assessment:</b>	Guideline: 30%: Continuous Assessment, 30%: Critiques of selected readings and research papers, 40%: Final Examination. <p><i>Should be noted that the instructor has the freedom to determine student assessment techniques based on the nature of the course and/or his/her approach.</i></p>	

### 2.7.6 ES622 Enterprise Systems Design

<b>Prerequisites:</b>	ES613	
<b>Credit Hours:</b>	3 (7 ECTS)	
<b>Description</b>	System engineering is a basic subject in the study, understanding and designing of complex systems and processes in the field of system engineering. Enterprise systems engineering is a multidisciplinary approach for aligning system architectures with enterprise business rules, including the development and implementation architectures consistent with enterprise strategic objectives. Topics covered include: characteristics, dimensions, structures and functions of system; system control; the complex nature of enterprises, technical and business components involved in delivering enterprise capability; use of the systems engineering life cycle as a framework for managing complexity, as well as methods for modelling and analysis of the interdependencies among infrastructure, applications, services, and end-user environments.	
<b>Learning Outcome</b>	<p>Upon successful completion of this course, students will be able to:</p> <ul style="list-style-type: none"> <li>• acquire the basic knowledge of engineering and systems view of the world;</li> <li>• develop critical thinking skills in the area of enterprise systems engineering;</li> <li>• assess an enterprise systems engineering model's ability to address challenges unique to complex dynamic enterprise systems; and</li> <li>• construct an enterprise system engineering model to support the evolution of a complex enterprise system.</li> </ul>	
<b>Course Content</b>		
<b>Unit</b>	<b>Topic</b>	<b>Week</b>
1	<p>Overview</p> <ul style="list-style-type: none"> <li>• Complex systems and processes</li> <li>• System architectures and business rules</li> <li>• Systems thinking for managing complexity</li> <li>• Enterprise and its context</li> <li>• Development through adaptation</li> <li>• Systems thinking for enterprise</li> </ul>	1-2
2	<p>Enterprise systems</p> <ul style="list-style-type: none"> <li>• Characteristics</li> <li>• Dimensions</li> <li>• Structures</li> <li>• Functions</li> </ul> <p>Systems engineering</p> <ul style="list-style-type: none"> <li>• Concepts</li> <li>• Standards</li> <li>• Terminologies</li> </ul> <p>Life cycle</p> <ul style="list-style-type: none"> <li>• Enterprise engineering - definition and the need</li> <li>• Traditional systems engineering versus enterprise engineering</li> </ul>	3-4
3	<p>General Concepts</p> <ul style="list-style-type: none"> <li>• Organizing and enterprise design</li> </ul>	5

	<ul style="list-style-type: none"> <li>• Enterprise competence</li> <li>• Conceptualizing enterprises</li> <li>• Structural functionalist and constructional perspectives</li> </ul>	
4	<p>Models &amp; Frameworks</p> <ul style="list-style-type: none"> <li>• Modelling Concepts</li> <li>• Systems engineering modelling languages</li> <li>• Frameworks and Tools</li> <li>• Enterprise architecture <ul style="list-style-type: none"> <li>○ Business</li> <li>○ Application</li> <li>○ Information</li> <li>○ Technology</li> </ul> </li> </ul>	6-7
5	<p>Using architectural models in enterprise analysis and design</p> <ul style="list-style-type: none"> <li>• Technology plan</li> <li>• Capabilities-based engineering analysis</li> <li>• Enterprise analysis and assessment</li> <li>• Enterprise management and governance</li> <li>• Network-enabled capabilities</li> <li>• System of systems</li> </ul>	8-9
6	<p>Enterprise Projects</p> <ul style="list-style-type: none"> <li>• Strategy formulation</li> <li>• Problem formulation and requirements</li> <li>• Process modelling and design</li> <li>• Information design</li> <li>• Organization design</li> <li>• Enterprise integration</li> </ul> <p>Applications of Systems Engineering</p> <ul style="list-style-type: none"> <li>• Information Enterprise Systems Engineering</li> <li>• Social Enterprise Systems Engineering</li> </ul>	10-11
	<p>Book review</p> <p>Case illustration</p> <p>Team case project</p>	12-15
<b>Recommended References:</b>	<ol style="list-style-type: none"> <li>1. Enterprise Systems Engineering: Advances in the Theory and Practice (Complex and Enterprise Systems Engineering), 2010, by George Rebovich Jr. and Brian E. White</li> <li>2. <u>Architecture and Principles of Systems Engineering (Complex and Enterprise Systems Engineering)</u>, 2009, by <u>Charles Dickerson</u> and Dimitri N. Mavris</li> <li>3. Motiwalla, Luvai and Thompson, Jeffrey (2011) Enterprise Systems for Management. 2nd Edition. ,</li> </ol> <p>There will also be supplemental readings beyond the References, such as articles or web pages, which will be assigned by the instructor throughout the semester.</p>	
<b>Teaching Strategy:</b>	Lectures, discussion forums, tutorials, reading assignments and term papers,	
<b>Assessment:</b>	<p>Guideline: 30%: Continuous Assessment, 30%: Critiques of selected readings and research papers, 40%: Final Examination.</p> <p><i>Should be noted that the instructor has the freedom to determine student assessment techniques based on the nature of the course and/or his/her approach.</i></p>	

### 2.7.7 IT646 IT Security Management

<b>Prerequisites:</b>	None	
<b>Credit Hours:</b>	3 (7 ECTS)	
<b>Description</b>	This course will give students comprehensive knowledge and experience working with enterprise level IT systems focusing on database administration and security, network administration and security, and information security. Topics covered include: data security standards and guidelines. configuration management, core networking services, system monitoring and troubleshooting. The course also addresses practical aspects of information security in operating systems, databases, network applications; infrastructure capacity planning; business continuity and recovery requirements assessment and planning.	
<b>Learning Outcome</b>	<p>Upon completion of the course, students will be able to:</p> <ul style="list-style-type: none"> <li>• install, configure and manage enterprise database systems and network resources, including hardware/software;</li> <li>• understand practical aspects of IT system security risks in an enterprise and ways that they can be mitigated</li> <li>• monitor enterprise systems for problems and use that information to locate and fix any issues within the system</li> </ul>	
<b>Course Content</b>		
Unit	Topic	Week
1	Introduction	
2	Organization assets <ul style="list-style-type: none"> <li>• Intangible assets</li> <li>• Tangible assets</li> <li>• Intangible and Tangible assets</li> <li>• Possible security risks</li> </ul>	1-2
3	Network Schematic <ul style="list-style-type: none"> <li>• IP address</li> <li>• Protecting network/ information</li> <li>• Protecting computers</li> <li>• Protection details of the company</li> </ul>	3-4
4	What is Risk <ul style="list-style-type: none"> <li>• Security risk management process</li> <li>• Benefit of risk analysis</li> <li>• Identify the risk areas</li> <li>• Qualitative risk matrix</li> <li>• Qualitative risk matrix to the identified risks areas</li> <li>• Assess the identified risks</li> <li>• Developing Risk management plan</li> </ul>	5-6
5	Information security management system <ul style="list-style-type: none"> <li>• What is ISO 17799/BS 7799-1</li> <li>• What is ISO 27001/BS 7799-2</li> </ul>	7
6	What is physical security <ul style="list-style-type: none"> <li>• Layered security</li> <li>• Physical security threats</li> <li>• Physical security issues</li> </ul>	8-9
7	Information security principles <ul style="list-style-type: none"> <li>• Security Governance</li> <li>• Policy mapping</li> </ul>	10

	<ul style="list-style-type: none"> <li>• How to fit policies standards and guidelines together</li> <li>• The policy design process</li> <li>• policies to the company</li> </ul>	
8	<p>Appropriate tools that can be used to control and monitor access to resource in the company</p> <ul style="list-style-type: none"> <li>• Servers</li> <li>• Routers</li> <li>• Firewall</li> </ul>	11
9	<p>Human mistakes</p> <ul style="list-style-type: none"> <li>• Solutions to the human mistakes</li> </ul>	12
Book review, Case illustration Team case project		13-14
<b>Recommended References:</b>	<ol style="list-style-type: none"> <li>1. The Practice of System and Network Administration, Second Edition, 2007, by Thomas A. Limoncelli and Christina J. Hogan</li> <li>2. The Practice of System and Network Administration: Volume 1: DevOps and other Best Practices for Enterprise IT (3rd Edition), 2016, by Thomas A. Limoncelli and Christina J. Hogan</li> <li>3. Database Administration: The Complete Guide to DBA Practices and Procedures (2nd Edition), 2012, by Craig S. Mullins</li> <li>4. Database Design, Application Development, and Administration, Sixth Edition, 2014, by Michael Mannino</li> </ol> <p>There will also be supplemental readings beyond the References, such as articles or web pages, which will be assigned by the instructor throughout the semester.</p>	
<b>Teaching Strategy:</b>	Lectures, discussion forums, tutorials, reading assignments and term papers,	
<b>Assessment:</b>	<p>Guideline: 30%: Continuous Assessment, 30%: Critiques of selected readings and research papers, 40%: Final Examination.</p> <p><i>Should be noted that the instructor has the freedom to determine student assessment techniques based on the nature of the course and/or his/her approach.</i></p>	

### 2.7.8 IT656 IT Project Management

<b>Prerequisites:</b>	None	
<b>Credit Hours:</b>	3 (7 ECTS)	
<b>Description</b>	This course is mainly designed to prepare IT project managers, novice or experienced, with project management skills needed to better manage IT projects. Built along the IT project management lifecycle, this course covers detailed topics of the basic concepts of IT project management, including initiating, planning, controlling, executing, and closing projects. The course also shows how IT projects should be managed, from inception to post implementation review. Topics covered include: project management concepts and processes; project initiation, planning, execution, control, and project close-up; project scope and quality management, project time and cost management, project resources management, conflict resolution and project risk management; the use and application of project management software tools.	
<b>Learning Outcome</b>	<p>Upon completion of the course, students will be able to:</p> <ul style="list-style-type: none"> <li>• recognize the key issues in IT project management</li> <li>• understand the processes involved in cost budgeting and preparing a cost estimate and budget for an information technology project.</li> <li>• improve their management skills and abilities to define the project scope, create a workable project plan, and manage within the budget and schedule.</li> <li>• use Gantt chart and PERT methods for planning and tracking project schedules and create a critical path; and</li> <li>• Build up the baseline knowledge for further career in IT project management fields.</li> </ul>	
<b>Course Content</b>		
<b>Unit</b>	<b>Topic</b>	<b>Week</b>
1	Overview <ul style="list-style-type: none"> <li>• Project management concepts and processes</li> <li>• IT Project characteristics and features</li> <li>• Dimensions of complexity</li> </ul>	1
2	Projects as Systems <ul style="list-style-type: none"> <li>• Project management systems</li> <li>• Project entities</li> <li>• Project communications</li> <li>• Project environment</li> </ul>	2
3	Project Selection & Approval <ul style="list-style-type: none"> <li>• Measurement of impact</li> <li>• Selection practice</li> <li>• Cost-benefit analysis</li> </ul>	3-4
4	System Development <ul style="list-style-type: none"> <li>• Methodologies</li> <li>• Standards</li> <li>• Lifecycle</li> <li>• Tools</li> </ul>	5
5	Processes, Methods & Tools Project planning process	6-7



	Project pricing and estimation method Project scheduling methods Project management tools	
6	Processes, Methods & Tools <ul style="list-style-type: none"> <li>• Managing project time and resources</li> <li>• Ensuring project quality</li> <li>• Assessing project risks and resolving conflicts</li> <li>• Controlling project costs</li> <li>• Measuring Project Success</li> <li>• Closing the Project</li> </ul>	8-9
7	Trends & Developments <ul style="list-style-type: none"> <li>• Enterprise Project Management Frameworks</li> <li>• Agile and Adaptive Project Management Cultures</li> <li>• Outsourcing and Offshoring Projects</li> <li>• Leading IT Projects</li> <li>• Project Management Maturity Model</li> </ul>	10-11
Book review, Case illustration. Team case project		12-14
<b>Recommended References:</b>	<ol style="list-style-type: none"> <li>1. Project Management: A Systems Approach to Planning, Scheduling, and Controlling, 2017, by <u>Harold Kerzner</u></li> <li>2. Information Systems Project Management: A Process and Team Approach, Edition 1.1, 2017, by Joseph S. Valacich and Joey F. George</li> <li>3. <u>Information Systems Project Management</u>, 2014, by David Olson</li> <li>4. Information Systems Project Management, 2008, by David E. Avison and Gholamreza Torkzadeh</li> </ol> <p>There will also be supplemental readings beyond the references, such as articles or web pages, which will be assigned by the instructor throughout the semester.</p>	
<b>Teaching Strategy:</b>	Lectures, discussion forums, tutorials, reading assignments and term papers,	
<b>Assessment:</b>	<p>Guideline: 30%: Continuous Assessment, 30%: Critiques of selected readings and research papers, 40%: Final Examination.</p> <p><i>Should be noted that the instructor has the freedom to determine student assessment techniques based on the nature of the course and/or his/her approach.</i></p>	

### 2.7.9 ES731 Business Intelligence and Analytics

<b>Prerequisites:</b>	None	
<b>Credit Hours:</b>	3 (7 ECTS)	
<b>Description</b>	To successfully compete in today's global business environment an organization must constantly monitor, recognize and understand every aspect and every issue of its operations, its industry and the overall business environment. This course interweaves management, statistics, and technology perspectives and tools to introduce students to business intelligence as an approach collect and analyse operational data to support data-driven decision making that impact business strategy, performance, and competitiveness. The course will cover the following areas: basic concepts of business intelligence, enterprise data warehousing and engineering; business value of BI; BI architecture, processes, technologies and tools; practical aspects of data visualization, dashboards, business reporting, data mining, and business analytics. Tools such as R and Tableau, SQL analysis services are used.	
<b>Learning Outcome</b>	<p>Upon successful completion of this course, students will be able to:</p> <ul style="list-style-type: none"> <li>• articulate concepts, theories, and practices of Business Intelligence (BI).</li> <li>• apply BI technologies and tools to gain new insights into organizational operations.</li> <li>• build a small data warehouse containing a schema design, data integration workflows, analytical queries, views, dashboards and visualizations</li> </ul>	
<b>Course Content</b>		
<b>Unit</b>	<b>Topic</b>	<b>Week</b>
1	Foundations for inference <ul style="list-style-type: none"> <li>• Probability Theory</li> <li>• Estimation of Variables</li> <li>• Confidence intervals</li> <li>• Hypothesis testing</li> <li>• The central limit theorem</li> <li>• Comparing two population means</li> <li>• Analysis of Variance (ANOVA)</li> </ul>	1-2
2	Regression and Correlation <ul style="list-style-type: none"> <li>• Estimating model parameters</li> <li>• Regression Parameters</li> <li>• Predicting Values</li> <li>• Correlation</li> <li>• Multiple Regression Models</li> <li>• Further Regression Topics</li> </ul>	3
3	Overview of business intelligence, analytics, and data science <ul style="list-style-type: none"> <li>• Evolving needs for decision support and analytics</li> <li>• Evolution of computerized decision support to analytics/data science</li> <li>• Transaction processing versus analytic processing</li> <li>• Basic concepts of business intelligence</li> <li>• Business value of business intelligence</li> </ul>	4-5

4	A framework for business intelligence <ul style="list-style-type: none"> <li>• Architecture</li> <li>• Processes</li> <li>• Technologies</li> <li>• Tools</li> </ul>	6
5	Descriptive analysis <ul style="list-style-type: none"> <li>• Data creation, storage, processing, and consumption</li> <li>• Demand for data, information and analytics</li> <li>• Statistical modeling for business analytics</li> <li>• Business reporting and data visualization</li> <li>• Business intelligence and data warehousing</li> <li>• Implementation and administration issues</li> </ul>	7-8
4	Predictive Analysis <ul style="list-style-type: none"> <li>• Data mining concepts</li> <li>• Applications</li> <li>• Methods and tools</li> </ul>	9
5	Prescriptive Analytics <ul style="list-style-type: none"> <li>• Optimization and Simulation Models</li> <li>• Text analytics and text mining applications</li> <li>• Web and social media analytics</li> </ul>	10-11
6	Big Data <ul style="list-style-type: none"> <li>• Big data and its value to firms</li> <li>• Big data concepts and tools</li> <li>• Architecting the enterprise via big data analytics</li> <li>• Business intelligence design and development</li> <li>• Developing or acquiring business intelligence systems</li> </ul>	12-13
7	Analytics examples in selected domains <ul style="list-style-type: none"> <li>• Analytics versus data science</li> <li>• The analytics ecosystem</li> </ul>	14
<b>Recommended References:</b>	<ol style="list-style-type: none"> <li>1. Business Intelligence and Analytics: Systems for Decision Support (10th Edition), 2014, by Ramesh Sharda and Dursun Delen</li> <li>2. Business Intelligence Guidebook: From Data Integration to Analytics, 2014, by Rick Sherman</li> <li>3. Business Intelligence, Analytics, and Data Science: A Managerial Perspective (4th Edition), 2017, by Ramesh Sharda and Dursun Delen</li> </ol> <p>There will also be supplemental readings beyond the References, such as articles or web pages, which will be assigned by the instructor throughout the semester.</p>	
<b>Teaching Strategy:</b>	Lectures, discussion forums, tutorials, reading assignments and term papers,	
<b>Assessment:</b>	<p>Guideline: 30%: Continuous Assessment, 30%: Critiques of selected readings and research papers, 40%: Final Examination.</p> <p><i>Should be noted that the instructor has the freedom to determine student assessment techniques based on the nature of the course and/or his/her approach.</i></p>	

### 2.7.10 ES723 Enterprise Resource Planning Systems

<b>Prerequisites:</b>	ES622	
<b>Credit Hours:</b>	3 (7 ECTS)	
<b>Description</b>	This course will introduce students to enterprise systems and show how organizations use enterprise systems to run their operations more efficiently and effectively. Students will learn about the critical success factors and implementation strategies that lead to enterprise system success, and about the informational, knowledge, and decision-making opportunities afforded by enterprise systems. The course also provides a technical overview of Enterprise Resource Planning Systems and their impact on organizations. SAP is introduced to illustrate the concepts, fundamentals, framework, general information technology context, the technological infrastructure, and integration of business enterprise-wide applications.	
<b>Learning Outcome</b>	<p>By the end of this course, students should be able to:</p> <ul style="list-style-type: none"> <li>• Demonstrate a good understanding of basic issues in Enterprise Systems,</li> <li>• Explain the scope of common Enterprise Systems (e.g., MM, SCM, CRM, HRM, procurement),</li> <li>• Explain the challenges associated with implementing enterprise systems and their impacts on organisations</li> <li>• Describe the selection, acquisition and implementation of enterprise systems</li> <li>• Use a leading Enterprise Systems package (SAP) to support business operations and decision-making,</li> <li>• Communicate and assess an organisation's readiness for enterprise system implementation with a professional approach in written form, and</li> <li>• Demonstrate an ability to work independently and in a group.</li> </ul>	
<b>Course Content</b>		
<b>Unit</b>	<b>Topic</b>	<b>Week</b>
1	ERP System Overview	1
2	Business functions and business processes <ul style="list-style-type: none"> <li>• Evolution of ERP</li> <li>• Major characteristics of ERP</li> <li>• Features and components of ERP</li> <li>• Motivation for and benefits of ERP</li> </ul>	2
3	Analysis of the functions of an ERP system <ul style="list-style-type: none"> <li>• The functional areas of an ERP system</li> <li>• Marketing IS and the sales order process</li> <li>• Production and supply chain management</li> <li>• ERP and Accounting Activities</li> <li>• HR processes with ERP</li> <li>• Manufacturing in ERP</li> </ul>	3-5
4	ERP system components <ul style="list-style-type: none"> <li>• Navigation</li> <li>• Reporting system</li> <li>• Data management system</li> </ul>	6
5	Approaches to Business Modelling for ERP Approaches to implementation of an ERP system	7-8

	<ul style="list-style-type: none"> <li>• Initial implementation</li> <li>• ERP system replacement</li> </ul>	
6	Using SAP to illustrate ERP	9-10
7	Next-Generation ERP	11
Team case project		12-14
<b>Recommended References:</b>	<ol style="list-style-type: none"> <li>1. Enterprise Resource Planning Concepts: Understanding the Power of ERP for Today's Businesses, 2016, by Jill A O'Sullivan and Gene Caiola</li> <li>2. Concepts in Enterprise Resource Planning, 2012, by Ellen Monk and Bret Wagner</li> <li>3. Enterprise Resource Planning Systems: Systems, Life Cycle, Electronic Commerce, and Risk, 2000, by Daniel E. O'Leary</li> <li>4. Enterprise Resource Planning, 2008, by Bret Wagner and Ellen Monk</li> <li>5. Enterprise Resource Planning: Concepts and Practice, 2004, by Vinod Kumar Garg and N.K. Venkitakrishnan</li> </ol> <p>There will also be supplemental readings beyond the references, such as articles or web pages, which will be assigned by the instructor throughout the semester.</p>	
<b>Teaching Strategy:</b>	Lectures, discussion forums, tutorials, reading assignments and term papers,	
<b>Assessment:</b>	<p>Guideline: 30%: Continuous Assessment, 30%: Critiques of selected readings and research papers, 40%: Final Examination.</p> <p><i>Should be noted that the instructor has the freedom to determine student assessment techniques based on the nature of the course and/or his/her approach.</i></p>	

### 2.7.11 ES752 Thesis / Project

<b>Prerequisites:</b>	All courses
<b>Credit Hours:</b>	6 (14 ECTS)
<b>Description</b>	The Thesis / Project runs for a full semester and constitutes the final and concluding task in the Masters Program in Systems Engineering. After completing all courses required in the masters program of Systems Engineering, students shall have acquired substantial scientific expertise in a broad range of fields within Systems Engineering, as well as developed the ability to communicate research/project results to the society. As partial fulfilment of the award of the masters degree, a student is expected to conduct independent, high-quality research (thesis) or carry out capstone industry project in the field of Systems Engineering. The student required to identify a research topic or capstone project of interest to them in the field of systems engineering.
<b>Learning Outcome:</b>	<p>On completion of the project, students will be able to</p> <ul style="list-style-type: none"> <li>• demonstrate knowledge and understanding in the main field of study, including both broad knowledge of the field and a considerable degree of specialised knowledge in certain areas of the field of systems engineering;</li> <li>• demonstrate specialised methodological knowledge in the main field of study</li> </ul>
<b>Recommended References:</b>	<ol style="list-style-type: none"> <li>1. Enjoy Writing Your Science Thesis Or Dissertation! : A Step-By-Step Guide to Planning and Writing A Thesis or Dissertation for Undergraduate and Graduate Science Students (2nd Edition), 2014, by Elizabeth M Fisher and Richard C Thompson.</li> <li>2. Writing the Winning Thesis or Dissertation: A Step-by-Step Guide, 2018, by Randy L. Joyner and William A. Rouse</li> <li>3. A Manual for Writers of Research Papers, Theses, and Dissertations, Ninth Edition: Chicago Style for Students and Researchers, 2018 by Kate L. Turabian and Wayne C. Booth</li> <li>4. Writing for Social Scientists: How to Start and Finish Your Thesis, Book, or Article: Second Edition , 2007, by Howard S. Becker and Pamela Richards</li> </ol>
<b>Resource Requirements:</b>	Sufficient experienced supervisors, Computer Labs, Internet connectivity
<b>Supervision</b>	The thesis supervisor assesses and approves thesis research proposal, guides candidate's research, approves the thesis for defence, and assesses the research work as member of thesis examination board
<b>Role of Students</b>	Candidates have the responsibility to identify research area (topic), follow guidance provided by their respective supervisors on their proposals and the research process that they are engaged in, conduct and report the research, and regularly interact with their respective supervisors
<b>Assessment:</b>	Research progress demonstration, presentation and written report. The results of a thesis, which is documented as a report, should be able to produce a material that can potentially be acceptable for publication in a journal or a conference proceeding. Assessment and grading will be made by a thesis examination board formed for each thesis based on area of study.

## 2.8 Description of Elective Courses

### 2.8.1 ES725 Organizational Behaviour

<b>Prerequisites:</b>	None	
<b>Credit Hours:</b>	3 (7 ECTS)	
<b>Description</b>	The course covers the following topics: understanding the basics of organizational behavior is important in business systems in general and IT/IS systems in particular. This course emphasizes theoretical concepts and practical methods for understanding, analyzing, predicting individual, group and organizational behavior required in organizational planning and management functions. Following topics are covered in this course: mission, objectives and policies of an organization; processes and structures of organizations; teams and team processes, teamwork, communication processes, creative problem-solving and decision making, work motivation, conflict management and negotiation, business meetings (preparation, conducting a meeting), techniques for improving performance presentations, organizational culture, information systems and organizational change. Ethical considerations are also addressed.	
<b>Learning Outcome</b>	<p>After successful completion of this course, student will be able to:</p> <ul style="list-style-type: none"> <li>• understand the various functions, processes, structures and operations of enterprise organizations;</li> <li>• explain the basic concepts of organizational behavior;</li> <li>• explain how information systems affect organizational behavior;</li> <li>• determine the various factors to be considered in designing business processes, structures and systems of enterprise organizations to improve performance.</li> </ul>	
<b>Course Content</b>		
Uni	Topic	Week
1	Overview <ul style="list-style-type: none"> <li>• Understanding organizations</li> <li>• Organizational behavior (OB) defined</li> <li>• Fields that contribute to the field of OB</li> <li>• Challenges and opportunities for OB</li> </ul>	1
2	Behavioral components <ul style="list-style-type: none"> <li>• Job attitudes</li> <li>• Job performance</li> <li>• Job satisfaction</li> <li>• Ability</li> <li>• Emotions</li> </ul>	2
3	Personality attributes relevant to OB <ul style="list-style-type: none"> <li>• Person-job fit</li> <li>• Person-organization fit</li> <li>• Cultural values</li> </ul>	3
4	Motivation <ul style="list-style-type: none"> <li>• Theories of motivation</li> <li>• Motivating by job design</li> <li>• Motivation through company culture</li> </ul>	4

5	<ul style="list-style-type: none"> <li>• Communication</li> <li>• Processes</li> <li>• Models</li> <li>• Channels</li> <li>• Barriers to effective communication</li> </ul>	5
6	Learning & decision making <ul style="list-style-type: none"> <li>• Perceptual processes</li> <li>• Learning in organizations</li> <li>• Decision making in organizations</li> </ul>	6
7	Teams <ul style="list-style-type: none"> <li>• Team processes</li> <li>• Creating effective teams</li> </ul>	7
8	Organizational mechanisms <ul style="list-style-type: none"> <li>• Organization structure &amp; design</li> <li>• Power and politics</li> <li>• Leadership styles &amp; behavior</li> <li>• Conflicts and conflict management</li> <li>• Organizational culture</li> </ul>	8-9
9	Organizational change <ul style="list-style-type: none"> <li>• Forces of change</li> <li>• Resistance to change</li> <li>• Managing organizational change</li> <li>• Leading organizational change</li> <li>• Creating a culture for change</li> </ul>	10-11
Book review, Team case projects		12-14
<b>Recommended References:</b>	<ol style="list-style-type: none"> <li>1. Organizational Behavior: Managing People and Organizations (MindTap Course List), 2016, by Ricky W. Griffin and Jean M. Phillips</li> <li>2. Organizational Behavior: Improving Performance and Commitment in the Workplace, 2016, by Jason A Colquitt and Jeffery A LePine</li> <li>3. Organizational Behavior: Human Behavior at Work, 2014, by John W Newstrom</li> <li>4. Essentials of Organizational Behavior (14th Edition), 2017, by Stephen P. Robbins and Timothy A. Judge</li> </ol> <p>There will also be supplemental readings beyond the References, such as articles or web pages, which will be assigned by the instructor throughout the semester.</p>	
<b>Teaching Strategy:</b>	Lectures, discussion forums, tutorials, reading assignments and term papers,	
<b>Assessment:</b>	Guideline: 30%: Continuous Assessment, 30%: Critiques of selected readings and research papers, 40%: Final Examination. <p><i>Should be noted that the instructor has the freedom to determine student assessment techniques based on the nature of the course and/or his/her approach.</i></p>	



### 2.8.2 ES727 Innovation, Entrepreneurship and Change Management

<b>Prerequisites:</b>	None	
<b>Credit Hours:</b>	3 (7 ECTS)	
<b>Description</b>	<p>Innovators and entrepreneurs within established enterprises combine innovation, creativity and leadership to develop and launch new products, new product lines and new business units that grow revenues and profits from within. This course is designed to provide students with practical experience in the investigation, evaluation and recommendation of technology and/or market entry strategies for new business opportunity. The course seeks to equip students with the skills and perspectives required to initiate new ventures and create viable businesses in dynamic environments. Course topics include the elements of strategic analysis and positioning for competitive advantage in dynamic markets, and the structuring, utilization and mobilization of the internal resources of existing firms in the pursuit of growth and new market opportunities. The course also embraces a system perspective of learning at the organizational level-of-analysis grounded in the premise that innovation, entrepreneurship and sustainable change are contingent upon an organization's ability to create new knowledge through learning.</p>	
<b>Learning Outcome</b>	<p>After successful completion of this course, student will be able to:</p> <ul style="list-style-type: none"> <li>• understand the concepts of entrepreneurship, innovation, managing innovation and change;</li> <li>• recognize the conceptual frameworks and analytical tools necessary to create and develop entrepreneurship in the area of ICT.</li> <li>• form a strategic marketing plan and integrate technological development with the rapidly growing demands of customers; and</li> <li>• analyse technological and business changes and the characteristics of new business models.</li> </ul>	
<b>Course Content</b>		
<b>Unit</b>	<b>Topic</b>	<b>Week</b>
1	<p>Overview</p> <ul style="list-style-type: none"> <li>• The Importance of change, creativity and innovation</li> <li>• The process of change, creativity and innovation</li> <li>• The creative pursuit of innovative ideas</li> </ul>	1-2
2	<p>Entrepreneurship</p> <ul style="list-style-type: none"> <li>• The entrepreneurial mind-set</li> <li>• Entrepreneurship in practice</li> <li>• Developing entrepreneurship within organizations</li> <li>• Developing entrepreneurial ventures</li> </ul>	3-4
3	<p>Defining organizational change</p> <ul style="list-style-type: none"> <li>• Key Dimensions</li> <li>• Concepts</li> <li>• Theories</li> </ul>	5-6
4	<p>Learning and the process of change Approaches to change management</p> <ul style="list-style-type: none"> <li>• Individual change management</li> <li>• Team change management</li> <li>• Organizational change management</li> <li>• Highlights of best practices</li> </ul>	7-9

5	Change competency <ul style="list-style-type: none"> <li>• Culture and change</li> <li>• Leading change</li> <li>• The change agent</li> <li>• Change management resources</li> </ul>	10-11
Case illustration, Team case project		12-15
<b>Recommended References:</b>	<ol style="list-style-type: none"> <li>1. Entrepreneurship: Theory, Process, and Practice (MindTap Course List), 2016, by <u>Donald F. Kuratko</u></li> <li>2. <u>Change Management: The People Side of Change</u>, by Jeffrey Hiatt and Timothy Creasey</li> <li>3. Making Sense of Change Management: A Complete Guide to the Models, Tools and Techniques of Organizational Change, 2015, by <u>Esther Cameron</u> and <u>Mike Green</u></li> <li>4. Lean Change Management: Innovative Practices For Managing Organizational Change, 2014, by <u>Jason Little</u></li> <li>5. Innovation and Entrepreneurship, 2006, by <u>Peter F. Drucker</u></li> <li>6. <u>Managing Change, Creativity and Innovation</u>, 2017, by Patrick Dawson and Costas Andriopoulos</li> </ol> <p>There will also be supplemental readings beyond the references, such as articles or web pages, which will be assigned by the instructor throughout the semester.</p>	
<b>Teaching Strategy:</b>	Lectures, discussion forums, tutorials, reading assignments and term papers,	
<b>Assessment:</b>	Guideline: 30%: Continuous Assessment, 30%: Critiques of selected readings and research papers, 40%: Final Examination.  <i>Should be noted that the instructor has the freedom to determine student assessment techniques based on the nature of the course and/or his/her approach.</i>	

### 2.8.3 ES729 Special Topics in Enterprise Systems Engineering

<b>Prerequisites:</b>	None
<b>Credit Hours:</b>	3 (7 ECTS)
<b>Description</b>	This course aims at developing the capability of students to critically and scientifically review published works and also introducing students to current research issues and results in selected areas of enterprise systems engineering. Students are provided with a list of papers published on accredited journals or conference proceeding to choose from. Each student will choose one paper, critically evaluate it, prepare and submit a well-written report followed by oral presentation findings and critics.
<b>Course Content</b>	Topics vary according to the interest of students and instructor.
<b>Learning Outcome</b>	After successful completion of this course, student will be able to: <ul style="list-style-type: none"> <li>• get professional updates in the field of systems engineering</li> <li>• get state-of-the-art recommendations from expert faculty and guest lecturers on systems engineering</li> <li>• Recognize advanced topics in systems engineering</li> <li>• critically review papers and point out limitation and strong points,</li> <li>• get research ideas for projects and thesis.</li> </ul>
<b>Recommended References:</b>	As suggested by respective instructors
<b>Teaching Strategy:</b>	Lectures, discussion forums, tutorials, reading assignments and term papers,
<b>Assessment:</b>	Guideline: 30%: Critiques of selected readings and research papers, 70%: Term papers.  <i>Should be noted that the instructor has the freedom to determine student assessment techniques based on the nature of the course and/or his/her approach.</i>

## 2.9 Assignment of Course Codes

The course code has two alphabets and three-digit numbers like IT621. The two alphabets code indicates the name of the program with all capital letters, For instance, ES indicates abbreviation of the program of Systems Engineering.

The course codes are made in the following format:

- ESYYY, where:
  - “ES” represents the short form of the program name for courses in the Enterprise Systems Engineering
  - “IT” represents the short form of the program name for courses in the Information technology management program
  - ‘YYY’ represents a 3-digit numeric part of the course code with the following convention:
    - The first digit indicates the level of the course in terms of the year (‘6’ for 1st year of the graduate program and ‘7’ for 2<sup>nd</sup> year of the graduate program);
    - The Second digit indicates level and similarity of the courses in the program
    - The third digit indicates the semester within which the course is offered (odd numbers are given for courses given in the first semester and even numbers are given for courses given in the second semester)

## 3. Resources

The Masters program in Enterprise Systems Engineering is well organized in staff and teaching learning facilities. The resource availed will allow students to be well equipped with current trends and research methodologies that will give them ability to discover and learn advanced issues independently. The general resources required for the program are summarized in the table below:

<b>Resource</b>	<b>Description</b>
Human Resource	Four full-time staff (Assistant Professor or above)
Classroom	Two class rooms with LCD projector and Internet connectivity
Computer Lab	One Computer Lab with at least 13 computers, capable of accommodating 26 students at a time
Library	A Graduate library equipped with at least two reference materials (soft or hard copy) for each of the courses proposed in the curriculum
Software	All required software are in place per the requirements of each course

## 4. Course Offering Schedule

<b>Year I Semester I</b>			
<b>Course</b>	<b>Course Title</b>	<b>Cr. Hrs.</b>	<b>ECTS</b>
ES611	Business Information Systems	3	7
ES613	Foundations of Enterprise Architecture	3	7
ES621	Systems Theory and Systems Thinking	3	7
IT631	Research Methods in IT and Systems	3	7
	<b>Total Credit</b>	<b>12</b>	<b>28</b>
<b>Year I Semester II</b>			
<b>Code</b>	<b>Course Title</b>	<b>Cr. Hrs.</b>	<b>ECTS</b>
ES618	Business Process Analysis & Engineering	3	7
ES622	Enterprise System Design	3	7
IT646	IT Security Management	3	7
IT656	IT Project Management	3	7
	<b>Total Credit</b>	<b>12</b>	<b>28</b>
<b>Year II Semester I</b>			
<b>Code</b>	<b>Course Title</b>	<b>Cr. Hrs.</b>	<b>ECTS</b>
ES731	Business Intelligence and Analytics	3	7
ES723	Enterprise Resource Planning Systems	3	7
	Elective	3	7
	<b>Total Credit</b>	<b>9</b>	<b>21</b>
<b>Year II Semester II</b>			
<b>Code</b>	<b>Title</b>	<b>Credit Hrs.</b>	<b>ECTS</b>
ES752	Thesis / Project	6	14
	<b>Total Credit</b>	<b>6</b>	<b>14</b>

## 5. Quality Assurance

The curriculum design focused on what still said to be lacking: **QUALITY**. This quality vision is achieved mainly through:

- attracting qualified and committed staff;
- maintaining curricula that meet national and international standards;
- maintaining standard class sizes that allows close follow-up and individualized service
- Standardization of course offerings through preparation of general course outlines, exam contents, and external audit;
- the actual provision of opportunities for students to take what has been learnt in classroom and transform it into uses in the real world;
- use of state-of-the-art laboratories, computing facilities, and educational support materials;
- Periodical workshops (with stakeholders, teachers and graduates);
- Summative review of the program every two years;
- Graduates' evaluation of the program;
- Assessments using survey project works/research, internships, and link programs;
- Annual assessment of the program;
- Establishing Alumni of Graduates as a mechanism to assess their career development.