



Bachelor of Engineering in Industrial and
Digital Management Systems Engineering

(International Program)
(2019 Revision)

Faculty of Engineering

King Mongkut's Institute of Technology Ladkrabang (KMITL)

**Bachelor of Engineering in Industrial and Digital Management Systems Engineering
(International Program)
(2019 Reversion)**

Name of Institution King Mongkut's Institute of Technology Ladkrabang (KMITL)
Faculty/Campus/College Faculty of Engineering
Department Industrial Engineering

Part1: General Information

1. Program Title: Bachelor of Engineering in Industrial and Digital
Management Systems Engineering (International Program)

2. Degree Title:

Full Name: Bachelor of Engineering

(Industrial and Digital Management Systems Engineering)

Abbreviations: B.Eng. (Industrial and Digital Management Systems Engineering)

3. Core Course or Special requirement courses (If any)

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4. Total Credits

Study Plan 1: Not less than 139 credits

Study Plan 2: Not less than 139 credits

Study Plan 3: Not less than 139 credits

5. Types of Program

5.1 Type

4 years bachelor's degree program

5.2 Program type

Academic bachelor's degree program

Advanced academic bachelor's degree program

Professional or practical Certificate

Advanced Vocational Certificate

5.3 Language

- Thai
- Foreign language (specify): English
- Thai and foreign language (specify): ...

5.4 Admission

- Only Thai students
- Only international students
- Both Thai and international students

5.5 Collaborations with Other Institutes

- Program issued specifically by KMITL
- Cooperate with

Name of Institution.....

Condition of Collaborations

- Cooperation with Other Institutions

Name of Institution: University of Reading Country: United Kingdom

Study Plan 2: This program is a Faculty of Engineering, King Mongkut's Institute of Technology Ladkrabang (KMITL) program which is under the collaboration with School of Computer Science University of Reading (UK) and under MOU between University of Reading and King Mongkut's Institute of Technology Ladkrabang (KMITL)

Name of Institution: University's title Sripatum University, Thailand

Study Plan 3: This program is a Faculty of Engineering, King Mongkut's Institute of Technology Ladkrabang (KMITL) program which is under the collaboration with Faculty of Business Administration, Sripatum University and under MOU between Sripatum University and King Mongkut's Institute of Technology Ladkrabang (KMITL)

The Condition of cooperation

- Hold KMITL's degree
- Hold Other's degree
- Hold Dual degree (more than two degrees)

5.6 Type of Degree offerement

- Hold degree in one subject field
 - Study Plan 1: A degree, Bachelor of Engineering (Industrial and Digital Management Systems Engineering), Faculty of Engineering King Mongkut's Institute of Technology Ladkrabang
- Hold degree more than one subject field (dual degree)

Study Plan 2: Dual degree, Bachelor of Engineering (Industrial and Digital Management Systems Engineering), Faculty of Engineering King Mongkut's Institute of Technology Ladkrabang (KMITL) and Bachelor of Science (B.Sc.) in Computer Science, University of Reading

Study Plan 3: Dual degree in Bachelor of Engineering (Industrial and Digital Management Systems Engineering), Faculty of Engineering, King Mongkut's Institute of Technology Ladkrabang (KMITL) and Bachelor of Business Administration Program in Digital Marketing, Faculty of Business Administration, Sripatum University

Others (specify).....

6. Status of the Program and Consideration for the Authorization/Agreement

Revised program, course begins in August, 2019

The program has been endorsed by the Academic Council in its meeting No. 5/2019 on 21 May 2019

The program has been endorsed by KMITL Council in its meeting No. 5/2019 on 31 May 2019

7. Expected Date for Thai Qualifications Register (TQR)

Academic year 2021

8. Career Paths

1. Industrial/ System Analysis/ Logistics and Supply Chain/ Quality/ Industrial System/ Project Engineers
2. Startup Entrepreneurs
3. Freelancer in Industrial and Digital Management Systems Engineering Field

9. Instructure Details

Name-Surname (Academic Position)	Qualifications (field of study) Academic year	University
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1. Assoc.Prof.Dr. Chumpol Yuangyai (Industrial engineering)	- Ph.D. (Industrial Engineering and Operations Research), 2009 - M.Eng. (Industrial Engineering), 2000 -B.Sc. (Mechanical Engineering), 1995	- The Pennsylvania State University, USA - Asian Institute of Technology, Thailand - Prince of Songkla University
2. Dr.Jonathan David Sands	- Ph.D. (Hydrogen, Fuel Cells and their Applications), 2015 - M.Sc. (Mathematical Engineering), 2010	- University of Birmingham, UK - University of Birmingham, UK
3. Dr. Jarotwan Koiwanit	- Ph.D. (Industrial Systems Engineering), 2015 - M.Sc. (Industrial Engineering), 2007 - B.Sc. (Industrial Engineering), 2006	- University of Regina, Canada - Chulalongkorn University -Prince of Songkla University
4. Asst.Prof.Dr. Nirand Pisutha-Arnond (Materials Science)	- Ph.D. (Materials Science and Engineering), 2013 - B.S. (Materials Science and Engineering), 2005	- University of Michigan, USA - Northwestern University, USA
5. Asst.Prof.Dr. Pasu Poonpakdee (Computer engineering)	- Ph.D. (Computer Science) School of Systems Engineering, 2016 - M.Sc. (Software Engineering), 2011 - B.Sc. (Software and Knowledge Engineering) (International Program), 1998	- University of Reading, UK - University of Portsmouth, UK - Kasetsart University

10. Location of Study

On campus: King Mongkut's Institute of Technology Ladkrabang

Outside campus: University of Reading

Study plan 1: King Mongkut's Institute of Technology Ladkrabang

Study plan 2: King Mongkut's Institute of Technology Ladkrabang and University of Reading

Study plan 3: King Mongkut's Institute of Technology Ladkrabang and Sripatum University

11. External Situation of Development Needed to be Considered for the Planning of the Program

11.1 Economic Situation/Development

Advanced technology enhances the sustainability of the industrial sector for high competitiveness, especially in 2016. Several departments have been initiating the Industry 4.0 to associate with policy called Thailand 4.0, to enhance sustainable development and to reinforce the strength and prosperity in community and society. In order to achieve the above goal, those who have industrial and digital management systems engineering competence are demanding to integrate a wide range of solutions to solve the problem by using various skills such as supply chain management, Industrial Robot management in manufacturing and quality, information technology, and big data management. Thailand, however, has shorted the mentioned competent.

11.2 Social and Cultural Situation/Development

It is undeniable that the development of industries is associated with social and cultural changes of community. Hence, apart from engineering skills, competent engineers should be concerned with social, cultural and environmental circumstances. Furthermore, they have to communicate effectively, are able to provide constructive criticism, and respect the Professional Code of Ethics. These aspects are required to minimize the effects of industries to society in every aspect.

12. Effects from 11.1 and 11.2 on the Development of the Program and the Relation to the Mission of the Institute

12.1 Program Development

King Mongkut's Institute of Technology Ladkrabang (KMUTL) has implemented new technology to develop the curriculum since the effect of technology on industrial technology has created impacts on several aspects such as manufacturing process controls, the development of Effectiveness and Efficiency in management to enhance the potential of competitiveness, the quality and the standard of products, the safety of the procedure, and minimizing the cost. In order to deal with above circumstance, this program, thus, is an international program since it is crucial to produce an industrial engineer to work for government and private sectors, to improve an appropriate technology, and to be a well-adjusted person who is able to learn new technology to enhance the organization, to have moral and ethical professions and to improve global communication. Moreover, it is necessary to develop a proactive curriculum so that it could be adjustable for the development of

industrial engineering.

1.2.2 Relation to the Mission of the Institute

King Mongkut's Institute of Technology Ladkrabang (KMITL) has been producing well recognized engineers, technology specialists and scientists to enhance the country's development and to serve the people. The development of the curriculum is associated with the mission and vision of the institute aimed to produce highly qualified graduates and to be the best in science and applied technology as well as sustainable innovation development institutions.

13. Relation (if any) with Other Programs Open in the Faculty / Other Departments of the Institute (i.e. Subjects open for the Service of the Faculties / Departments or to be Studied with Other Faculties / Departments)

13.1 Subjects/ Subject Groups in the Program Open by the Other Faculties / Departments /Programs

13.1.1 General course including language, humanities, and social science as well as science and mathematics courses

13.1.2 Elective course

13.2 Subjects/Subject Groups in the Program Open and Required to be Studied by Other Faculties/Departments/Programs

- Core course
- Elective course
- Thesis/Research study
- None

13.3 Management and Administration

- The Vice Dean for Academic Affairs and secretary of undergraduate students are responsible for general courses and core courses within undergraduate students in the faculty. Secretary of undergraduate students cooperates with the curriculum committee to arrange timetable, examination date, the number of in each course and other conditions.
- For a free elective course, students can check the details of registration by contact with advisors and lectures. Students
- can sit in for elective subjects before registering.

Curriculum

A. Common Foundation Subjects **30 credits**

1) Language courses **0 credits**

Credits

(lecture-practice-self-study)

01006500 ACADEMIC LISTENING AND SPEAKING *AUDITS* 4(4-0-8)

01006501 ACADEMIC READING AND WRITING *AUDITS* 4(4-0-8)

2) Science and Mathematics courses

Plan 1: Students are required to take **4 credits**

Plan 2: Students are required to take **4 credits**

Plan 3: Students are required to take **7 credits**

From the following subjects list:

Credits

(lecture-practice-self-study)

01006508 DIGITAL ECONOMY 3(3-0-6)

01006509 ENGINEERING AND PUBLIC POLICY 3(3-0-6)

01006515 DESIGN METHODS FOR INNOVATIONS 4(4-0-8)

The following subjects is provided for plan 2 only

01356900 Mathematics for Computer Science 4(2-6-7)

01356913 Neurocomputation 4(2-6-7)

3) Humanities subjects

Plan 1: Students are required to take **14 credits**

Plan 2: Students are required to take **14 credits**

Plan 3: Students are required to take **13 credits**

From the following subjects list:

		Credits (lecture-practice-self-study)
01006503	INTRODUCTION TO PSYCHOLOGY	3(3-0-6)
01006504	PHILOSOPHY OF SCIENCE	3(3-0-6)
01006505	CREATIVE THINKING	3(3-0-6)
01006506	CRITICAL THINKING	3(3-0-6)
01006507	PERSONAL ECONOMICS	3(3-0-6)
01006512	ASIAN STUDY	3(3-0-6)
01006513	INTERPRETATION AND ARGUMENT	4(4-0-8)
01006514	INNOVATIVE COMMUNICATION	4(4-0-8)
01006516	INNOVATION MANAGEMENT	4(4-0-8)
01006520	LEADERSHIP AND PERSONAL DEVELOPMENT	3(3-0-6)

4. Social Science

Plan 1: Students are required to take 12 **credits**

Plan 2: Students are required to take 12 **credits**

Plan 3: Students are required to take 10 **credits**

From the following subjects list:

		Credits (lecture-practice-self-study)
01006502	PROFESSIONAL ETHICS	3(3-0-6)
01006510	INTRODUCTION TO ECONOMICS	3(3-0-6)
01006511	THAI SOCIETY AND CULTURE	3(3-0-6)
01006517	LEAN STARTUP AND AGILE BUSINESS	4(4-0-8)
01006518	EMERGING TRENDS IN ENGINEERING	1(1-0-2)
01006519	INTRODUCTION TO ENVIRONMENTAL PRINCIPLES	3(3-0-6)
01006521	MEDITATION FOR LIFE DEVELOPMENT	3(3-0-6)
	Note: The following subjects are provided for study plan 2	
01356901	SOCIAL, LEGAL AND ETHICAL ASPECTS OF COMPUTING	3(2-2-5)
01356902	SOCIAL, LEGAL AND ETHICAL ASPECTS OF SCIENCE AND ENGINEERING	3(2-2-5)
01356903	HUMAN COMPUTER INTERACTION	3(2-2-5)

B. Special Education Courses

Plan 1: Students are required to take 103 **credits**

Plan 2: Students are required to take 103 **credits**

Plan 3: Students are required to take 103 **credits**

From the following subjects list:

1) Science and Mathematics for Engineering

Plan 1: Students are required to take 21 **credits**

Plan 2: Students are required to take 21 **credits**

Plan 3: Students are required to take 21 **credits**

From the following subjects list:

		Credits (lecture-practice-self-study)
01006702	PHYSICS 1	4(3-3-8)
01006703	PHYSICS 2	4(3-3-8)
01006708	CHEMISTRY	4(3-3-8)
01006710	INTRODUCTION TO CALCULUS	3(3-0-6)
01006711	ADVANCED CALCULUS	3(3-0-6)
01006712	DIFFERENTIAL EQUATIONS AND LINEAR ALGEBRA	3(3-0-6)

2) Basic Engineering

Students from all study plans are required 28 credits from the following subjects list.

		Credits (lecture-practice-self-study)
01006801	INTRODUCTION TO ENGINEERING PROGRAMMING	3(2-2-5)
01006802	ENGINEERING DRAWING	3(2-2-5)
01006803	ENGINEERING MECHANICS	3(3-0-6)
01006804	ENGINEERING MATERIALS	3(3-0-6)
01356251	MANUFACTURING PROCESSES	3(3-0-6)
01356252	THERMODYNAMICS	3(3-0-6)
01356253	FUNDAMENTAL OF ELECTRICAL ENGINEERING	3(2-2-5)
01356254	ENGINEERING STATISTICS	3(3-0-6)
01356255	INDUSTRIAL ENGINEERING LABORATORY	1(0-3-2)
01356256	INDUSTRIAL ENGINEERING PRACTICE	2(0-6-3)
01356257	MECHANICAL ENGINEERING LABORATORY	1(0-3-2)

3) Basic Engineering: Basic Industrial Engineering

Students from all study plans are required 24 credits from the following subjects list.

		Credits (lecture-practice-self-study)
01356418	INDUSTRIAL SAFETY ENGINEERING	3(3-0-6)
01356318	INDUSTRIAL PLANT DESIGN	3(3-0-6)
01356208	PRODUCTION PLANNING AND CONTROL	3(3-0-6)
01356333	QUALITY ENGINEERING	3(3-0-6)
01356419	INDUSTRIAL WORK STUDY	3(3-0-6)
01356420	OPERATIONS RESEARCH	3(3-0-6)
01356204	ENGINEERING ECONOMY	3(3-0-6)
01356319	MAINTENANCE ENGINEERING	3(3-0-6)

Note: The following subjects are provided for study plan 2

01356904	SOFTWARE ENGINEERING	4(2-6-7)
01356905	SYSTEMS DESIGN	3(2-2-5)
01356906	IT SERVICE MANAGEMENT	3(2-2-5)
01356907	ENTERPRISE APPLICATION INTEGRATION	3(2-2-5)
01356908	REQUIREMENTS, DOMAINS AND SOFT SYSTEMS	3(2-2-5)

4) Simulation and Analysis of Digital Management Systems Engineering

Plan 1 : Students are required to take 18 **credits**

Plan 2 : Students are required to take 18 **credits**

Plan 3 : Students are required to take 18 **credits**

From the following subjects list:

		Credits (lecture-practice-self-study)
01356332	DISCRETE EVENT SIMULATION	3(3-0-6)
01356322	COMPUTER AND INFORMATION TECHNOLOGY FOR INDUSTRIAL ENGINEERING	3(3-0-6)
01356323	AUTOMATION SYSTEMS	3(3-0-6)
01356325	DATA SCIENCE AND DATA ANALYTICS	3(3-0-6)
01356423	PROJECT MANAGEMENT	3(3-0-6)
01356326	SUPPLY CHAIN AND LOGISTICS MANAGEMENT	3(3-0-6)

Note: The following subjects are provided for study plan 2

01356910	ARTIFICIAL INTELLIGENCE	3(2-2-5)
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01356911	DATA MINING	3(2-2-5)
01356912	SOFTWARE QUALITY AND TESTING	3(2-2-5)
01356331	IMAGE ANALYSIS	3(2-2-5)

5) Elective Courses

Students from all study plans are required to take at least 24 credits

Note 1) KNOWLEDGE

5.1) Simulation and analysis of Digital Management Systems Engineering

01356421	INTELLIGENT DEVICE AND DIGITALS SYSTEMS	3(3-0-6)
01356422	DATABASE DESIGN AND IMPLEMENTATION	3(3-0-6)
01356426	ARTIFICIAL INTELLIGENCE IN INDUSTRIAL ENGINEERING	3(3-0-6)
01356425	DECISION MODELLING AND RISK ANALYSIS	3(3-0-6)
01356438	FINANCIAL MODELING	3(3-0-6)
01356439	WINDOWS APPLICATION DEVELOPMENT FOR INDUSTRIAL	3(3-0-6)
01356440	WEB APPLICATION DEVELOPMENT FOR INDUSTRIAL	3(3-0-6)
01356442	INDUSTRIAL ROBOT 3(3-0-6)	

Note : For Plan 3, students are required to pass the following two subjects.

01356425	DECISION MODELLING AND RISK ANALYSIS	3(3-0-6)
01356438	FINANCIAL MODELING	3(3-0-6)

5.2) Industrial Management

01356445	INVENTORY & WAREHOUSE MANAGEMENT	3(3-0-6)
01356427	HUMAN FACTORS IN ENGINEERING AND DESIGN	3(3-0-6)
01356429	FACILITY LAYOUT AND LOCATION	3(3-0-6)
01356433	QUALITY PLANNING AND MANAGEMENT	3(3-0-6)
01356434	MANAGEMENT SYSTEM SUSTAINABILITY	3(3-0-6)
01356435	ENERGY AND ENVIRONMENTAL MANAGEMENT	3(3-0-6)
01356436	HEALTH CARE ENGINEERING	3(3-0-6)
01356437	HUMAN INTERACTION AND SERVICE SYSTEM	3(3-0-6)
01356441	MODERN MANUFACTURING PROCESS	3(3-0-6)
01356443	NANOTECHNOLOGY AND NANOSENSORS	3(3-0-6)
01356444	INDUSTRIAL ENVIRONMENTAL MANAGEMENT	3(3-0-6)
01356465	PROCESS ANALYSIS AND REDESIGN	3(3-0-6)

5.3) Logistics and Supply Chain

01356464	SUPPLY CHAIN MODELLING	3(3-0-6)
01356428	SUPPLY CHAIN STRATEGY	3(3-0-6)

5.4) Economics, Finance, and Digital Business Management

01356430	TECHNOLOGY MANAGEMENT STRATEGY	3(3-0-6)
01356431	NEW PRODUCT MANAGEMENT	3(3-0-6)
01356432	SERVICE INNOVATION MANAGEMENT	3(3-0-6)
01356446	BUSINESS INFORMATION SYSTEMS ANALYSIS	3(3-0-6)
01356447	PRINCIPLES OF MARKETING	3(3-0-6)
01356324	COST ANALYSIS AND MANAGEMENT	3(3-0-6)

Note: The following subjects are provided for study plan 2.

01356448	APPLICATIONS OF COMPUTER SCIENCE	4(2-6-7)
01356449	FUNDAMENTALS OF COMPUTER SCIENCE	4(2-6-7)
01356450	PROGRAMMING	4(2-6-7)
01356451	ALGORITHMS AND OPERATING SYSTEMS	4(2-6-7)
01356452	COMPUTER ARCHITECTURE AND NETWORKING	4(2-6-7)
01356453	COMPILERS	3(2-2-5)
01356454	DATABASES AND INFORMATION SECURITY	4(2-6-7)
01356455	JAVA	4(2-6-7)
01356456	INDIVIDUAL PROJECT	4(0-9-0)
01356457	SERVICE-ORIENTED SYSTEM APPLICATIONS	3(2-2-5)
01356458	ADVANCED COMPUTING	3(2-2-5)
01356459	COMPUTER NETWORKING	4(2-6-7)
01356460	INFORMATION SECURITY	3(2-2-5)
01356461	PYTHON AND DATA SCIENCE APPLICATIONS	3(2-2-5)
01356462	VISUAL INTELLIGENCE	3(2-2-5)
01356463	VIRTUAL REALITY	3(2-2-5)

6) Elective course

Students from all study plans are required to take 6 credits from the following subjects list.

01356602	IE&DMS PROJECT PREPARATION	3(0-9-0)
01356601	IE&DMS PROJECT	3(0-9-0)
OR		
01006301	COOPERATIVE EDUCATION	6(0-45-0)
OR		
01006302	STUDY ABROAD	6(6-0-12)

C. Free Elective Courses

For Study plan 1 and 2, are required to select 1 alternative choice:

Total credits: 6 credits

**** For the Elective course, the study plan 3 students are required to take the following two subjects.**

01356423	PROJECT MANAGEMENT	3(3-0-6)
01356445	INVENTORY & WAREHOUSE MANAGEMENT	3(3-0-6)

D. Internship

Credits: None

01006805	INDUSTRIAL INTERNSHIP	0 (0-45-0)
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Study Plan 1: Study Site Location, KMITL

1st Year: 1st semester

Code	Subject	Credits
01006710	INTRODUCTION TO CALCULUS	3(3-0-6)
01006702	PHYSICS 1	4(3-3-8)
01006708	CHEMISTRY	4(3-3-8)
01006801	INTRODUCTION TO ENGINEERING PROGRAMMING	3(2-2-5)
01006804	ENGINEERING MATERIALS	3(3-0-6)
01006500	(ESL) ACADEMIC LISTENING AND SPEAKING *AUDITS*	4(4-0-8)
010065XX	(GENED ELECTIVE) Humanities 1	4(4-0-8)
Total credits		21

1st Year: 2nd semester

Code	Subject	Credits
01006703	PHYSICS 2	4(3-3-8)
01006711	ADVANCED CALCULUS	3(3-0-6)
01006802	ENGINEERING DRAWING	3(3-0-6)
01006803	ENGINEERING MECHANICS	3(3-0-6)

Code	Subject	Credits
01006501	(ESL) ACADEMIC READING AND WRITING *AUDITS*	4(4-0-8)
010065XX	(GENED ELECTIVE) HUMANITIES 2	4(4-0-8)
010065XX	(GENED ELECTIVE) SOCIAL SCIENCES 1	3(3-0-6)
Total credits		20

2nd Year: 1st semester

Code	Subject	Credits
01356253	FUNDAMENTAL OF ELECTRICAL ENGINEERING	3(2-2-5)
01356251	MANUFACTURING PROCESSES	3(3-0-6)
01006712	DIFFERENTIAL EQUATIONS AND LINEAR ALGEBRA	3(3-0-6)
01356254	ENGINEERING STATISTICS	3(3-0-6)
01356322	COMPUTER AND INFORMATION TECHNOLOGY FOR INDUSTRIAL ENGINEERING	3(3-0-6)
01356255	INDUSTRIAL ENGINEERING LABORATORY	1(0-3-2)
010065XX	(GENED ELECTIVE) HUMANITIES 3	3(3-0-6)
Total credits		19

2nd Year: 2nd semester

Code	Subject	Credits
01356419	INDUSTRIAL WORK STUDY	3(3-0-6)
01356332	DISCRETE EVENT SIMULATION	3(3-0-6)
01356252	THERMODYNAMICS	3(3-0-6)
01356256	INDUSTRIAL ENGINEERING PRACTICE	2(0-6-3)
01356257	MECHANICAL ENGINEERING LABORATORY	1(0-3-2)

Code	Subject	Credits
01356418	INDUSTRIAL SAFETY ENGINEERING	3(3-0-6)
01356325	DATA SCIENCE AND DATA ANALYTICS	3(3-0-6)
Total credits		18

3rd Year: 1st semester

Code	Subject	Credits
01356420	OPERATIONS RESEARCH	3(3-0-6)
01356204	ENGINEERING ECONOMY	3(3-0-6)
01356333	QUALITY ENGINEERING	3(3-0-6)
010065XX	(GENED ELECTIVE)	3(3-0-6)
01356323	AUTOMATION SYSTEMS	3(3-0-6)
010065XX	(GENED ELECTIVE) SOCIAL SCIENCES 2	3(3-0-6)
Total credits		18

3rd Year: 2nd semester

Code	Subject	Credits
01356318	INDUSTRIAL PLANT DESIGN	3(3-0-6)
01356319	MAINTENANCE ENGINEERING	3(3-0-6)
01356208	PRODUCTION PLANNING AND CONTROL	3(3-0-6)
01356326	SUPPLY CHAIN AND LOGISTICS MANAGEMENT	3(3-0-6)
010065XX	(GENED ELECTIVE) SCIENCE 1	4(4-0-8)
XXXXXXXX	(FREE ELECTIVE)	3(3-0-6)
Total credits		19

3rd Year: 3rd semester

Code	Subject	Credits
01006805	INDUSTRIAL INTERNSHIP	0(0-45-0)
Total credits		0

4th Year: 1st semester

Code	Subject	Credits
01356XXX	IE&DMS ELECTIVE	3(3-0-6)
01356602	IE&DMS PROJECT PREPARATION	3(0-9-0)
01356423	PROJECT MANAGEMENT	3(3-0-6)
010065XX	(GENED ELECTIVE) Social Sciences 3	3(3-0-6)
Total credits		12

4th Year: 2nd semester

Code	Subject	Credits
01356XXX	IE&DMS ELECTIVE	3(3-0-6)
01356601	IE&DMS PROJECT	3(0-9-0)
010065XX	(GENED ELECTIVE) SOCIAL SCIENCES 4	3(3-0-6)
XXXXXXXX	(FREE ELECTIVE)	3(3-0-6)
Total credits		12

COOPERATIVE EDUCATION OR STUDY ABROAD PLAN

4th Year: 1st semester

Code	Subject	Credits
01006301	COOPERATIVE EDUCATION	6(0-45-0)
Total credits		6

OR

4th Year: 1st semester

Code	Subject	Credits
01006302	STUDY ABROAD	6(6-0-12)
Total credits		6

4th Year: 2nd semester

Code	Subject	Credits
01356XXX	IE&DMS ELECTIVE	3(3-0-6)
01356XXX	IE&DMS ELECTIVE	3(3-0-6)
01356423	PROJECT MANAGEMENT	3(3-0-6)
010065XX	(GENED ELECTIVE) SOCIAL SCIENCES 4	3(3-0-6)
010065XX	(GENED ELECTIVE) SOCIAL SCIENCES 3	3(3-0-6)
XXXXXXXX	(FREE ELECTIVE)	3(3-0-6)
Total credits		18

Study Plan 2: Study Site Location, (KMITL-University of Reading)

1st Year: 1st semester

Code	Subject	Credits
01006710	INTRODUCTION TO CALCULUS	3(3-0-6)
01006702	PHYSICS 1	4(3-3-8)
01006708	CHEMISTRY	4(3-3-8)
01006801	INTRODUCTION TO ENGINEERING PROGRAMMING	3(2-2-5)
01006804	ENGINEERING MATERIALS	3(3-0-6)
01006500	(ESL) ACADEMIC LISTENING AND SPEAKING *AUDITS*	4(4-0-8)
010065XX	(GENED ELECTIVE) HUMANITIES 1	4(4-0-8)
Total credits		21

1st Year: 2nd semester

Code	Subject	Credits
01006703	PHYSICS 2	4(3-3-8)
01006711	ADVANCED CALCULUS	3(3-0-6)
01006802	ENGINEERING DRAWING	3(3-0-6)
01006803	ENGINEERING MECHANICS	3(3-0-6)
01006501	(ESL) ACADEMIC READING AND WRITING *AUDITS*	4(4-0-8)
010065XX	(GENED ELECTIVE) HUMANITIES 2	4(4-0-8)
010065XX	(GENED ELECTIVE) SOCIAL SCIENCES 1	3(3-0-6)
Total credits		20

1st Year: 3rd semester

Code	Subject	Credits
010065XX	(GENED ELECTIVE)	3(3-0-6)
01356420	OPERATIONS RESEARCH	3(3-0-6)
01356418	INDUSTRIAL SAFETY ENGINEERING	3(3-0-6)
Total credits		9

2nd Year: 1st semester

Code	Subject	Credits
01356253	FUNDAMENTAL OF ELECTRICAL ENGINEERING	3(2-2-5)
01356251	MANUFACTURING PROCESSES	3(3-0-6)
01006712	DIFFERENTIAL EQUATIONS AND LINEAR ALGEBRA	3(3-0-6)
01356254	ENGINEERING STATISTICS	3(3-0-6)
01356322	COMPUTER AND INFORMATION TECHNOLOGY FOR INDUSTRIAL ENGINEERING	3(3-0-6)
01356255	INDUSTRIAL ENGINEERING LABORATORY	1(0-3-2)
010065XX	(GENED ELECTIVE) HUMANITIES 3	3(3-0-6)
Total credits		19

2nd Year: 2nd semester

Course No.	Subject	Credits
01356419	INDUSTRIAL WORK STUDY	3(3-0-6)
01356332	DISCRETE EVENT SIMULATION	3(3-0-6)
01356252	THERMODYNAMICS	3(3-0-6)

Course No.	Subject	Credits
01356256	INDUSTRIAL ENGINEERING PRACTICE	2(0-6-3)
01356257	MECHANICAL ENGINEERING LABORATORY	1(0-3-2)
01356418	INDUSTRIAL SAFETY ENGINEERING	3(3-0-6)
01356325	DATA SCIENCE AND DATA ANALYTICS	3(3-0-6)
Total credits		18

2nd Year: 3rd semester

Course No.	Subject	Credits
01356204	ENGINEERING ECONOMY	3(3-0-6)
01356318	INDUSTRIAL PLANT DESIGN	3(3-0-6)
01356208	PRODUCTION PLANNING AND CONTROL	3(3-0-6)
Total credits		9

Study Plan 2: The students are required to study at University of Reading. The subject's lists are as follows:

1. Software Engineering
2. Neurocomputation
3. Social, Legal and Ethical Aspects of Computing
4. Social, Legal and Ethical Aspects of Science and Engineering
5. Human Computer Interaction

The recommendation plans are as follows:

3rd Year: 1st semester

Course No.	Subject	Credits
01356904	Software Engineering	4(2-6-7)

Course No.	Subject	Credits
01356455	Java	4(2-6-7)
01356905	Systems Design	3(2-2-5)
Total credits		11

3rd Year: 2nd semester

Course No.	Subject	Credits
01356451	Algorithms and Operating Systems	4(2-6-7)
01356452	Computer Architecture and Networking	4(2-6-7)
01356453	Compilers	3(2-2-5)
01356454	Databases and Information Security	4(2-6-7)
Total credits		15

3rd Year: 3rd semester

Course No.	Subject	Credits
01006805	INDUSTRIAL INTERNSHIP	0(0-45-0)
Total credits		0

4th Year: 1st semester

Course No.	Subject	Credits
01356903	Human Computer Interaction	3(2-2-5)
01356902	Social, Legal and Ethical Aspects of Science and Engineering	3(2-2-5)
0135XXXX	Optional Module	3(2-2-5)
0135XXXX	Optional Module	3(2-2-5)

Course No.	Subject	Credits
0135XXXX	Optional Module	3(2-2-5)
0135XXXX	Optional Module	3(2-2-5)
Total credits		18

Study plan 3: Study Site Location (KMITL - Sripatum University)

1st Year: 1st semester

Course No.	Subject	Credits
01006710	INTRODUCTION TO CALCULUS	3(3-0-6)
01006702	PHYSICS 1	4(3-3-8)
01006708	CHEMISTRY	4(3-3-8)
01006801	INTRODUCTION TO ENGINEERING PROGRAMMING	3(2-2-5)
01006804	ENGINEERING MATERIALS	3(3-0-6)
01006500	(ESL) ACADEMIC LISTENING AND SPEAKING *AUDITS*	4(4-0-8)
01006503	(GENED ELECTIVE): INTRODUCTION TO PSYCHOLOGY HUMANITIES 1	3(4-0-8)
Total credits		20

1st Year: 2nd semester

Course No.	Subject	Credits
01006703	PHYSICS 2	4(3-3-8)
01006711	ADVANCED CALCULUS	3(3-0-6)
01006802	ENGINEERING DRAWING	3(3-0-6)
01006803	ENGINEERING MECHANICS	3(3-0-6)
01006501	(ESL) ACADEMIC READING AND WRITING *AUDITS*	4(4-0-8)

Course No.	Subject	Credits
01006510	(GENED ELECTIVE): CREATIVE THINKING HUMANITIES 2	3(4-0-8)
01006510	(GENED ELECTIVE): INTRODUCTION TO ECONOMICS SOCIAL SCIENCES 1	3(3-0-6)
Total credits		19

2nd Year: 1st semester

Course No.	Subject	Credits
01356253	FUNDAMENTAL OF ELECTRICAL ENGINEERING	3(2-2-5)
01356251	MANUFACTURING PROCESSES	3(3-0-6)
01006712	DIFFERENTIAL EQUATIONS AND LINEAR ALGEBRA	3(3-0-6)
01356254	ENGINEERING STATISTICS	3(3-0-6)
01356322	COMPUTER AND INFORMATION TECHNOLOGY FOR INDUSTRIAL ENGINEERING	3(3-0-6)
01356255	INDUSTRIAL ENGINEERING LABORATORY	1(0-3-2)
01006511	(GENED ELECTIVE): THAI SOCIETY AND CULTURE HUMANITIES 2	3(3-0-6)
Total credits		19

2nd Year: 2nd semester

Course No.	Subject	Credits
01356419	INDUSTRIAL WORK STUDY	3(3-0-6)
01356332	DISCRETE EVENT SIMULATION	3(3-0-6)
01356252	THERMODYNAMICS	3(3-0-6)
01356256	INDUSTRIAL ENGINEERING PRACTICE	2(0-6-3)
01356257	MECHANICAL ENGINEERING LABORATORY	1(0-3-2)

Course No.	Subject	Credits
01356418	INDUSTRIAL SAFETY ENGINEERING	3(3-0-6)
01356325	DATA SCIENCE AND DATA ANALYTICS	3(3-0-6)
01006514	(GENED ELECTIVE) INNOVATIVE COMMUNICATION HUMANITIES 3	4(4-0-8)
Total credits		22

3rd Year: 1st semester

Course No.	Subject	Credits
01356420	OPERATIONS RESEARCH	3(3-0-6)
01356204	ENGINEERING ECONOMY	3(3-0-6)
01356333	QUALITY ENGINEERING	3(3-0-6)
01356323	AUTOMATION SYSTEMS	3(3-0-6)
01006517	(GENED ELECTIVE) : LEAN STARTUP AND AGILE BUSINESS	4(3-0-6)
Total credits		16

3rd Year: 2nd semester

Course NO.	Subject	Credits
01356318	INDUSTRIAL PLANT DESIGN	3(3-0-6)
01356319	MAINTENANCE ENGINEERING	3(3-0-6)
01356208	PRODUCTION PLANNING AND CONTROL	3(3-0-6)
01356326	SUPPLY CHAIN AND LOGISTICS MANAGEMENT	3(3-0-6)
01006515	(GENED ELECTIVE) : DESIGN METHODS FOR INNOVATIONS	4(4-0-8)
01356423	(FREE ELECTIVE): PROJECT MANAGEMENT	3(3-0-6)
Total credits		19

3rd Year: 3rd semester

Course No.	Subject	Credits
01006805	INDUSTRIAL INTERNSHIP	0(0-45-0)
Total credits		0

4th Year: 1st semester

Course No.	Subject	Credits
01356XXX	IE&DMS ELECTIVE	3(3-0-6)
01356602	IE&DMS PROJECT PREPARATION	3(0-9-0)
01356423	PROJECT MANAGEMENT	3(3-0-6)
01006508	(GENED ELECTIVE) : DIGITAL ECONOMY SCIENCE 2	3(3-0-6)
Total credits		12

4th Year: 2nd semester

Course No.	Subject	Credits
01356438	(IE&DMS ELECTIVE) FINANCIAL MODELING	3(3-0-6)
01356601	IE&DMS PROJECT	3(0-9-0)
01006520	(GENED ELECTIVE): LEADERSHIP AND PERSONAL DEVELOPMENT	3(3-0-6)
01356445	(FREE ELECTIVE) : INVENTORY & WAREHOUSE MANAGEMENT	3(3-0-6)
Total credits		12

**COURSE DESCRIPTIONS
GENERAL EDUCATION**

01006500 ACADEMIC LISTENING AND SPEAKING *AUDITS* 4(4-0-8)
PREREQUISITE: NONE

The course provides ESL students guidance and extensive practice in listening and speaking in academic and professional settings. Listening focuses on understanding spoken English in formats such as college lectures and news broadcasts. Note-taking tasks are also included to reinforce aural comprehension. Students learn to recognize organizational patterns. Students also practice outlining main ideas and supporting details through audio taped, videotaped and live presentations. Speaking focuses on increased fluency and communicative strategies used by native speakers in academic and professional settings.

01006501 ACADEMIC READING AND WRITING *AUDITS* 4(4-0-8)
PREREQUISITE: NONE

This course is designed to improve the reading and writing skills of ESL students. Students receive practice on reading and vocabulary development. Reading practice will emphasize paraphrasing, summarizing, and the simple analysis of texts to identify main ideas and distinguish fact from opinion. Writing practice includes writing of simple and compound sentences, using compound tenses and correct word forms, word order, spelling, and punctuation. Students will also develop the ability to write varied, complex sentences and effective paragraphs in standard written English.

01006502 PROFESSIONAL ETHICS 3(3-0-6)
PREREQUISITE: NONE

This course introduces the theory and the practice of professional and engineering ethics, including code of conducts and regulations in academic, professional, and technical fields. Students also learn about different approaches to ethical problems and examine real-life case studies, drawn from a variety of professional contexts. This course helps students develop skills and knowledge to manage and engage with ethical issues in their working lives.

01006503 INTRODUCTION TO PSYCHOLOGY 3(3-0-6)
PREREQUISITE: NONE

This course introduces a broad survey of psychological science including sensation and perception; learning, memory, intelligence, language, and cognition; emotions and

motivation; development, personality, health and illness, and social behavior. Students will study and discuss relations between the brain, behavior, and experience as well as learning the process of discovering new ideas and empirical results in the field.

01006504 PHILOSOPHY OF SCIENCE 3(3-0-6)

PREREQUISITE: NONE

The course provides a study of the thing we call “science”, together with its nature and methodology. The topics cover the meaning of science, reality, the nature of scientific observations, scientific theories and their discovery and formation, scientific explanations and predictions, the problem of induction, scientific rationality, the nature of scientific knowledge, concepts of truth, hypothesis testing, hypothesis confirmation, hypothesis falsification, logic of scientific method, and scientific progress.

01006505 CREATIVE THINKING 3(3-0-6)

PREREQUISITE: NONE

This course explores approaches to "How might we proceed when confronted by problems, situations too ambiguous, complex, or messy or impossible to be addressed directly through logical strategies?" It seeks to increase the participants' understanding of creativity, to improve their creative problem-solving skills and to enhance their ability to promote these skills in others, in a variety of educational settings. Students participate in activities designed to help develop their own creativity and discuss the creative process from various theoretical perspectives. Readings are on such topics as creative individuals, environments that tend to enhance creative functioning, and related educational issues. Discussions with artists, scientists and others particularly involved in the creative process focus on their techniques, and on ways in which creativity can be nurtured.

01006506 CRITICAL THINKING 3(3-0-6)

PREREQUISITE: NONE

This course explores issues about the nature and techniques of critical thought, viewed to establish a reliable basis for our claims, beliefs, and attitudes about the world. We explore multiple perspectives, placing established facts, theories, and practices in tension with alternatives to see how things could be otherwise. Views about observation and interpretation, reasoning and inference, valuing and judging, and the production of knowledge in its social context are considered. Special attention is given to translating what is learned into strategies, materials, and interventions for use in students' own educational and professional settings.

01006507 PERSONAL ECONOMICS 3(3-0-6)
PREREQUISITE: NONE

This course introduces students to the concept of personal economics. Students will learn to apply the economic way of thinking to manage their scarce resources. Employs economic concepts to understand financial planning and income management; saving and investing; stocks, bonds, and mutual funds; risk-return tradeoff and diversification; interest rates and credit.

01006508 DIGITAL ECONOMY 3(3-0-6)
PREREQUISITE: NONE

This course will develop and utilize economic principles to better understand and explain the expansion and integration of information and communications technologies into the global economies. It will introduce concepts and theories useful in analyzing economic aspects of the digital and information technology revolutions.

01006509 ENGINEERING AND PUBLIC POLICY 3(3-0-6)
PREREQUISITE: NONE

This course examines the processes of public and private decision making which affects the evolution of a technology. While technology has an important role in shaping today's society, the social forces often play a central role in the evolution of a technology. This course will study an engineering-related technology and its related policies. Students will discuss the technological and institutional issues, their interaction, the possible need for public policy and the factors that govern the policy.

01006510 INTRODUCTION TO ECONOMICS 3(3-0-6)
PREREQUISITE: NONE

This course gives an overview of economics, covering basic concepts and theories of microeconomics and macroeconomics. Topics in microeconomics studied include demand and supply, price elasticities, consumer behavior theory, production and cost theory, and perfect and imperfect competitions. Macroeconomics topics studied include aggregate demand and supply, macroeconomic data (e.g. gross domestic product, national income, etc.), management of economic growth, inflation problems, unemployment problems, money and banking systems, fiscal and monetary policy, taxation, international trades, and exchange rates.

01006511 THAI SOCIETY AND CULTURE 3(3-0-6)
PREREQUISITE: NONE

This course covers a study of Thai social identity and culture, development and inheritance of Thai culture, evolution of Thai society, as well as relation of Thai society and culture to societies and cultures of other countries.

01006512 ASIAN STUDY 3(3-0-6)
PREREQUISITE: NONE

This course covers a study of an Asian country's language, social identity and culture. The course will discuss the development and evolution of an Asian country, their economic prospect, cultural settings, societies and relations to the society and cultures of other countries.

01006513 INTERPRETATION AND ARGUMENTS 4(4-0-8)
PREREQUISITE: NONE

This course provides the study of interpreting and analyzing written and visual arguments. Students will learn to identify the underlying values, definitions, and assumptions in those arguments. The students also learn how to synthesize a multiplicity of competing perspectives, and to articulate fundamental disagreements between those perspectives. Ultimately, students will advance their own contributions to discussions in engineering, business innovations, and technology studies.

01006514 INNOVATIVE COMMUNICATION 4(4-0-8)
PREREQUISITE: NONE

This course provides the study and practice of different communication skills including technical, professional, and creative writing; infographics design; and delivering presentation. The students will study relevant techniques and learn to combine a range of skills to effectively communicate technical or specialized concepts. They will be able to explore and translate the benefit, the uniqueness, and the credibility of innovative ideas to a target audience.

01006515 DESIGN METHODS FOR INNOVATIONS 4(4-0-8)
PREREQUISITE: NONE

This course consists of structural design process to create innovative products or services. The students will study the process to gather trends and information such as global

direction, public opinions, technology, business, society and economic; learn how to extract context of interested area to find opportunities; study the processes used to gather behaviors, generate intense understanding about areas that lead to innovative concepts, produce innovative solutions and finally offering innovative products and services.

01006516 INNOVATION MANAGEMENT 4(4-0-8)

PREREQUISITE: NONE

This course introduces students to the concepts of innovative thinking and innovation management practices. This course prepares students with the insights and instruction necessary to successfully lead worldwide enterprises or local ventures. Covered topics include organization, strategy planning, policy development, communities, research and development and product management. Students are exposed to issues that challenged real world organizations. Students will learn best practices used by engineering leaders who successfully develop commercially viable products and services, create efficient operating processes, manage profitable organizations, and transform companies into industry leaders.

01006517 LEAN STARTUP AND AGILE BUSINESS 4(4-0-8)

PREREQUISITE: NONE

This course covers the basic principles of lean startup and agile business practice. Students will learn how to create an innovation accounting system to build products that meets customer demands; find the easiest and fastest ways to build minimum viable products to reduce time-to-market; learn tactics for improvement and measure customers' needs such as experimenting landing pages, A/B tests, MVPs on real customers; study how to implement an agile culture in business environments and learn how to develop business structures in order to keep the business functioning on constantly-moving units.

01006518 EMERGING TRENDS IN ENGINEERING 1(1-0-2)

PREREQUISITE: NONE

This course consists of a series of lectures given by different faculty members and distinguished speakers from the academic and industries. The lectures are designed to provide students a good understanding of each curriculum structure and the courses in each subject area. Students will be introduced to emerging trends in Engineering and the relevance of our courses. New courses and research opportunities will be presented, including the faculty's research fields. The course also discusses basic learning and working ethics and prepares students career-making skills. Pass/Fail required to graduate.

01006519 **INTRODUCTION TO ENVIRONMENTAL PRINCIPLES** **3(3-0-6)**
PREREQUISITE: **NONE**

This course provides students general principles of environmental engineering and science. Basics of the physical processes involved in the interactions between water, soil, climate, and vegetation. Natural and human activity as it impacts the environment, weather and climate, pollution.

01006520 **LEADERSHIP AND PERSONAL DEVELOPMENT** **3(3-0-6)**
PREREQUISITE: **NONE**

This course provides students fundamental skills for success in careers and team environments. The course will cover topics such as goal setting, career Skills, leadership skills, teamwork, effective communication, and public speaking. Learning methods will consist of hands-on activities and projects, group work, lecture, discussion, reading, writing, and presenting.

01006521 **MEDITATION FOR LIFE DEVELOPMENT** **3(3-0-6)**
PREREQUISITE: **NONE**

This course introduces theory and practice of meditation including : meaning of meditation, objectives, methods, the beginning, process characteristics of reciting and meditating, benefits of meditation, meditation resistances and applying meditation in daily life, meditation as related to education and working purposes, objectives, methods, characteristics of the states of absorption (jhana) and insight knowledge (Nana), fundamental knowledge about insight meditation (Vipassana), differences between foundation meditation (Summata) and insight meditation (Vipassana), layout of foundation meditation (Summata) and insight meditation (Vipassana), insight meditation as related to world population.

B. SPECIAL GENERAL EDUCATION

1) SCIENCE AND MATHEMATICS FOR ENGINEERING

01006702 **PHYSICS 1** **4(3-3-8)**
PREREQUISITE: **NONE**

This course covers basic physics and mechanics including a study of motion, space and time, kinematics, Newton's law of motion, forces, energy and momentum, work, power, conservation laws, systems of particles, linear momentum, circular motion, rotation, torques, harmonic oscillation and gravitation.

01006703 PHYSICS 2 4(3-3-8)

PREREQUISITE: 01006702 PHYSICS 1

This course provides the physical science required to analyze electrical and electronic devices. Covered topics include electrostatics and electromagnetics, electric field and potential, conductors, insulators, capacitors, dielectrics, electric current, electric circuits, magnetic fields, and electromagnetism.

01006705 NUMERICAL METHODS 4(4-0-8)

PREREQUISITE: NONE

The course covers root finding, solving systems of linear equations, interpolation, least squares, numerical integration, and differentiation, and solving systems of differential equations. Students may have learned some techniques in calculus to approximate an area with a Riemann integral or to approximate a function with a Taylor Series.

01006707 BIOLOGY 4(3-3-8)

PREREQUISITE: NONE

This course provides the basis for further studies in biochemistry, cell biology, genetics, and molecular biology. Students will gain the knowledge of the chemical principles underlying biological processes and cell structures as well as the analysis of genetics and heredity from a molecular perspective. Subject matter includes evolution, cellular processes energy and communication, genetics, information transfer, ecology, and interactions.

01006708 CHEMISTRY 4(3-3-8)

PREREQUISITE: NONE

This course provides a study of fundamental principles of chemistry and its applications. The subject matter includes principles of atomic structure, intermolecular forces and bonding, chemical reactions, kinetics, thermodynamics, and equilibrium. Relevant examples will be drawn from such areas as environmental, materials, and biological chemistry.

01006710 INTRODUCTION TO CALCULUS 3(3-0-6)

PREREQUISITE: NONE

Function, Limit, Continuity and their applications, Mathematical induction, Introduction to derivative, Differentiation, Applications of derivative, Definite integrals, Antiderivative integration, Application of definite integral, Indeterminate forms, Improper integrals, Numerical integration, Sequences and series of numbers, Taylor series expansions of

elementary functions vector analysis.

01006711 ADVANCED CALCULUS 3(3-0-6)

PREREQUISITE: 01006710 INTRODUCTION TO CALCULUS or Equivalent

Functions of several variables and their applications, Vector algebra in three dimensions, Polar coordinates, Calculus of real - valued functions of two variables, Differentiation and integration of real - valued and vector - valued functions of multiple real variables, Introduction to line integrals, Lines, planes and surfaces in three-dimensional space, Calculus of real - valued functions in three-dimensional space, Principal theory for applications such as Green's theorem, divergence theorem, Gauss theorem, Stokes theorem, etc.

01006712 DIFFERENTIAL EQUATIONS AND LINEAR ALGEBRA 3(3-0-6)

PREREQUISITE: NONE

Systems of linear equations and solutions. vector and space, Matrices, Solution of linear equations by matrices, bases, orthonormal bases, and applications in Fourier series, etc. Linear transformations: Laplace transformation, z-transformation Fourier-transformation, complex function and transformation, Introduction to differential equations, linear and nonlinear differential equation, Ordinary differential equations, Application of ordinary differential equation for engineering problems, initial value problems.

01006713 MATHEMATICAL CRYPTOGRAPHY 4(4-0-8)

PREREQUISITE: NONE

This is an advanced undergraduate course that provides a self-contained introduction to modern cryptography, with an emphasis on the mathematics behind the theory of public key cryptosystems and digital signature schemes. The course will focus on developing the mathematical tools needed for the construction and security analysis of diverse cryptosystems. Key topics include: classical cryptographic constructions, such as Diffie Hellman key exchange, discrete logarithm-based cryptosystems, the RSA cryptosystem, and digital signatures; fundamental mathematical tools for cryptography, including primality testing, factorization algorithms, probability theory, information theory, and collision algorithms; an in depth treatment of important recent cryptographic innovations, such as elliptic curves, elliptic curve and pairing-based cryptography, lattices, lattice-based cryptography, and the NTRU cryptosystem.

01006714 **MATHEMATICS FOR 3D GAME AND COMPUTER GRAPHICS** **4(4-0-8)**
PREREQUISITE: **NONE**

This course provides the mathematical concepts that a developer needs to develop 3D computer graphics and game engines. Key topics include vectors; matrices; transforms; 3D geometry; ray tracing; lighting and shading; illumination; polygonal techniques; visibility determination; curves and surfaces; fluid and cloth simulation.

2) INTRODUCTORY FOR ENGINEERING

01006801 **INTRODUCTION TO ENGINEERING PROGRAMMING** **3(2-2-5)**
PREREQUISITE: **NONE**

This course introduces basic concepts of computer programming such as elementary programming, data types, expressions, simple algorithms, and problem solving involving sequential statements, conditionals, and iterations. Students learn routines or methods as fundamental concepts and practice using strings, arrays, lists, maps or dictionaries, pre-defined libraries and classes, abstraction mechanisms and basic object oriented programming concepts. Students will practice related activities of software development life cycle such as system requirement analysis, debugging, testing and validation.

01006802 **ENGINEERING DRAWING** **3(2-2-5)**
PREREQUISITE: **NONE**

Lettering, orthographic projection, orthographic drawing and pictorial drawings, dimensioning and tolerancing, sections, auxiliary views and development, freehand sketches, detail and assembly drawings, basic computer aided drawing.

01006803 **ENGINEERING MECHANICS** **3(3-0-6)**
PREREQUISITE: **NONE**

Force systems, resultant, equilibrium, fluid statics, kinematics and kinetics of particles and rigid bodies, Newton is second law of motion, work, and energy, impulse and momentum.

01006804 **ENGINEERING MATERIALS** **3(3-0-6)**
PREREQUISITE: **NONE**

Study of relationship between structures, properties, production processes and applications of main groups of engineering materials i.e. metals, polymers, ceramics, and composites; phase equilibrium diagrams and their interpretation, mechanical properties, and materials degradation.

01356251 MANUFACTURING PROCESSES 3(3-0-6)

PREREQUISITE: NONE

Theory and concept of manufacturing processes such as casting, forming, machining, and welding; material and manufacturing processes relationships; fundamental of manufacturing cost.

01356252 THERMODYNAMICS 3(3-0-6)

PREREQUISITE: NONE

First law of thermodynamics; second law of thermodynamics and Carnot cycle; energy; entropy; basic heat transfer and energy conversion.

01356253 FUNDAMENTAL OF ELECTRICAL ENGINEERING 3(2-2-5)

PREREQUISITE: NONE

Basic DC and AC circuit analysis; voltage; current and power; transformers; introduction to electrical machinery; generators, motors, and their uses; concepts of three-phase systems; method of power transmission; introduction to some basic electrical instruments.

01356254 ENGINEERING STATISTICS 3(3-0-6)

PREREQUISITE: NONE

Probability, random variable, probability distribution, continuous and discrete models, function of random variables, random sample distribution, estimation of parameters, confidence interval, hypothesis testing, analysis of variance, regression and linear correlation, their applications to industrial systems, and usage of computer programs.

01356255 INDUSTRIAL ENGINEERING LABORATORY 1(0-3-2)

PREREQUISITE: NONE

The goal of this course is to involve the students in another laboratory work in various topics. The laboratory works are related to design, assign, control, and evaluation of work considering productivity and quality. However, it aspects Basic experiments of Mechanical engineering including engineering measurement, temperature, pressure and flow rate measurements, materials testing, stress, stain, fatigue, hardness, impact testing, materials characterization.

01356256 INDUSTRIAL ENGINEERING PRACTICE 2(0-6-3)
PREREQUISITE: NONE

The workshop facilities are utilized to provide training in various courses. The workshop is equipped with modern equipment, some of it is computerized, and hence capable of producing precise dimensions in different materials such as metal and plastic.

01356257 MECHANICAL ENGINEERING LABORATORY 1(0-3-2)
PREREQUISITE: NONE

Experiments in the fields of strength of materials, fluid mechanics, mechanics of machines and thermodynamics; for students to have a familiarity with basic instruments, to analysis the data and discuss the results and compare with the relating theory.

3) FOUNDATION COURSE FOR IE&DMS

01356602 IE&DMS PROJECT PREPARATION 3(0-9-0)
PREREQUISITE: NONE

This course instructs and prepares students in aspects of effective technical oral presentations through exposure to different workplace communication skills. As preparation and research for the capstone design, students must develop topics, identify a supervisor, and prepare a proposal for an oral presentation. The design must incorporate fundamental and advanced concepts in Computer Innovation Engineering. Each team of 2 to 4 students will propose innovative design projects which require application of standards and realistic engineering constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability. Each team must prepare and deliver oral presentations describing their analysis of the problems, the proposed innovation, and the design process.

01356601 IE&DMS PROJECT 3(0-9-0)
PREREQUISITE: 01006301 COOPERATIVE EDUCATION OR 01006302

STUDY ABROAD OR 01356602 IE&DMS PROJECT PREPARATION OR Equivalent

This course consists of open-ended design projects that incorporate fundamental and advanced concepts in IE&DMS. Students will analyze, design and implement innovative prototypes which require application of standards and realistic engineering constraints. Students from alternative study programs can extend their work from the alternative study programs. Each team of 1 to 4 students must design and implement a prototype of the proposed innovation. Measurements, simulations, and/or characterization of the proposed solution are performed so as to demonstrate that the design objectives and specifications have been met.

The final design reports must address issues, as appropriate, that are related to engineering economics, commercialization, manufacturability, environmental, social issues, ethics, and health and safety. Each team must prepare and deliver oral presentations and demonstrations of their design prototype.

01356418 INDUSTRIAL SAFETY ENGINEERING 3(3-0-6)

PREREQUISITE: NONE

Industrial safety laws, accident prevention techniques, relationship between safety designs and production efficiency, risk analysis, principles of industrial environment control, safety management system, industrial psychology, and first aid techniques.

01356318 INDUSTRIAL PLANT DESIGN 3(3-0-6)

PREREQUISITE: NONE

Introduction to plant design, preliminary analysis of plant design, layout, and facilities planning; material handling; nature of plant layout problems; plant location; product analysis; basic types of layout service and auxiliary functions.

01356208 PRODUCTION PLANNING AND CONTROL 3(3-0-6)

PREREQUISITE: NONE

Production planning and control system, forecasting techniques, aggregate production planning, inventory management, supply chain management, cost and profitability analysis for decision making, production scheduling, Material Requirement Planning (MRP) and Just In Time (JIT), production control, modern techniques in production planning and control.

01356333 QUALITY ENGINEERING 3(3-0-6)

PREREQUISITE: 01356254 ENGINEERING STATISTICS OR Equivalent

This course is about strategic approach to implementing quality, process and business improvement methods using data analysis tools; total quality management and six sigma approaches to define, measure, analyze, improve and control processes; principles of lean engineering; control charts; process capability analysis; basic metrology, applied statistics, lean principles and process capability.

01356419 INDUSTRIAL WORK STUDY 3(3-0-6)

PREREQUISITE: NONE

Working knowledge of the time and motion study; practices and procedures

including application of principles of motion economy; use of flow process charts and diagrams, Man-Machine charts, micro-motion study, time formulas, work sampling, performance rating, standard data systems and use of equipment related to the work. In addition, another main aim of this course is to provide the students with tools and techniques for business process analysis.

01356420 OPERATIONS RESEARCH 3(3-0-6)

PREREQUISITE: NONE

This course provides an introduction to operation research and their applications for decision making. The course will emphasize the applications rather than the details of methodology. Covered topics include decision analysis, fundamentals of discrete probability, continuous probability distributions and their applications, statistical sampling, simulation modeling, regression models, linear optimization, nonlinear optimization and discrete optimization. Students will be exposed to a variety of applications that can be addressed using Operation Research techniques.

01356204 ENGINEERING ECONOMY 3(3-0-6)

PREREQUISITE: NONE

This course focuses on the introduction to engineering and business economics investment alternatives and to project management. This course also aims to give students a working knowledge of money management and how to make economic comparisons of alternatives involving future benefits and cost. The impact of inflation, taxation, depreciation, financial planning, economic optimization, project scheduling, and legal and regulatory issues are introduced and applied to economic investment. In addition, these issues can be applied to plan for project-management problems.

01356319 MAINTENANCE ENGINEERING 3(3-0-6)

PREREQUISITE: NONE

Industrial maintenance and Total Productive Maintenance(TPM) concepts, Failure statistics, reliability, maintainability and availability analysis, Lubrication, preventive maintenance systems and condition monitoring technologies, Maintenance control and work order systems, Maintenance organization, personnel and resources, Computerized maintenance management systems (CMMS), Life cycle management, Maintenance reports and key performance indexes, Maintenance system development.

4) INDUSTRIAL SYSTEMS MODELING AND ANALYTICS DIGITAL MANAGEMENT SYSTEM

01356332 DISCRETE EVENT SIMULATION 3(3-0-6)

PREREQUISITE: 01356254 ENGINEERING STATISTICS OR Equivalent

This course focuses on an introduction to the application and a theoretical background of the system simulation. Topics include systems concepts, modeling systems using discrete events and the modeling of manufacturing and materials handling systems, computer systems and service systems through simulation. Theoretical topics include random variable generation, model verification and validation, statistical analysis of output, variance reduction techniques and optimization via simulation. A high-level simulation language will be utilized, and a simulation project will be presented as a student project.

01356322 COMPUTER AND INFORMATION TECHNOLOGY 3(3-0-6)
FOR INDUSTRIAL ENGINEERING

PREREQUISITE: NONE

This course provides management principles for information systems in industrial organization including the systems for finance, manufacturing, inventory, accounting, marketing and distribution, and processes of system building. The students will also learn the fundamental concepts of computer systems, data communication, computer network, ecommerce, and search engine optimization (SEO).

01356323 AUTOMATION SYSTEMS 3(3-0-6)

PREREQUISITE: NONE

Machine motion, machine power source, sensor, switch theory, logic gate, relay, counter, and timer, design of electrical and pneumatic circuits, programmable logic controller, computer, and microcontroller in automatic machine.

01356423 PROJECT MANAGEMENT 3(3-0-6)

PREREQUISITE: NONE

Project initiation; project budgeting; development of work plan; project scheduling; design coordinating; project organization; project directing; project controlling; phase procurement, time, cost and quality management; project development; project close out; total quality management and case studies.

01356325 DATA SCIENCE AND DATA ANALYTICS 3(3-0-6)

PREREQUISITE: INTRODUCTION TO ENGINEERING PROGRAMMING OR EQUIVALENT

This course is designed to provide students the basic techniques of data science, that included prominent algorithms used to mine data (e.g., clustering and association rule mining), and basic statistical modeling (e.g., linear and nonlinear regression). The basic programming in Python, a widely used programming language to extract information and knowledge from data, is also part of this course. The course is targeted towards individuals who would like to know the practices used and the potential use of large-scale data analytics. In addition, the applications of artificial intelligence techniques to solve industrial engineering problems neural networks, fuzzy logic and genetic algorithm are included in this course. Artificial intelligence (AI) is a research field that studies how to realize the intelligent human behaviors on a computer. The ultimate goal of AI is to make a computer that can learn, plan, and solve problems autonomously. Although AI has been studied for more than half a century, we still cannot make a computer that is as intelligent as a human in all aspects. However, we do have many successful applications. In some cases, the computer equipped with AI technology can be even more intelligent than us. The Deep Blue system which defeated the world chess champion is a well-known example.

01356326 SUPPLY CHAIN AND LOGISTICS MANAGEMENT 3(3-0-6)

PREREQUISITE: NONE

This course is designed to provide an overview of the strategic role of the warehousing function within the modern logistics environment and the elements involved in warehouse management. Subjects include warehouse strategies, regulations, ICT, material handling, inventory control, and measuring inventory and warehouse productivity. Logistics management, a part of the supply chain management, is absolutely essential in planning, implementing, and controlling the efficient, effective forward and reverse flow and storage of goods and services. The management provides required information between the point of origin and the point of consumption in order to meet customers' requirements.

5) IE&DMS ELECTIVES

5.1) ANALYSIS OF INDUSTRIAL ENGINEERING DESIGN MODELLING SIMULATION

01356421 INTELLIGENT DEVICE AND DIGITALS SYSTEMS 3(3-0-6)

PREREQUISITE: NONE

This course focuses on the fundamentals of designing and building modern intelligent devices in an application-driven context. The course provides an introduction to core

computer engineering topics including digital circuit, signal and system design. Students will learn logic processing, Boolean algebra, and related applications such as Boolean equation, reduction technique, logic gates, flip-flops, counters, shift registers, combinational circuit, synchronous and asynchronous circuits. Students will develop and analyze digital circuit design using integrated circuit, microcontroller, and programmable logic device.

01356422 DATABASE DESIGN AND IMPLEMENTATION 3(3-0-6)

PREREQUISITE: NONE

This course provides fundamental concepts of database systems. The design of database systems and the use of databases in applications are included in this course. The students will learn relational model and SQL that can help them to be able to design, understand and implement the database systems which are suitable for industrials.

01356426 ARTIFICIAL INTELLIGENCE IN INDUSTRIAL ENGINEERING 3(3-0-6)

PREREQUISITE: NONE

This course is about application of artificial intelligence techniques to solve industrial engineering problems neural networks, fuzzy logic, and genetic algorithm. Artificial intelligence (AI) is a research field that studies how to realize the intelligent human behaviors on a computer. The ultimate goal of AI is to make a computer that can learn, plan, and solve problems autonomously. Although AI has been studied for more than half a century, we still cannot make a computer that is as intelligent as a human in all aspects. However, we do have many successful applications. In some cases, the computer equipped with AI technology can be even more intelligent than us. The Deep Blue system which defeated the world chess champion is a well-known example.

01356425 DECISION MODELLING AND RISK ANALYSIS 3(3-0-6)

PREREQUISITE: NONE

This course is related to modeling and how computer models can support managerial decision making. A model is a simplified representation of a real situation and modeling is the process of developing, analyzing, and interpreting a model in order to help make better decisions. Models can be invaluable tools in managing and understanding the complexity and risk inherent in many business problems. As a result, constructing models has become an increasingly important part of a business at all levels from daily operations to strategic decision making.

01356438 FINANCIAL MODELING 3(3-0-6)
PREREQUISITE: NONE

This course is built on finance theory, financial strategy, and quantitative analysis. The course extensively uses Microsoft Excel to tackle a number of questions faced by financial analysts. Students will learn how to design and develop financial models for solving complex financial questions. The course also gives students opportunities to experience hands on practices on numerical analyses, graphical illustrations, and customized formatting that arise out of application on forecasting financial statement, estimating costs of capital, constructing an efficient portfolio, computing covariance matrix, measuring value at risk, pricing financial and real options, and fixed-income analytics.

01356439 WINDOWS APPLICATION DEVELOPMENT FOR INDUSTRIAL 3(2-2-5)
PREREQUISITE: 01356422 DATABASE DESIGN AND IMPLEMENTATION OR EQUIVALENT

This course introduces the fundamental concepts of for windows applications programming, event-driven programming, and the GUI. The students will learn and practice how to do practical window programming including dialogues, menus, controls, data types, scope and life of variables, objects and instances, fonts and graphics and database interfacing.

01356440 WEB APPLICATION DEVELOPMENT FOR INDUSTRIAL 3(2-2-5)
PREREQUISITE: 01356422 DATABASE DESIGN AND IMPLEMENTATION OR EQUIVALENT

This course introduces the fundamental concepts of web application programming. This module includes: web architectures, MVC pattern, HTML, interactive programs using CSS, and JavaScript; interacting with databases using SQL; Asynchronous JavaScript and XML (Ajax) for enhanced web interaction and applications; and web development framework that leads the students to be able to implement web application for the industrial.

01356442 INDUSTRIAL ROBOT 3(3-0-6)
PREREQUISITE: 01356323 AUTOMATION SYSTEMS OR Equivalent

This course is an introduction to industrial robots, types of manipulators, structures of manipulators, forward kinematics, reverse kinematics, and robotic programming.

5.2) INDUSTRIAL MANAGEMENT

01356445 INVENTORY & WAREHOUSE MANAGEMENT 3(3-0-6)

PREREQUISITE: NONE

The nature and importance of inventories, Forecasting systems, Inventory models for one item with constant demand rate. Time-varying demands. Inventory models for one item with stochastic demand. Inventory models for several products. Planning and control in multi echelon inventory situations. Distribution requirements planning (DRP), the role of the warehouse, Warehouse processes: receiving and put away. Warehouse processes: pick preparation. Picking strategy and equipment, Order-picking methods, Warehouse layout, Storage and handling equipment, Warehouse costs, Warehouse management systems Warehouse environment and safety.

01356427 HUMAN FACTORS IN ENGINEERING AND DESIGN 3(3-0-6)

PREREQUISITE: NONE

This course focuses on an introduction to human factors issues in the design of human-machine systems. There are some major topics including in this course such as design of workstations, controls, and displays, human-computer interfaces, the environment in industrial systems, etc. This course also introduces the field of human factors engineering and investigates human psychological, physiological and performance limitations in complex systems and why it is vital for engineers to understand human operational limitations when designing complex systems. Course includes studies of real accidents caused by human errors, proper or failure of improper designs, latent conditions and accident-producing designs. The goal of this course is to understand how to conduct engineering design with consideration of human factors.

01356429 FACILITY LAYOUT AND LOCATION 3(3-0-6)

PREREQUISITE: 01356419 INDUSTRIAL WORK STUDY OR Equivalent

This course focuses on an introduction to facilities location problems and factors affecting the selection criteria. Discussion of quantitative models and algorithms to choose the location considering various costs such as transportation, inventory, and fixed cost to open and operate a facility. Facilities planning and design is the process of locating and laying out the industrial and service facilities to best support the purpose of the facility while respecting resource constraints, especially space and budget. The facility planning function involves strategic, tactical, and operational decisions depending on the nature of the facility.

01356433 QUALITY PLANNING AND MANAGEMENT 3(3-0-6)
PREREQUISITE: NONE

This course focuses on principles of Quality Management. The major principles of quality management include customer focus, continuous improvement, employee involvement, and process improvement. This course addresses the planning and implementation of Quality management processes as they are integrated into the overall project plan and execution. Students will learn the evolution of product and project quality based on theory and practice on the Quality Management Processes. Quality Planning is discussed and practiced as an integral part of the overall project planning sequence. Process based Quality Assurance is addressed with a set of hands-on practice using a team case study.

01356434 MANAGEMENT SYSTEM SUSTAINABILITY 3(3-0-6)
PREREQUISITE: NONE

This self-paced course is aimed at encouraging groups to look at sustainability in terms of what's material to day-to-day business activities and moving beyond just measuring and disclosing, to arguing for value creation by strengthening internal management systems. Participants will be introduced to the power of creating sustainability uniquely to each organization as a compass for moving forward, the importance of sustainability management systems, instituting a "Plan-Do- Check- Act" for process orientation, and an overview of tools available to help manage critical impacts.

01356435 ENERGY AND ENVIRONMENTAL MANAGEMENT 3(3-0-6)
PREREQUISITE: NONE

This course is focusing on the design principles and practical applications of modern energy and environmental management systems, ISOs, and RTOs. The course will examine hardware, software, communications, and user interfaces. In addition, the course aims to develop a clear understanding of the philosophy of modern power and environmental system operations and the role of energy and environmental management systems, their design, and actual implementation. Survey past and current practices, as well as trends in the state-of-the-art design of energy management systems will also be included in this course. Discussion on new requirements imposed by deregulation, open access, and competition are also considered.

01356436 HEALTH CARE ENGINEERING 3(3-0-6)
PREREQUISITE: NONE

This course is an exploration of the concept and application of major information systems methodologies, integrated with mobile intelligent devices and approaches in the delivery of modern health care systems. Some of the main covered areas include process modeling and analysis, computerized patient records, electronic data interchange, imaging applications, decision support systems, eHealth, and Health applications.

01356437 HUMAN INTERACTION AND SERVICE SYSTEM 3(3-0-6)
PREREQUISITE: NONE

This course focuses on the foundation of human services from a broad perspective and examines the philosophies, values, concepts, trends, challenges, and opportunities. Students will be able to demonstrate an understanding of the history of human services, giving special attention to the history and development of human services and the scope of the future of the field. Human systems engineering uses engineering methods and knowledge from the physical, biological, information, social and management sciences to develop, implement, operate, evaluate, and improve human-machine, human-human, and human-organization systems. Topical areas provided in this course include management systems engineering and human factors and ergonomics.

01356441 MODERN MANUFACTURING PROCESS 3(2-2-5)
PREREQUISITE: 01006804 ENGINEERING MATERIALS OR Equivalent

This course introduces fundamentals of modern manufacturing processes including those involving solidification, particulate processing of metals and ceramics, material removal, surface enhancing operations, and joining/assembly techniques. Special topics include, but not limit to, rapid prototyping, processing of integrated circuits, micro- and nanofabrication technologies.

01356443 NANOTECHNOLOGY AND NANOSENSORS 3(3-0-6)
PREREQUISITE: 01006804 ENGINEERING MATERIALS OR Equivalent
01006703 PHYSICS 2 OR Equivalent

This course will provide a survey on some of the fundamental principles behind nanotechnology and nanomaterials and their vital role in novel sensing properties and applications. The course will discuss interesting interdisciplinary scientific and engineering knowledge at the nanoscale to understand fundamental physical differences at the nano

sensors. By the end of the course, students will understand the fabrication, characterization, and manipulation of nanomaterials, nano sensors, and how they can be exploited for new applications.

01356444 INDUSTRIAL ENVIRONMENTAL MANAGEMENT 3(3-0-6)
PREREQUISITE: NONE

The main goal of this course is to provide students with fundamental knowledge of Life Cycle Assessment (LCA) methods, applications, and tools. Upon course completion students will be better prepared to design and manage natural and industrial systems to meet human needs in an environmentally, economically, and socially sustainable manner. Topics covered will include 1) life cycle assessment tool and methodology, 2) design for environment, 3) greenhouse gas accounting, 4) environmental management systems, 5) corporate social responsibility, etc.

01356465 PROCESS ANALYSIS AND REDESIGN 3(3-0-6)
PREREQUISITE: NONE

The course aims at providing the students with tools and techniques for business process analysis and redesign. The course is structured as follows: - Business Process Management and Business Process Reengineering (BPR): basic concepts and methodological framework; - Business Process mapping and modelling: performance evaluation and benchmark identification; tools and techniques for process mapping and modelling; - Business Process analysis and diagnosis: process analysis criteria; identification of criticalities; - Business Process redesign: process reengineering criteria; - Change Management and Project Planning: evaluation and choice of design alternatives During the semesters, the students will develop a BPR project on a teaching case, working in teams. The delivery of the project is a prerequisite to access the final exam.

5.3) LOGISTICS AND SUPPLY CHAIN

01356464 SUPPLY CHAIN MODELLING 3(3-0-6)
PREREQUISITE: NONE

The aim of this course is to introduce modeling and solution methods for facility location, transportation and inventory management decisions that arise in supply chain analysis. This course mainly focuses on the modeling of managerial coordination and control problems in the chain. By using in-depth knowledge from the fields of operations management, operations research and economics, valuable insight can be given for complex, integrated into

real-life problems. Specific issues that will be discussed include facility location, logistic network planning and design, routing, inventory management, supplier contracting, sourcing strategies, quality assurance, information technology, flexibility, globalization, and performance measurement.

01356428 SUPPLY CHAIN STRATEGY 3(3-0-6)

PREREQUISITE: NONE

This course provides a broad overview of key supply chain strategies together with issues and challenges. A successful supply chain management requires cross-functional integration of key business processes within the firm and across the network of firms that comprise the supply chain. The challenge is to determine how to successfully accomplish this integration. Other covered topics include the management aspects of logistics networks, forecasting, inventory management, supply contracts, strategic alliances, supply chain integration and design, procurement and outsourcing, customer value, international issues, and a quick review of supply chain software.

5.4) ECONOMICS, FINANCE AND DIGITAL BUSINESS MANAGEMENT

01356430 TECHNOLOGY MANAGEMENT STRATEGY 3(3-0-6)

PREREQUISITE: NONE

This course provides a series of strategic frameworks for managing high technology businesses. The emphasis throughout the course is on the development and application of conceptual models which clarify the interactions between competition, patterns of technological and market change, and the structure and development of organizational capabilities. The Technology Management Strategic certificate program is designed for engineering students who aspire to lead a venture, make higher-level strategic technology/business decisions, and develop leadership skills. From an innovation viewpoint, this program will provide students with the understanding and the tools to incubate new ventures and participate in the process of innovation and market adoption within corporate environments.

01356431 NEW PRODUCT MANAGEMENT 3(3-0-6)

PREREQUISITE: NONE

The aim of this course is to familiarize students with applications of relatively recent new product planning techniques. The course will emphasize the use of market research data and marketing models for new product development and management. The main topics

to be covered in this course are idea generation, concept evaluation, optimal product design, test marketing, product positioning, market segmentation, market share estimation, product packaging, advertising testing, pricing, brand name selection, brand equity, and global product planning.

01356432 SERVICE INNOVATION MANAGEMENT 3(3-0-6)

PREREQUISITE: NONE

Specific topics provided for this course include sources and models of innovation, standards battles and design dominance, timing of entry, innovation strategy: assessing and defining strategic directions, collaboration strategies and protection of innovation, organizing teams for innovation and new product development processes and teams. The course aims to train students with an understanding of the main issues in the innovation management and an appreciation of the relevant skills needed to manage innovation at both strategic and operational levels. It provides evidence of different approaches based on real-world examples and experiences of leading organizations from around the world. The innovation management is one of the most important and challenging aspects of modern organization. Innovation, and particularly technological innovation, is inherently difficult, uncertain and risky, and most new technologies fail to be translated into successful products and services. Given this, it is essential that students understand the strategies, tools and techniques for managing innovation.

01356446 BUSINESS INFORMATION SYSTEMS ANALYSIS 3(3-0-6)

PREREQUISITE: NONE

Definition to business information systems analysis methodologies in an organizational context as well as tools and techniques to assist in the analysis of complex, socio-technical problems that typify the nature of organizational information systems and the work of business and information analysts.

01356447 PRINCIPLES OF MARKETING 3(3-0-6)

PREREQUISITE: NONE

Definitions, significance, roles, and marketing processes, marketing management philosophies, marketing combinations, target market, consumer behavior; marketing information technology system and research on marketing and marketing environment.

- 01356324** **COST ANALYSIS AND MANAGEMENT** **3(3-0-6)**
PREREQUISITE: NONE
Fundamentals of financial reports, cost analysis for planning process, capital expenditure, capital rationing and decision making for investment in interesting projects.
- 01356448** **APPLICATIONS OF COMPUTER SCIENCE** **4(2-6-7)**
PREREQUISITE: NONE
This module introduces popular applications associated with computers, including artificial intelligence, robotics, virtual reality, computer vision and data analytics.
- 01356449** **FUNDAMENTALS OF COMPUTER SCIENCE** **4(2-6-7)**
PREREQUISITE: NONE
This module introduces the essential concept of computer systems in the autumn term, and the foundations of data structures and algorithms in the spring term.
- 01356900** **MATHEMATICS FOR COMPUTER SCIENCE** **4(2-6-7)**
PREREQUISITE: NONE
This module provides a foundation of mathematical knowledge and methods for students in the Department of Computer Science.
- 01356450** **PROGRAMMING** **4(2-6-7)**
PREREQUISITE: NONE
This module introduces students to procedural computer programming.
- 01356904** **SOFTWARE ENGINEERING** **4(2-6-7)**
PREREQUISITE: NONE
This module introduces students to the concepts, practice, and management of software engineering. It addresses the lifecycle activities associated with developing software as part of a system as well as the management activities required to ensure that the software is developed on time, within budget and is fit for purpose. The module also incorporates case studies and examples to show the application of the concepts and principles to real-world systems.

01356451 ALGORITHMS AND OPERATING SYSTEMS 4(2-6-7)
PREREQUISITE: NONE

Algorithms and Operating Systems are fundamental concepts in Computer Science discipline. The module gives an introduction to fundamental algorithm design strategies that are common to many concrete applications. It also explores the features underlying the concepts of Operating Systems and provides experience of practical aspects related to core concepts in the area.

01356452 COMPUTER ARCHITECTURE AND NETWORKING 4(2-6-7)
PREREQUISITE: NONE

This module includes material on computer architecture and computer networking.

01356453 COMPILERS 3(2-2-5)
PREREQUISITE: NONE

This module covers the theory and practice of compilers.

01356454 DATABASES AND INFORMATION SECURITY 4(2-6-7)
PREREQUISITE: NONE

The module consists of two parts. The first part, Databases, covers an introduction to the basics of relational database design, Structured Query Languages (SQL) and some selected advanced database topics. The second part covers the major threats and risks that affect the security of a network and the systems that rely on it (network security), and the major threats to data in both structured and unstructured form (data security).

01356455 JAVA 4(2-6-7)
PREREQUISITE: NONE

The module introduces the students to Object-Oriented programming with the Java language. The module covers the discipline, methodologies, and techniques of software development in Java. Knowledge of the C language syntax and experience of structured programming is a pre-requisite. The module is designed for students with some programming experience. The module is delivered in two terms. In the Autumn term the module introduces the basics of Object-Oriented Programming in Java (e.g. classes, objects, inheritance hierarchies, I/O, etc.). In the Spring term the module covers the advanced topics and techniques (e.g. data structures, networking, GUI, etc.).

01356905 SYSTEMS DESIGN 3(2-2-5)

PREREQUISITE: NONE

This module delivers the Unified Modelling Language (UML) methodology and its selected techniques which aid to articulate system users' needs and then transform the needs on to software application solutions. Students will be engaged in an interactive learning environment in that they develop professional application design knowledge and skills.

01356456 INDIVIDUAL PROJECT 3(0-9-0)

PREREQUISITE: NONE

This module is for those students who are studying for a BSc in the Department of Computer Science. It enables them to work individually on a project in their final year. Students must pass this module to be awarded an honors degree, as this is a BCS accreditation requirement.

01356901 SOCIAL, LEGAL AND ETHICAL ASPECTS OF COMPUTING 3(2-2-5)

PREREQUISITE: NONE

This module provides students with a sound grounding in a range of social, legal, ethical and professional (SLEP) issues that might arise in their possible roles as working in technology related disciplines.

01356901 SOCIAL, LEGAL AND ETHICAL ASPECTS OF SCIENCE AND ENGINEERING 3(2-2-5)

PREREQUISITE: NONE

This module provides students with a sound grounding in a range of social, legal, ethical, and professional (SLEP) issues that might arise in their possible roles as working in technology related disciplines.

01356903 HUMAN COMPUTER INTERACTION 3(2-2-5)

PREREQUISITE: NONE

The aim of this module is to develop a sound understanding of the requirements, design, development, and evaluation of human-computer interfaces including those for web-based applications. A key focus of the module is placed on designing fit-for purpose, usable and accessible products/applications. Aims also include learning about input and output methods in human-computer interfaces and their appropriateness for different people and situations and learning about current research in the field of HCI.

01356913 NEUROCOMPUTATION 4(2-6-7)
PREREQUISITE: NONE

This module covers the theory and implementation of a few types of artificial neural network. In addition, one network is used as a case study for object-oriented programming. Students are expected to implement a neural network and apply it to real world problems.

01356457 SERVICE-ORIENTED SYSTEM APPLICATIONS 3(2-2-5)
PREREQUISITE: NONE

The module aims to adopt service-oriented concepts and principles for developing and integrating software applications and technology. This approach represents business operations in “business services” and breaks down a software application into common repeatable “application services” and “technology services”. Using this approach, enterprises can configure and reconfigure these sets of services for conceptualizing service-oriented systems applications which are aligned with business structure and goals. In order to represent the architectural requirements, the enterprise architecture and ArchiMate can be employed for modelling service-oriented systems applications.

01356912 SOFTWARE QUALITY AND TESTING 3(2-2-5)
PREREQUISITE: NONE

This module introduces students to software quality and testing principles and methods. It encourages a system view, putting quality systems and testing in context. Particular attention is given to software trustworthiness, static and dynamic testing, quality management and application to contemporary software development.

01356458 ADVANCED COMPUTING 3(2-2-5)
PREREQUISITE: NONE

The module covers contents of distributed computing, cloud computing, and parallel computing. Multi-core processors, such as GPU, and related parallel computing are also introduced. After introduction to distributed systems, distributed computing and cloud computing are discussed as applications in the context of the pervasive Internet of Things data streams and the challenges of processing and making sense of the Big Data volumes resulting from a network-centric world. The course will also examine the new technological innovations arising from the development of the distributed ledger technology including “AI-as-a service”, Block Chain and the Ethereum Smart Contracting Solution Stack and its deployment in various application domains

01356910 ARTIFICIAL INTELLIGENCE 3(2-2-5)

PREREQUISITE: NONE

The main goal of this module is to familiarize students with fundamental algorithms and methods in Artificial Intelligence. The module aims to provide students with theoretical and practical knowledge of Artificial Intelligence from various techniques and applications.

01356459 COMPUTER NETWORKING 4(2-6-7)

PREREQUISITE: NONE

This module describes the theories underlying computer communications and shows how these are applied in real world network applications.

01356911 DATA MINING 3(2-2-5)

PREREQUISITE: NONE

Automated data collection tools and mature database technology lead to tremendous amounts of data stored in databases, data warehouses and other information repositories. In this context, automated data analysis techniques (Data Mining) are becoming essential components to any information system. Application areas of these techniques include scientific computing, intelligent business, direct marketing, customer relationship management, market segmentation, store shelf management, data warehouse management, fraud detection in e-commerce and in credit card transactions etc. This module introduces concepts, techniques and algorithms for the extraction of interesting knowledge (rules, regularities, patterns) from large data sets. The techniques span from statistics to machine learning and information science methods to generate descriptive and predictive data models.

01356907 ENTERPRISE APPLICATION INTEGRATION 3(2-2-5)

PREREQUISITE: NONE

This module concerns the use of software and computer systems architectural principles to integrate systems and applications across an enterprise. Typically, an enterprise has existing legacy applications and databases and wants to continue to use them while adding or migrating to a new set of applications and technologies in a distributed computing environment. Students will be exposed to the crucial integration issues at different levels, e.g. enterprise, business process, people, data, and IT applications and technologies. Such complex integration in the enterprise can be supported by a collection of technologies and services which form a

middleware. This module will enable students to design and engineer an enterprise application integration (EAI) solution by adopting social-technical systems theories and methods.

01356331 IMAGE ANALYSIS 3(2-2-5)

PREREQUISITE: NONE

This module covers digital image processing techniques.

01356460 INFORMATION SECURITY 3(2-2-5)

PREREQUISITE: NONE

The module covers the major threats and risks that affect the security of a network and the systems that rely on it (network security), and the major threats to data in both structured and unstructured form (data security). It aims to counter these threats and to minimize risks with technical mechanisms.

01356906 IT SERVICE MANAGEMENT 3(2-2-5)

PREREQUISITE: NONE

This module is about managing the information technology (computers, networks, storage, and software) in an enterprise. Services link technology to application software, and application software to business function. IT Service Management embodies a set of processes aimed at ensuring that the services are maintained fit for purpose. The module begins with the principles of service management and formulating service oriented architecture descriptions (using an architecture modelling language) and moves on to the processes of IT Service Management. The service management approach adopted here relates to industrial exemplars such as but not limited to ITIL and the TOGAF ADM. The module pedagogy involves examples based on a familiar real world environment.

01356461 PYTHON AND DATA SCIENCE APPLICATIONS 3(2-2-5)

PREREQUISITE: NONE

The module introduces students to the Python programming language and the Python data science module ecosystem, including data processing and machine learning libraries.

01356908 REQUIREMENTS, DOMAINS AND SOFT SYSTEMS 3(2-2-5)

PREREQUISITE: NONE

This module is aimed at aspiring systems analysts, system architects and development managers. It concerns the quality of systems requirements and how systems requirements are derived from the motivation's goals of stakeholders. Analysis patterns, domain analysis, goal-orientation and management are included.

01356912 SOFTWARE QUALITY AND TESTING 3(2-2-5)
PREREQUISITE: NONE

This module introduces students to software quality, testing principles and methods. It encourages a system view, putting quality systems, requirements and testing in context. Particular attention is given to software trustworthiness, static and dynamic testing, quality management and application to contemporary software development.

01356462 VISUAL INTELLIGENCE 3(2-2-5)
PREREQUISITE: NONE

This module covers the topics of visual perception and computer vision.

01356463 VIRTUAL REALITY 3(2-2-5)
PREREQUISITE: NONE

This module covers techniques used in virtual reality.

6) ALTERNATIVE STUDY PROGRAMS

01006301 COOPERATIVE EDUCATION 6(0-45-0)
PREREQUISITE: NONE

This course demands the student to work in an innovative company or a government/private organization, which is approved by the program committee for working on an innovative project for at least 16 weeks. The work of the student is under supervision of a faculty member, who is regarded as the student's supervisor. The student must report progress to the supervisor regularly. Upon completion, the student must prepare and deliver oral presentations describing the work from the program.

01006302 STUDY ABROAD 6(6-0-12)
PREREQUISITE: NONE

This course is reserved for students who participate in the study abroad program. Upon the completion of the program, the students must prepare and deliver oral presentations describing their experience from the program.

01006303 OVERSEA TRAINING 6(6-0-12)
PREREQUISITE: NONE

Students must complete practical training at an overseas academic institution or company in the field relevant to Industrial and Management Systems Engineering for a period of at least 16 weeks.

01006805 INDUSTRIAL INTERNSHIP

0(0-45-0)

PREREQUISITE: NONE

During their four-year selected studies, students are required to complete a short-term industrial placement within professional selected environments. It takes place during a summer period. This course allows students to put into practice under conditions reflecting their future activities and responsibilities. The work, carried out under the responsibility of the firm involved, is presented in a written report.