COURSE COUNSELING
(FOR YEARS 3 & 4 IN 2020-21)
Department of Information Engineering
June 3rd, 2020
OUTLINE

- IERG & MIEG Curricula
  - Major required & IE elective courses
- New IE courses
- IE courses offered in 2020-21
- IE Streams of Specialization
- Discussion on some courses
- Q&A
ENGG YEAR 1 MAJOR CORE

Semester 1

- MATH1510
  Calculus
- PHYS1110/1003
  Engineering Physics I
- ENGG1100
  Engineering Design Lab

Semester 2

- ENGG1410
  Engineering Mathematics I
- ENGG1110
  Problem Solving by Programming

One more Faculty Science Course:

Chemistry Courses: CHEM1380
Life Science Courses: LSCI1001, 1003
Physics Courses: PHYS1110, ENGG1310
Other Courses: CSCI1120, CSCI1130
IERG/MIEG YEAR 2 MAJOR REQUIRED

Semester 3

- ENGG2420 (ENGG2440)
  Complex Numbers, Differential Equations & Discrete Mathematics
- IERG2080 (2 units)
  Intro. To System Programming
- IERG2051 (IERG only)
  Signals and Systems
- IERG2060
  Basic Analog and Digital Circuits
- IERG1810 (1 unit)
  Electronic Circuits Laboratory
- MATH1050
  Foundations of Modern Mathematics
- MATH2010
  Advanced Calculus I

Semester 4

- ENGG2470 (ENGG2430)
  Probability for Engineers
- IERG2602 (1 unit)
  Engineering Practicum
- CSCI2100
- Data Structure
- ENGG2310
  Principles of Communication Systems
- IERG3820 (1 unit)
  Communication Laboratory
- IERG2051 (MIEG only)
  Signals and Systems
- MATH2020
  Advanced Calculus II

FACULTY

IERG

MIEG (additional)
IERG/MIEG YEAR 3 MAJOR REQUIRED

Semester 5

- IERG3310
  Computer Networks
- IERG3800 (1 unit)
  Information Infrastructure Design Lab
- IERG3080
  Software Engineering and Practices
- MATH2050
  Algebraic Structures
- MATH2230
  Complex Variables with Applications

Semester 6

- IERG3060 (IERG only)
  Microcontrollers and Embedded Systems
- IERG3810 (1 unit, IERG only)
  Microcontrollers and Embedded Systems Laboratory
- MATH2040
  Linear Algebra II
- ENGG2310
- IERG3820

(IERG3060 & IERG3810 are elective courses for MIEG)

If not yet taken in semester 4.
IERG/MIEG YEAR 4 MAJOR CORE

Semester 7

- IERG4998
  Final Year Project I

Semester 8

- CSCI3160 (MIEG only)
  Design & Analysis of Algorithms
- IERG4999
  Final Year Project II

Two-semester Final Year Project (FYP)

Project selection in April for next academic year

Professor suggested topics

Student proposed topics

Poster presentations in December and May
MAJOR ELECTIVES

- **IERG**: at least 17 units
  - At least 12 units from IE Major Elective List
  - The rest (5 units) can be either from IE Major Elective List or from 3000-coded courses from all other programmes under Engineering Faculty

- **MIEG**: at least 12 units from the given MIEG major elective lists.
### IE MAJOR ELECTIVES

- At least 17 units of IERG Major Electives
- At least 12 units from List of IE Major Electives

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Name</th>
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<tbody>
<tr>
<td>CSCI 3150</td>
<td>Introduction to Operating Systems</td>
</tr>
<tr>
<td>ENGG 1820</td>
<td>Engineering Internship</td>
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<tr>
<td>IERG 3010</td>
<td>Digital Communications</td>
</tr>
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<td>IERG 3050</td>
<td>Simulation and Statistical Analysis</td>
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</tr>
<tr>
<td>IERG 3830</td>
<td>Product Design Project</td>
</tr>
<tr>
<td>IERG 4030</td>
<td>Optical Communications</td>
</tr>
<tr>
<td>IERG 4080</td>
<td>Building Scalable Internet-based Services</td>
</tr>
<tr>
<td>IERG 4090</td>
<td>Network Protocols and Systems</td>
</tr>
<tr>
<td>IERG 4100</td>
<td>Wireless Communication Systems</td>
</tr>
</tbody>
</table>
IE MAJOR ELECTIVES

IERG 4110  Hands-on Wireless Communications
IERG 4130  Introduction to Cyber Security
IERG 4160  Image and Video Processing
IERG 4180  Network Software Design and Programming
IERG 4190  Multimedia Coding and Processing
IERG 4210  Web Programming and Security
IERG 4220  Secure Software Engineering
IERG 4230  Introduction to Internet of Things
IERG 4300  Web and Information Analytics
IERG 4330  Programming Big Data Systems
IERG 4340  Emerging Technologies in IE
IERG 4350  Cloud Computing Security
IERG 4831  Networking Laboratory I
IERG 4841  Networking Laboratory II
IE MAJOR ELECTIVES

IERG 5020  Telecommunication Switching and Network Systems
IERG 5090  Advanced Networking Protocols and Systems
IERG 5100  Advanced Wireless Communications
IERG 5130  Probabilistic Models and Inference Algorithms for Machine Learning
IERG 5140  Lightwave Networks
IERG 5154  Information Theory
IERG 5200  Channel Coding and Modulation
IERG 5230  Algorithms and Realization of Internet of Things Systems
IERG 5240  Applied Cryptography
IERG 5270  Advanced Topics in P2P Networks and Systems
IERG 5280  Mobile Networking
IERG 5290  Network Coding Theory
IERG 5300  Random Processes for Engineers
IERG 5310  Security & Privacy in Cyber Systems
IERG 5320  Digital Forensics
IERG 5330  Network Economics
IERG 5340  IT Innovation and Entrepreneurship
IERG 5350  Reinforcement Learning
IERG 5590  Advances in Blockchains
MAJOR ELECTIVES FOR MIEG

- At least 12 units of MIEG Major Electives (Lists A & B), AND
- At least 9 units from List A

A. CSCI2110 (or MATH3250), CSCI3130, 3150, 3230, 3320, 5320 (or MATH3260), ENGG1820, IERG3010/ESTR3300, IERG3050, 3060, IERG3280/ESTR3302, IERG3300/ESTR3304 (or MATH4240), IERG3320/ESTR3306, IERG3810, 3830, 4030, IERG4080/ESTR4312, IERG4090/ESTR4302, IERG4100/ESTR4304, IERG4110/ESTR4314, IERG4130/ESTR4306, IERG4160, IERG4180/ESTR4308, IERG4190, 4210, 4220, 4230, IERG4300/ESTR4300 [^ENGG4030], IERG4330/ESTR4316, IERG4340, IERG4831, 4841, 5020, IERG5040/ENGG5392, IERG5090, IERG5100/ENGG5303, IERG5130, 5140, IERG5154/ENGG5301, IERG5200 (or MATH4260), IERG5230, IERG5240/ENGG5383, IERG5270, 5280, 5290, IERG5300/ENGG5302, IERG5310, 5320, 5330, 5340, 5350, 5590,

B. MATH2060, 2070, 3010, 3030, 3040, 3070, 3080, 3093, 3215, 3230, 3270, 3290, 3310, 3320, 3330, 3360, 4010, 4020, 4030, 4230, 4280
MAJOR GPA

- BMEG/CENG/CSCI/EEEN/ELEG/ENER/ENGG/ESTR/FTEC/IERG/MAEG/SEEM required and major elective courses at 2000 and above level as well as IERG2060/ESTR2304 will be included in the calculation of Major GPA for honour classification, excluding courses in Faculty Package, Foundation Science courses (except IERG2060/ESTR2304), and Foundation Mathematics courses.
NEW IE COURSES

IERG 5350  Reinforcement Learning

This course aims to cover the fundamental topics relevant to Reinforcement Learning (RL), a computational learning approach where an agent tries to maximize the total amount of reward it receives while interacting with the complex and uncertain environments. The course content includes the basics of Markov Decision Processes, model-based and model-free RL techniques, policy optimization, RL distributed system design, as well as the case studies of RL for game playing such as AlphaGo, traffic simulation, and other robotics applications.

Advisory: Students are expected to have solid foundation on signal processing.

FTEC 4004  E-payment Systems and Cryptocurrency Technologies

The course introduces e-payment systems and cryptocurrency technologies.

Overview and Notion of Money; Banks, Clearing and Settlement; Credit Card Payment Protocols; Smartcard and Stored Value Facilities (SVF) such as Octopus; Digital Wallets and Mobile Payment Protocols and Systems such as Apple Pay, Google Pay, Samsung Pay, AliPay and WeChatPay; Peer-to-Peer Payment Systems such as PayPal; Micropayment and Ecash; Bitcoin and Blockchain Smart Contract, Ethereum and their applications; future of Money Technologies, such Central Bank Digital Currencies (CBDC).

Pre-requisite: IERG4130/CSCI4130 Introduction to Cyber-Security (not in IE major elective list yet)
- All laboratory work will be done via GNS3, a network emulation platform

**Lab01 - Design and implementation of SOHO network**
- Connects a SOHO network to the Internet via DD-WRT

**Lab02 - Design and implementation of switching network**
- Builds a switching network for a company and connect them to the Internet. VLAN are involved to separate networks from different department

**Lab03 - Design and Implementation of Resilience switching network**
- Builds a large scale switching network for an Enterprise. Static routes are involved.

**Lab04 - Design and Implementation of intra-domain routing network**
- Use the topology in Lab03 to build a network using different kind of routing protocol

**Lab05 - Design and implementation of inter-domain routing network**
- Learn to build an ISP and Internet Exchange (IX)
Help the small and medium enterprise (SME) firm to set up an office network and build a private cloud to hold their servers.

Configure the switch and firewall device such that the office machine can connect to internet.

Servers setup and management:

- Setup the management network, which only those authenticated user can access, to manage the VM hypervisors at office and data center.
- Provision the firewall VM to protect web and name servers.
- Provision the web and name servers.

Deploy IPv6 to the servers

Deploy wireless AP with WPA, captive portal, & EAP-PEAP authentication
IE MAJOR REQUIRED & ELECTIVES TO BE OFFERED IN 2020-21

<table>
<thead>
<tr>
<th>First Semester</th>
<th>Second Semester</th>
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<tbody>
<tr>
<td>IERG3010</td>
<td>ENG5301</td>
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<td>IERG3320</td>
<td>ENG5303</td>
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<td>ENG5340</td>
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<td>IERG4220</td>
<td>IERG1810</td>
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<td>IERG2051</td>
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<td>IERG3820</td>
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</table>
IE STREAMS OF SPECIALIZATION

- Communications
- Internet Engineering
- Cyber Security
- Enrichment
- Big Data: Systems and Applications

- On voluntary basis.
- To qualify for a stream of specialization, the student must complete at least 12 units from the electives listed under the stream.
- A student who satisfies all the requirements of a stream of specialization may obtain a letter of certification from the department.
IE STREAMS OF SPECIALIZATION

Communications

IERG 3010  Digital Communications
IERG 3280  Networks: Technology, Economics, and Social Interactions
IERG 3300  Introduction to Stochastic Processes
IERG 4030  Optical Communications
IERG 4100  Wireless Communication Systems
IERG 4110  Hands-on Wireless Communications
IERG 4130  Introduction to Cyber Security
IERG 4230  Introduction to Internet of Things
IERG 4340  Emerging Technologies in IE
IERG 5020  Telecommunication Switching and Network Systems
IERG 5200  Channel Coding and Modulation
IERG 5230  Algorithms and Realization of Internet of Things Systems
IERG 5280  Mobile Networking
IERG 5330  Network Economics
ENGG 5303  Advanced Wireless Communications
IERG 5040  Lightwave System Technologies (ENGG5392)
IE STREAMS OF SPECIALIZATION

Internet Engineering

CSCI 3150  Introduction to Operating Systems  (Required)
IERG 3050  Simulation and Statistical Analysis
IERG 3280  Networks: Technology, Economics, and Social Interactions
IERG 3300  Introduction to Stochastic Processes
IERG 4080  Building Scalable Internet-based Services
IERG 4090  Network Protocols and Systems
IERG 4130  Introduction to Cyber Security
IERG 4180  Network Software Design and Programming
IERG 4190  Multimedia Coding and Processing
IERG 4210  Web Programming and Security
IERG 4831  Networking Laboratory I
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IE STREAMS OF SPECIALIZATION

**Cyber Security**

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<tr>
<td>IERG 4130</td>
<td>Introduction to Cyber Security</td>
<td>(Required)</td>
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<td>IERG 4210</td>
<td>Web Programming and Security</td>
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<td>IERG 4220</td>
<td>Secure Software Engineering</td>
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<td>IERG 4350</td>
<td>Cloud Computing Security</td>
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<td>IERG 5240</td>
<td>Applied Cryptography (ENGG5383)</td>
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<td>IERG 5310</td>
<td>Security &amp; Privacy in Cyber Systems</td>
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<td>IERG 5320</td>
<td>Digital Forensics</td>
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<tr>
<td>IERG 5590</td>
<td>Advances in Blockchains</td>
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IE STREAMS OF SPECIALIZATION

**Enrichment**

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<td>Digital Communications</td>
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<td>IERG 3050</td>
<td>Simulation and Statistical Analysis</td>
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<td>Networks: Technology, Economics, and Social Interactions</td>
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<td>Introduction to Stochastic Processes</td>
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<td>IERG 4100</td>
<td>Wireless Communication Systems</td>
</tr>
<tr>
<td>IERG 4190</td>
<td>Multimedia Coding and Processing</td>
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<tr>
<td>IERG 4300</td>
<td>Web and Information Analytics</td>
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<tr>
<td>IERG 5154</td>
<td>Information Theory (ENGG5301)</td>
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<tr>
<td>IERG 5200</td>
<td>Channel Coding and Modulation</td>
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<tr>
<td>IERG 5290</td>
<td>Network Coding Theory</td>
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<tr>
<td>IERG 5300</td>
<td>Random Processes for Engineers (ENGG5302)</td>
</tr>
<tr>
<td>CSCI 3160</td>
<td>Design and Analysis of Algorithms</td>
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# IE STREAMS OF SPECIALIZATION

## Big Data: Systems and Applications

<table>
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<td>IERG 3320</td>
<td>Social Media and Human Information Interaction</td>
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<tr>
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<tr>
<td>IERG 4160</td>
<td>Image and Video Processing</td>
</tr>
<tr>
<td>IERG 4230</td>
<td>Introduction to Internet of Things</td>
</tr>
<tr>
<td>IERG 4300</td>
<td>Web-scale Information Analytics (Required)</td>
</tr>
<tr>
<td>IERG 4330</td>
<td>Programming Big Data Systems</td>
</tr>
<tr>
<td>IERG 5130</td>
<td>Probabilistic Models and Inference Algorithms for Machine Learning</td>
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<td>IERG 5350</td>
<td>Reinforcement Learning</td>
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<tr>
<td>CSCI 3320</td>
<td>Fundamental of Machine Learning</td>
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<tr>
<td>CSCI 4180</td>
<td>Introduction to Cloud Computing and Storage</td>
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<td>CSCI 4190</td>
<td>Introduction to Social Networks</td>
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<tr>
<td>ELEG 5491</td>
<td>Introduction to Deep Learning</td>
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ELITE (ENGINEERING LEADERSHIP, INNOVATION, TECHNOLOGY AND ENTREPRENEURSHIP) STREAM

- Elective Courses:
- 15 units of courses:
  (i) 12 units of ESTR courses of which at most 6 units of courses at 1000 or 2000 level and at least 6 units of courses at 3000 or 4000 level
  (ii) 3 units of BMEG/CENG/CSCI/ELEG/ENGG/IERG/MAEG/SEEM courses at 5000 level
CS MINOR

Students are required to complete a minimum of 18 units of courses, with at least 6 units at 3000 or above level, as follows:

1. **Required Courses:**
   - CSCI2510, 2520, 2720, 3100  
   - Units: 12

2. **Elective Courses:**
   - (a) CSCI1510, 1520, 1530, 1540  
     - Units: 3
   - (b) CENG3150, CENG3430/ESTR3100, CSCI1020, 1030, 1040, 1050, CSCI2110/ENGG2440/ESTR2004, CSCI2120, 2800, 3120, 3130, CSCI3150/ESTR3102, CSCI3160/ESTR3104, CSCI3170, CSCI3180/ESTR3106, CSCI3190, 3220, CSCI3230/ESTR3108, CSCI3250, 3260, 3280, 3310, 3320, 3420, 4120, 4140, CSCI4180/ESTR4106, CSCI4190, 4210, 4220  
     - Units: 3

**Total:** 18

Explanatory Notes:
1. Course(s) in Column A are equivalent to course(s) in Column B and can be used to fulfill the requirements of this Minor Programme.

<table>
<thead>
<tr>
<th>Column A</th>
<th>Column B</th>
</tr>
</thead>
<tbody>
<tr>
<td>CSCI1110/1120, 1130/ESTR1100/1102</td>
<td>CSCI1510/1520/1530/1540</td>
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<tr>
<td>ENGG1110/ESTR1002</td>
<td>CSCI1510/1520/1530/1540</td>
</tr>
<tr>
<td>CENG2400/ELEG2401/3230/ESTR2100</td>
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<td>CSCI2100/ESTR2102</td>
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<td>MATH2210 and 2220</td>
<td>CSCI1530</td>
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<tr>
<td>PHYS2061</td>
<td>CSCI1530</td>
</tr>
</tbody>
</table>

2. Other than CSCI2520, 2720 and one of the courses from CSCI1510, 1520, 1530 and 1540, students cannot use the same course to fulfill requirements of both Minor in Computer Science and Minor in Web and Cloud Computing.

**IE students must at least take 3 units CS course to fulfill CS minor.**
(Required by CSE Dept)