COURSE COUNSELING

Department of Information Engineering

May 11, 2016
OUTLINE

- IERG & MIEG Curricula
  - Major required & IE elective courses
- New IE courses
- IE courses offered in 2016-17
- 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: CHEM1070, 1280, 1380
Life Science Courses: LSCI1001, 1003
Physics Courses: ENGG1310
Other Courses: CSCI1120, CSCI1130, SEEM2460
IERG/MIEG YEAR 2 MAJOR REQUIRED

Semester 3

- ENGG2460
  Complex Numbers, Differential Equations & Discrete Mathematics
- CSCI1140 (1 unit)
  Programming Laboratory
- IERG2060
  Basic Analog and Digital Circuits
- MATH2010
  Advanced Calculus I
- MATH1050
  Foundations of Modern Mathematics

Semester 4

- ENGG2430
  Probability & Statistics
- ENGG2601 (2 units)
  Technology, Society and Engineering
- ENGG2602 (1 unit)
  Engineering Practicum
- CSCI2100
  Data Structure
- IERG2051
  Signals and Systems
- MATH2020
  Advanced Calculus II

FACULTY IERG MIEG (additional)
# IERG/MIEG YEAR 3 MAJOR REQUIRED

## Semester 5
- **ENGG2310**
  Principles of Communication Systems
- **IERG3820**
  Communication Laboratory
- **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**
  Microcontrollers and Embedded Systems
- **IERG3810**
  Microcontrollers and Embedded Systems Laboratory
- **MATH2040**
  Linear Algebra II
- **MATH2070**
  Mathematical Analysis I

*(IERG3060 & IERG3810 are elective courses for MIEG)*
IERG/MIEG YEAR 4 MAJOR CORE

Semester 7

- ENGG4998
  Final Year Project I

Semester 8

- ENGG4999
  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 9 units from the given MIEG major elective list:
  - IE Major Electives, MATH2060, 3010, 3030, 3040, 3070, 3080, 3210 (or SEEM2420), 3220, 3230, 3270, 3290, 4030
IE MAJOR ELECTIVES

CSCI 3150  Introduction to Operating Systems
ENGG 1820  Engineering Internship
ENGG 4030  Web and Information Analytics
IERG 3010  Digital Communications
IERG 3050  Simulation and Statistical Analysis
IERG 3280  Networks: Technology, Economics, and Social Interactions
IERG 3300  Introduction to Stochastic Processes
IERG 3320  Social Media and Human Information Interaction
IERG 3830  Product Design Project
IERG 4020  Telecommunication Switching and Network Systems
IERG 4030  Optical Communications
IERG 4080  Building Scalable Internet-based Services
IERG 4090  Network Protocols and Systems
IERG 4100  Wireless Communication Systems
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 4330 Programming Big Data Systems
IERG 4831 Networking Laboratory I
IERG 4841 Networking Laboratory II
IE MAJOR ELECTIVES

IERG 5040  Lightwave System Technologies
IERG 5090  Advanced Networking Protocols and Systems
IERG 5100  Advanced Wireless Communications
IERG 5140  Lightwave Networks
IERG 5154  Information Theory
IERG 5200  Channel Coding and Modulation
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
Courses on Telecommunications and Information Processing

- **ENGG1410/2460/2430**
  - Engineering Math

- **IERG2051**
  - Signals and Systems

- **IERG2060**
  - Basic Analog and Digital Circuits

- **IERG3820**
  - Communication Laboratory

- **IERG3010**
  - Digital Communications

- **IERG3050**
  - Simulation and Statistical Analysis

- **IERG3060**
  - Microcontrollers & Embedded Systems

- **IERG3810**
  - Microcontrollers & Embedded Systems Lab

- **IERG3300**
  - Stochastic Process

- **IERG3280**
  - Networks: Technology, Economics & Social Interactions

- **IERG4020**
  - Telecommunication Switching and Network Systems

- **IERG4030**
  - Optical Communications

- **IERG4100**
  - Wireless Communication Systems

- **IERG4110**
  - Hands-on Wireless Communications

- **IERG4160**
  - Image and Video Processing

- **IERG4190**
  - Multimedia Coding and Processing

- **IERG4230**
  - Introduction to Internet of Things

- **IERG4230**
  - Random Processes for Engineers

- **IERG5200**
  - Channel Coding and Modulation

- **IERG5290**
  - Network Coding Theory
Courses on Software, Computer Networking, Cyber Security, Big Data

- IERG3320: Social Media and Human Information Interaction
- IERG3280: Networks: Technology, Economics & Social Interactions
- IERG3080: Software Engineering and Practices
- IERG3310: Computer Networks
- IERG3150: Introduction to Operating Systems
- ENGG1110: Problem Solving by Programming
- CSCI2100: Data Structures
- CSCI1140: Programming Laboratory
- IERG4030: Web-scale Information Analytics
- IERG4330: Programming Big Data Systems
- IERG4220: Secure Software Engineering
- IERG4230: Introduction to Internet of Things
- IERG4180: Network Software Design and Programming
- IERG43800: Information Infrastructure Lab
- IERG4831/4841: Networking Laboratories I/II
- IERG4090: Network Protocols and Systems
- IERG4130: Introduction to Cyber Security
- IERG4210: Web Programming and Security
- IERG4220: Secure Software Engineering
- IERG4080: Building Scalable Internet-based Services
- IERG5090: Advanced Networking Protocols and Systems
- IERG5270: Advanced Topics in P2P Networks and Systems
- IERG5280: Mobile Networking
- IERG5240: Applied Cryptography
- IERG5310: Security & Privacy in Cyber Systems
- IERG5320: Digital Forensics
- IERG5330: Networks Economics
- IERG3800: Information Infrastructure Lab
IE MAJOR ELECTIVES TO BE OFFERED IN 2016-17

<table>
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<tr>
<th>First Semester</th>
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<tr>
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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 4020  Telecommunication Switching and Network Systems
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 5040  Lightwave System Technologies
IERG 5100  Advanced Wireless Communications
IERG 5200  Channel Coding and Modulation
IERG 5280  Mobile Networking
IERG 5330  Network Economics
# Internet Engineering

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<tr>
<td>CSCI 3150</td>
<td>Introduction to Operating Systems (Required)</td>
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<tr>
<td>ERG 3050</td>
<td>Simulation and Statistical Analysis</td>
</tr>
<tr>
<td>IERG 3280</td>
<td>Networks: Technology, Economics, and Social Interactions</td>
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<td>Building Scalable Internet-based Services</td>
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<td>Network Protocols and Systems</td>
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<td>Network Software Design and Programming</td>
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<td>Multimedia Coding and Processing</td>
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<td>Advanced Networking Protocols and Systems</td>
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Cyber Security

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<td>Secure Software Engineering</td>
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<td>IERG 5240</td>
<td>Applied Cryptography</td>
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<td>IERG 5310</td>
<td>Security &amp; Privacy in Cyber Systems</td>
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<td>Digital Forensics</td>
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Enrichment

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<td>ENGG 4030</td>
<td>Web and Information Analytics</td>
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<td>IERG 3010</td>
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# IE STREAMS OF SPECIALIZATION

## Big Data: Systems and Applications

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<td>ENGG 4030</td>
<td>Web-scale Information Analytics <em>(Required)</em></td>
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<tr>
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<td>Social Media and Human Information Interaction</td>
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<td>Introduction to Internet of Things</td>
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<tr>
<td>IERG 4330</td>
<td>Programming Big Data Systems</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
IERG3300/ESTR3304
Introduction To Stochastic Processes

- Topics: Markov chains, random walks, martingales and stopping times, Poisson process
- Useful to students specializing in: computer networks, information theory, and finance
- Recommended for MIEG students (and those that like math)
- Non-measure-theoretic treatment (means easier math)

- Instructor: Chandra Nair
IERG4020 Telecommunication Switching and Network Systems

Basic telephony; concepts of switching, transmission, multiplexing and concentration; circuit switching, time-space-time switching; virtual-circuit/label switching; crossbar/bus/shared-memory switches; Ethernet switches at edge and metro; switching characteristics of interconnection networks; parallel switching control in sorting, concentration, multicasting and distribution.

Advisory note: Students are expected to have background in signals & systems.
IERG3320 Social Media and Human Information Interaction

- Social media is one of the main sources of big data. This course aims to enable students to understand about social media and the interaction between human and information.

  1) examines the social and human dimensions of social media;
  2) introduces the theories, models, and analysis techniques related to social media and human information interaction; and
  3) discusses how to integrate theories and concepts into social media and human information interaction into the analytics and visualization of big data.

- Topics include: foundations of social media, human cognition and information behavior, online communities, and social interactions, as well as infographic and big data visualization.
The course aims to provide students with the hands-on experience needed for a successful career in Big Data in the information technology industry.

Many of the assignments will be completed on massive publicly available data sets giving them appropriate experience with the algorithm, mainstream platforms and software tools needed to master programming for Big Data.

The students will develop a solid background in provisioning, programming and applying Big Data systems and software.
This course will cover

1. common security problems, vulnerabilities and attack patterns in software and their underlying causes, for example, different types of buffer overflows, race conditions, side channels;
2. security models and their realizations in modern desktop/mobile operating systems and applications;
3. secure software engineering principles, coding techniques, guidelines and tools to prevent common vulnerabilities and pitfalls;
4. security testing methodologies and tools in practice;
5. risk assessment/management and security audit.
IERG4080 Building Scalable Internet-Based Services

- Mobile devices has greatly increased the demand of Internet-based services. Large-scale online services such as Pinterest and Instagram must be designed in a way such that they can be scaled up and scaled out in a rapid and seamless manner.

- This course will teach students how to build scalable online services and applications. In particular, the design principles and engineering considerations for different core components, including the front-end system, the load-balancer, performance monitoring, content-delivery networking, fault-tolerant mega data store, distributed messaging services, backend big data processing/ analytics will be discussed.

- As a course project, the students will prototype a scalable Internet service by leveraging industrial-strength component offerings from leading infrastructure and platform service providers.

- Advisory note: Students are expected to have background in object oriented programming.
IERG4230 Introduction to Internet of Things

- The course introduces the principles, architectures and applications of Internet of Things (IoT) systems, which enable the networking and interaction of smart objects via various communication technologies.

- Topics:
  - IoT Identification, EPC, RFID, QR, NFC
  - Sensors for IoT, Touch-Screen, Accelerometers, Sensor Web
  - Machine-to-machine Communications: WPAN, Bluetooth/BLE, ZigBee, WiFi, 6LoWPAN, RPL, CoAP, MQTT, LWM2M, IPSO, etc.
  - Big Data Analytics
  - Smart Applications: healthcare, energy management, transportation/ urban dynamics, inventory control, building/home automation, environmental monitoring/control

- Experiments: Arduino Nano, Arduino Yun, ZigBee, Bluetooth Low Energy, IoT Projects

Videos:
1. In A Grocery Store
2. A day in the life of the Internet of Things
3. Smart Home
Have a Happy Summer Vacation!!