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: CHEM~~1070~~, 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** (additional)

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

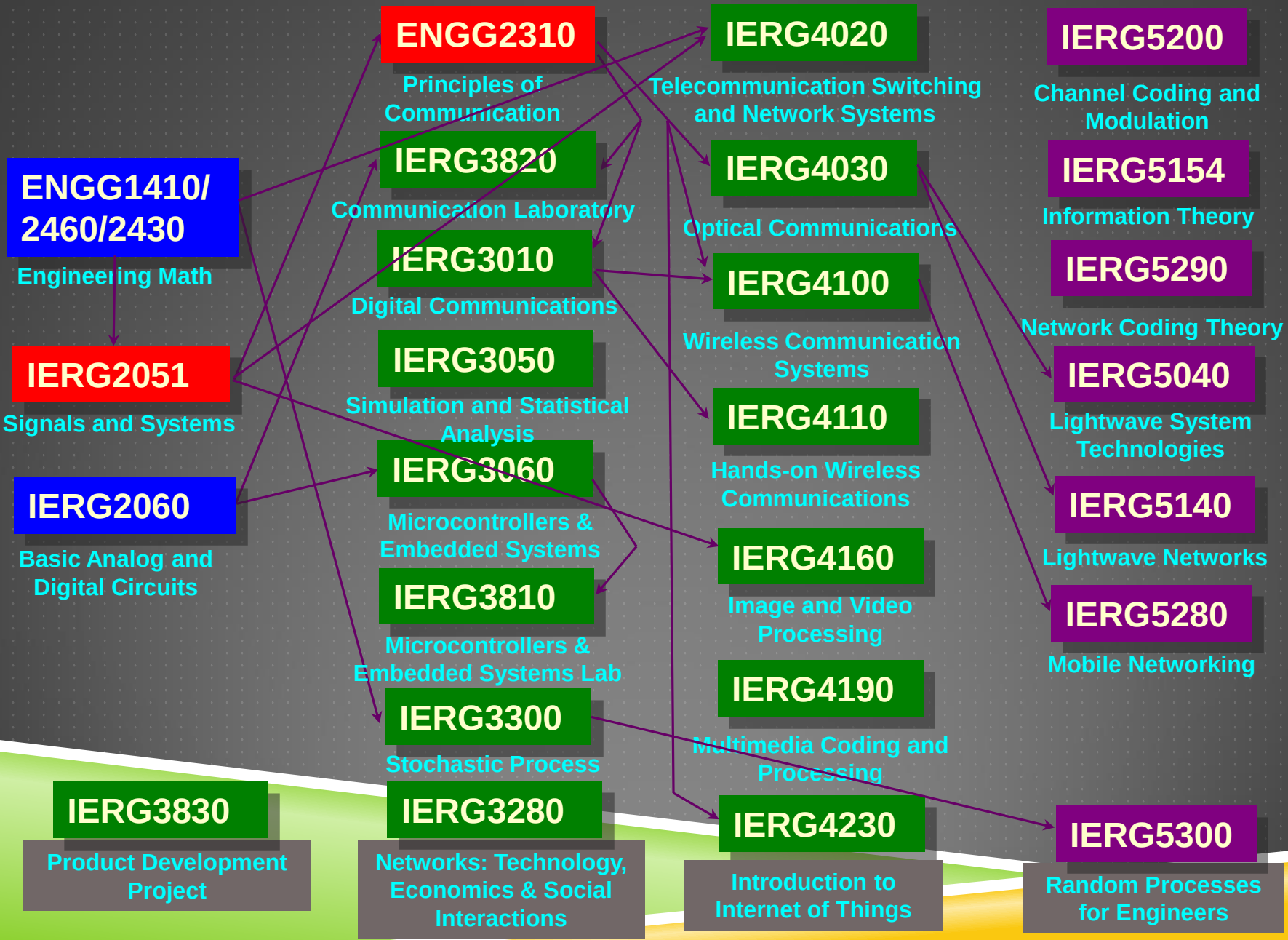
IE MAJOR ELECTIVES

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

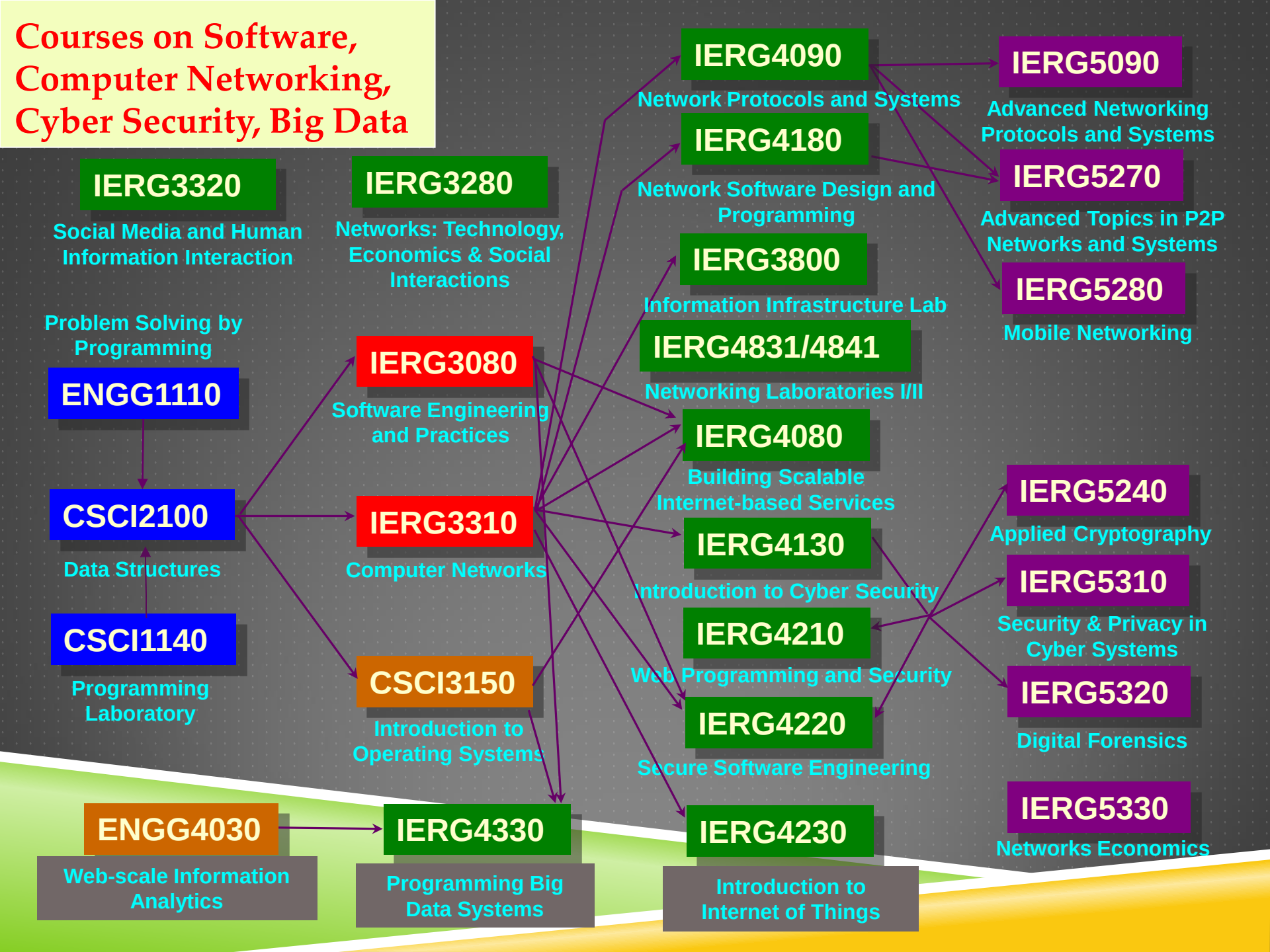
IE MAJOR ELECTIVES

- **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



Courses on Software, Computer Networking, Cyber Security, Big Data



IE MAJOR ELECTIVES TO BE OFFERED IN 2016-17

First Semester

- ENGG4030
- IERG3050
- IERG3300
- IERG4020
- IERG4080
- IERG4130
- IERG4180
- IERG4190
- IERG4210
- IERG4831
- IERG4841
- IERG5154
- IERG5330

Second Semester

- IERG3010
- IERG3320
- IERG3830
- IERG4030
- IERG4090
- IERG4100
- IERG4160
- IERG4220
- IERG4230
- IERG4330
- IERG4831
- IERG4841
- IERG5140
- IERG5100

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

IE STREAMS OF SPECIALIZATION

Internet Engineering

CSCI 3150	Introduction to Operating Systems (Required)
ERG 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
IERG 4841	Networking Laboratory II
IERG 5090	Advanced Networking Protocols and Systems
IERG 5270	Advanced Topics in P2P Networks and Systems
IERG 5280	Mobile Networking

IE STREAMS OF SPECIALIZATION

Cyber Security

CSCI 3150	Introduction to Operating Systems
IERG 4130	Introduction to Cyber Security (Required)
IERG 4210	Web Programming and Security
IERG 4220	Secure Software Engineering
IERG 5240	Applied Cryptography
IERG 5310	Security & Privacy in Cyber Systems
IERG 5320	Digital Forensics

IE STREAMS OF SPECIALIZATION

Enrichment

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 4100	Wireless Communication Systems
IERG 4190	Multimedia Coding and Processing
IERG 5154	Information Theory
IERG 5200	Channel Coding and Modulation
IERG 5270	Advanced Topics in P2P Networks and Systems
IERG 5290	Network Coding Theory
IERG 5300	Random Processes for Engineers

IE STREAMS OF SPECIALIZATION

Big Data: Systems and Applications

ENGG 4030	Web-scale Information Analytics (Required)
IERG 3320	Social Media and Human Information Interaction
IERG 4080	Building Scalable Internet-Based Services
IERG 4160	Image and Video Processing
IERG 4230	Introduction to Internet of Things
IERG 4330	Programming Big Data Systems
CSCI 3320	Fundamental of Machine Learning
CSCI 4180	Introduction to Cloud Computing and Storage
CSCI 4190	Introduction to Social Networks
ELEG 5491	Introduction to Deep Learning

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.
- It
  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.

IERG4330 Programming Big Data Systems

- 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.

IERG4220 Secure Software Engineering

- 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-Screem, Accelerometers, Sensor Web**
  - **Machine-to-machine Communications: WPAN, Bluetooth/BLE, ZigBee, WiFi, 6LoWPAN, RPL, CoAP, MQTT, LWM2M, IPSO, etc.**
  - **Software and Networking: Cloud Computing, Fog Computing, Software Defined Networking, Network Function Virtualization**
  - **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

Q & A

Have a Happy Summer Vacation!!