3E, E3 — COMPUTER SCIENCE AND ELECTRICAL ENGINEERING

Offered by the Department of Computer Science and Electrical Engineering. For contact details consult the Faculty of Engineering, Physical Sciences and Architecture entry in the Faculties, Schools and Departments chapter.

3E

3E201 Fundamentals of Electrical Engineering I
#12 (3L2T1P) 1st
Pre: 9E103 or PH145 or [3E100 + (PH106 or 107)] Inc: 3E200 or E3201 or 202 or 203 or 204 or 281 or 282
Coordinator: Dr Saha.
Assessment: Final examination, tutorials, class exam.
Systems approach to analyse & design solutions to electrical engineering problems. Theoretical investigations, reinforced with substantial case studies & laboratory experiments. Topics: issues in linking electrical & electronics systems, DC & AC circuit techniques, basics of electromagnetics & electromechanics.

3E202 Fundamentals of Electrical Engineering II
#12 (3L2T1P) 2nd
Pre: 9E103 or PH145 Inc: 3E200 or E3201 or 202 or 203 or 204 or 281 or 282 P: 3E201
Coordinator: Mr Walker.
Assessment: Final examination, tutorials, class exam, prac reports.
Systems approach to analyse & design solutions to electrical engineering problems. Theoretical investigations, reinforced with substantial case studies & laboratory experiments. Topics: amplifiers, power supplies, semiconductor circuit elements.

3E211 Fundamentals of Computer Engineering
#12 (3L1T1P) 1st
Pre: 9E103 or (CS107 or 181) + (MT108 or 161) Inc: 3E210 or E3206 or 210 or 277 or 281 or 282 Coordinator: Dr Parameswaran.
Assessment: Final examination, six assignments.
Basic issues in design of digital systems. Fundamentals, levels of abstraction that allow designers to cope with complex systems & connections to practical hardware implementation problems. Microcontroller, including programming & interfacing.

3E223 Electronics & Microprocessors
#12 (3L1T1P) 2nd
Pre: 9E103 + CS181 Inc: 3E202 or 222 or E3272 Coordinator: Dr Skattebol.
Assessment: Examination, assignment, laboratory work.

3E281 Robotics
#12 (2L1T2P) 2nd
Pre: 9E103 + CS181 Inc: E3466 P: 9E101 Coordinator: Dr Wyeth.
Assessment: Examinations, assignment, project.

**3E291 Team Project I**
#12 (1L<1C) 2nd
Pre: 3E100 or 9E103 Inc: 3E220 or E3209 P: 3E211
Coordinator: Mr Walker.
Assessment: Mentor assessment of team members, oral presentations, written reports, oral examination of team & product.
Team project comprising: Technical — small electronic (or software) product designed, tested, documented & presented for potential client. Organisational — project team must follow standard project procedures: milestones, reporting, project meetings, interacting with client, etc.

**3E301 Fundamentals of Electromagnetic Fields & Waves**
#12 (3L2T1P) 1st
Pre: (3E200 or 202) + (ME210 or MT250) Inc: E3202 or 312
Coordinator: Dr Bialkowski.
Assessment: Laboratory & tutorial work, mid-semester examination, final examination.
Fundamentals of electromagnetics including transmission lines, magnetostatics & electrostatics, time varying fields, plane waves, radiation. Applications in area of satellite communications & radar sensors.

**3E302 Principles of Semiconductor Devices**
#12 (4L1T1P) 1st
Pre: (3E200 or 202) + [(ME210 + 211 + 212) or (MT250 + 255)] Comp: 3E331 Inc: E3203 or 305 C: PH 323
Coordinator: Dr Yeow.
Properties of semiconductor materials, physics of p-n junctions & insulator-semiconductor interfaces, d.c. & a.c. characteristics of diodes, bipolar junction transistors, field-effect transistors & power devices, semiconductor device characterisation methods.

**3E312 Introduction to Instrumentation & Control Engineering**
#12 (3L1T2P) 2nd
Pre: (3E200 or 202) + [(ME210 + 212) or (MT250 + 255)] Inc: E1325 or E3310 or 320 or E4469 P: ME211
Coordinator: Dr Wyeth.
Assessment: Practical examination reports, problem assignments, final examination.

**3E313 Signal & Image Processing I**
#12 (3L1T1P) 2nd
Pre: (3E201 or 202) + [(ME210 + 212) or MT250] Inc: E3314
Coordinator: Dr Lovell.
Assessment: Practical work, programming/problem assignments, final examination.
3E321 Introduction to Communications
#12 (4L1T) 2nd
Pre: 3E201 Inc: 3E315 P: 3E301
Coordinator: Dr Cherniakov.

3E331 Electronic Circuits
#12 (3L2T1P) 1st
Pre: (3E200 or 202) + (ME212 or MT255) Inc: E3301 or 302 or 317 C: 3E313
Coordinator: Dr Majewski.
Assessment: Practical reports, mid-semester examination, final examination.
Detailed examination of electrical & electronic circuit analysis & synthesis tools & techniques such as the Laplace transform, nodal analysis & two port network theory. Examples of use in analysis & design of amplifiers, filters, oscillators & other circuits.

3E332 Electrical Energy Conversion & Utilisation
#12 (3L<2T1P) 1st
Pre: 3E200 or 201 Inc: 3E311 or E3454
Coordinator: Dr Saha.
Assessment: Examinations, laboratory & tutorial work.

3E341 Digital System Design I
#12 (2L2T2P) 1st
Pre: 9E103 or 3E100 Inc: E3206 or 390 P: 3E210 or 211
Coordinator: Dr Schulz.
Assessment: Design assignments, final examination.

3E342 Computer Architecture I
#12 (3L2T1P) 2nd
Pre: 3E211 or CS206 Inc: E3420
Coordinator: Dr Schulz.
Assessment: Examinations, tutorial assignments.
Performance measures for computers, instruction set design, computer arithmetic, datapath design, controller design, memory hierarchy, cache, virtual memory, interfacing processors & peripherals, parallel processors.

3E381 Neural Computing
#12 (3L<2T1P) 2nd
Pre: CS181 + [(ME210 + 211) or MT250] Inc: E3449 or 755 or 855
Coordinator: Mr Gallagher.
Assessment: Examination, laboratory & tutorial assignments.
Learning capacities of linear systems: threshold logic, linear separability, associative memory.

**3E391 Team Project II**

#12 (1L<1C) 2nd
Pre: 3E220 or 291 Inc: E3393 or 394 or 395 P: 3E200 or 202 or 210 or 211
Coordinator: Dr Wyeth.
Assessment: Mentor assessment of team members, oral presentations, written reports, oral examination of team & product.
Small teams of students undertake design, implementation, testing, evaluation & presentation of specific project of substantial size & complexity. Written & oral presentations are assessed.

**3E402 Advanced VLSI Device Physics & Technology**

#12 (3L<2T1P) 2nd [offered in even years only]
Pre: 3E302 Inc: E3413
Coordinator: Dr Yeow.
Assessment: Examination, class tests, projects.
Physics of sub-micron MOSFETs & modern bipolar junction transistors & numerical simulations of devices. Modern semiconductor fabrication processes, MOS & BJT technologies. Semiconductor measurement techniques.

**3E403 Photonic Devices & Applications**

#12 (3L<2T1P) 2nd [offered in odd years only]
Pre: 3E302 or 331 Inc: E3422
Coordinator: Dr Majewski.
Assessment: Mid-semester & final examination, laboratory & tutorial projects.

**3E404 Passive & Active Microwave Subsystems**

#12 (3L<2T1P) 2nd
Pre: 3E201 + [ME210 or MT250] Inc: E3443 P: 3E302 or M E211
Coordinator: Dr Biakowski.
Assessment: Mid-semester & final examination, laboratory & tutorial assignments.

**3E412 Advanced Control**

#12 (2L<2T<2P) 1st
Pre: 3E312 Inc: E3444 or 465
Assessment: Examinations, project & project report.
Modern control techniques for use in practical control applications. Coverage of latest control methodologies. Practical design using modern industrial control equipment & systems.

**3E413 Signal & Image Processing II**

#12 (3L1T1P) 1st
Pre: 3E313 + (ME308 or MS262) Inc: E3462
Coordinator: Dr Lovell.
Assessment: Examination, research & tutorial assignments.
Advanced digital filtering: polyphase, multirate, all-pass, & IIR filters. Signal conditioning, analog filter types, sigma delta converters. Fast algorithms; Cooley-Tukey FFT, mixed radix formulations, Good-Thomas algorithm. Computer vision, morphological techniques, watershed transform, skeletonisation, image segmentation, active contours.

3E414 Medical Imaging
#12 (<3L<3C) 1st
Pre: 3E313 Inc: 9E300
Coordinator: Dr Crozier.
Assessment: Examination, assignments.
Modern medical imaging technology. Techniques & hardware for non-ionising methods (ultrasound, magnetic resonance imaging (MRI) & biomagnetics) & ionising radiation methods (X-rays, CT scans, Single Photon Emission Tomography (SPECT), Positron Emission Tomography (PET).

3E415 Magnetic Resonance Technology
#12 (<3L<3C) 1st
Pre: 3E313
Coordinator: Dr Crozier.
Assessment: Examination, assignment.
Engineering of magnetic resonance instruments: clinical & non-clinical applications. Design concepts for superconducting NMR/ MRI magnets. RF resonator design & advanced gradient coil design methods. Spectrometer architectures. Fast imaging requirements, sequences & technology implications. MRI processing applications & methods.

3E421 Advanced Digital Communications
#12 (3L1T1P) 1st
Pre: 3E321 + MS262 Inc: E3470 C: 3E313
Coordinator: Dr Cherniakov.
Assessment: Examination, tutorial work.

3E423 Wireless Communication Systems
#12 (3L1T1P) 1st [offered in odd years only]
Pre: 3E321 Inc: E3477 P: 3E301 C: 3E401 + 421
Coordinator: Dr Cherniakov.
Assessment: Mid-semester & final examination, tutorial assignments.

3E424 Optical Communication Systems
#12 (3L<2T1P) 1st [offered in even years only]
Pre: 3E321 Inc: E3316 or 422  
Coordinator: Dr Majewski.  
Assessment: Mid-semester & final examination, laboratory & tutorial reports.  

**3E431 Advanced Electronic & Power Electronics Design**  
#12 (3L1T<2P) 2nd  
Pre: 3E331 Inc: E3317 or 403 or 461  
Coordinator: Mr Walker.  
Assessment: Examination, assignments.  
Power electronic semiconductors, switch mode power converters, motor drives & their control. Digital signal interfacing, including optoelectronic & transceivers. Precision analog signal conditioning. High speed & low power techniques. Practical circuit construction & testing techniques.

**3E432 Power Systems & Reliability**  
#12 (3L<2T1P) 2nd [offered in even years only]  
Pre: 3E202 Inc: E3438 P: 3E332  
Coordinator: Dr Saha.  
Assessment: Examination, class test, laboratory experiments, tutorial assignments.  
Overview of power system modelling, load flow analysis, symmetrical & unsymmetrical fault calculation, economic operation, power system stability, basic methods of power system reliability. Loss of load & energy indices.

**3E433 Power Quality & Equipment Protection**  
#12 (3L<2T1P) 2nd [offered in odd years only]  
Pre: 3E202 Inc: E3417 P: 3E332  
Coordinator: Dr Saha.  
Assessment: Examination, class test, laboratory experiments, tutorial assignments.  
Power quality problems, sources & characteristics, transient overvoltages, voltage sag & long duration variations, harmonics, laboratory simulation, protective devices, over-voltage protection. Protection of electronic, communication & computer equipment, wiring & grounding.

**3E434 Biomedical Instrumentation**  
#12 (2L1T1P1F) 2nd  
Pre: 3E311 or 332 P: BL115  
Coordinator: Dr Crozier.  
Assessment: Examination, assignment, practical report.  
Measurement of biological signals from transducers, signal conditioning, display & analysis. Practical work based on design, construction & validation of simple clinical measurement devices. Field trips to clinical measurement laboratories.

**3E441 Digital System Design II**  
#12 (2L<2T<2P) 2nd  
Pre: 3E341 Inc: E3421 or 752 or 852  
Coordinator: Dr Postula.  
Assessment: Examination, design assignments.

3E442 Computer Architecture II
#12 (3L<2T1P) 1st
Pre: 3E342 or CS206
Assessment: Examination, laboratory & tutorial assignments.
High speed computer arithmetic, pipelining, multiprocessors, elements of supercomputers, storage systems, memory hierarchy, interfacing processors & peripherals, digital signal processors, networked computers.

3E451 Embedded System Design
#12 (1L3P) 2nd
Pre: CS306 or 309 Inc: CS301 or 307 P: 3E341
Coordinator: Dr Schulz.
Assessment: Examination, project report & demonstration.
Design & interaction between hardware & software elements of an embedded computer system: business issues, microprocessor selection, watchdogs, design for debugging & test, memory management. Substantial design project.

3E491 Thesis Project
#24 Year [Commences 1st]
Pre: 3E391 Inc: 3E400 or 401 or 492 or E3412 or 415 or 430 or 474 or 475
Coordinator: Mr Walker.
Thesis on subject selected or approved by Head of Department. Detailed statements on requirements supplied. Commences semester 1 only. Students commencing thesis in semester 2 enrol in 3E492.

3E492 Thesis Project
#24 Year [Commences 2nd]
Pre: 3E391 Inc: 3E400 or 401 or 491 or E3412 or 415 or 430 or 474 or 475
Coordinator: Mr Walker.
Thesis on subject selected or approved by Head of Department. Detailed statements on requirements supplied. Commences semester 2 only. Students commencing thesis in semester 1 enrol in 3E491.

3E493 Project Management
#12 (2L1T<3P) 2nd
Pre: 3E391 Inc: E3401 or 471 or 472
Assessment: Assignment, major project.
Project management in high-tech electrical & information technology engineering laboratories, where dealing with risk & fast changing technologies are special factors. Good working knowledge of project management for the early career engineer. Development of interpersonal skills for team management.

3E494 Digital System Design Projects
#12 (2P) 1st
Pre: 3E341 Inc: E3425 P: 3E351 or CS229
Coordinator: Dr Schulz.
Assessment: Design projects.
Hardware & software design of interfaces for special-purpose application such as graphics, speech & optical devices, measurement & control devices.

E3

E3429 Computer Networking¹
#8 (2L 2P) 1st
Pre: 3E211 or CS206 or E3315 Inc: CS332
Coordinator: Dr Parameswaran.

Endnote