Biomedical and Electrical Engineering

Calendar Changes Effective 2009/10

Department of Systems and Computer Engineering
Carleton University

Purpose

- Remind students in the program of calendar changes
- Review reasons for changes and benefits to students
- Prepare students for selection of 4th year electives
- Obtain feedback from students on proposed changes
- Answer any questions or concerns raised by students

Important Notes

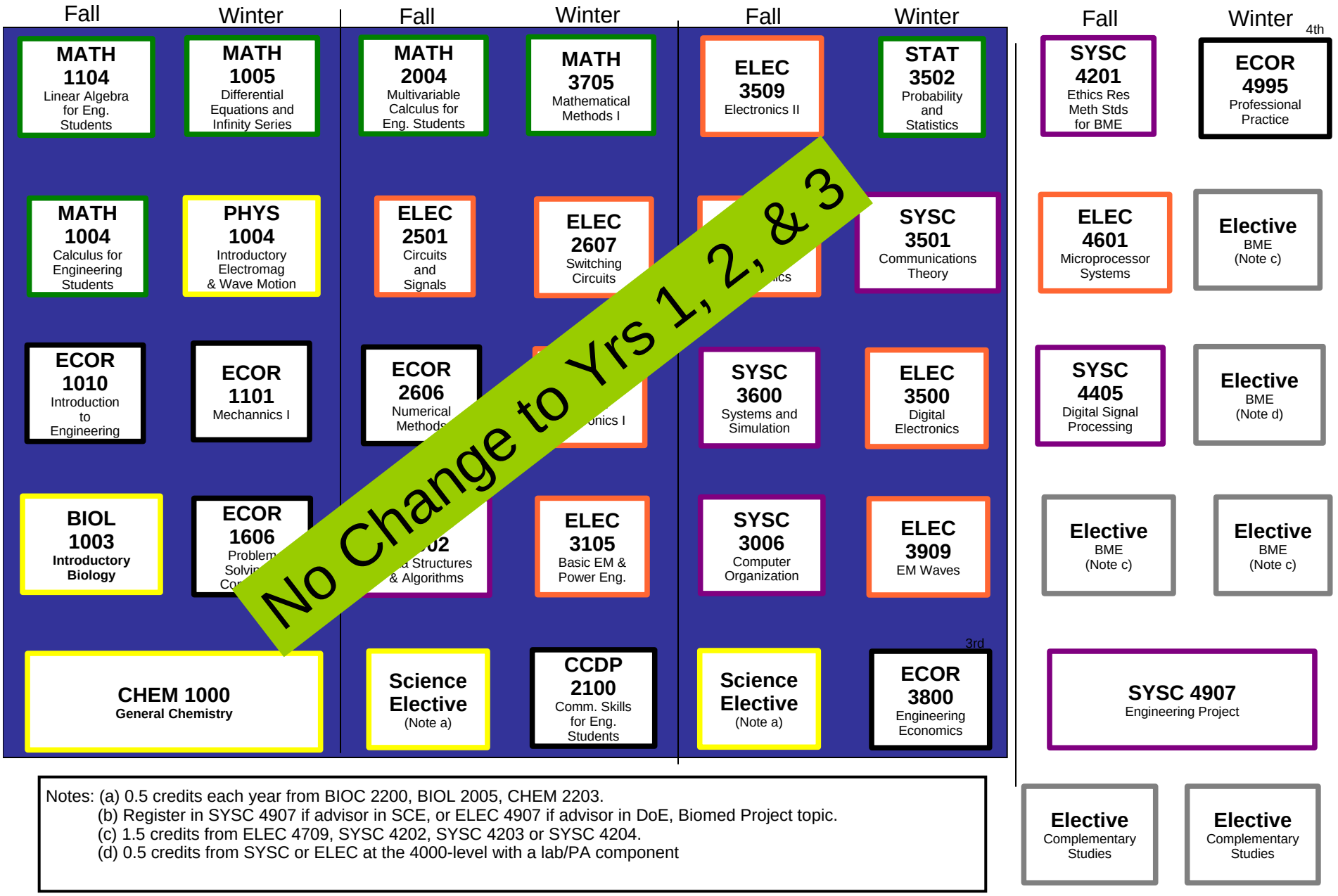
- These changes have been fully approved and will apply to all students currently in the program
- Changes only apply to the 4th year of the program; years 1, 2, and 3 remain unchanged
- First cohort of 4th year students in Fall 2009

Biomedical and Electrical Engineering (Old Program)

Fall	Winter	Fall	Winter	Fall	Winter	Fall	Winter 4th
MATH 1104 Linear Algebra for Eng. Students	**MATH 1005** Differential Equations and Infinity Series	**MATH 2004** Multivariable Calculus for Eng. Students	**MATH 3705** Mathematical Methods I	**ELEC 3509** Electronics II	**STAT 3502** Probability and Statistics	**SYSC 4201** Ethics Res Meth Stds for BME	**ECOR 4995** Professional Practice
MATH 1004 Calculus for Engineering Students	**PHYS 1004** Introductory Electromag & Wave Motion	**ELEC 2501** Circuits and Signals	**ELEC 2607** Switching Circuits	**ELEC 3908** Physical Electronics	**SYSC 3501** Communications Theory	**ELEC 4601** Microprocessor Systems	**Elective** BME (Note c)
ECOR 1010 Introduction to Engineering	**ECOR 1101** Mechannics I	**ECOR 2606** Numerical Methods	**ELEC 2507** Electronics I	**SYSC 3600** Systems and Simulation	**ELEC 3500** Digital Electronics	**SYSC 4405** Digital Signal Processing	**Elective** BME (Note d)
BIOL 1003 **Introductory Biology**	**ECOR 1606** Problem Solving & Computers	**SYSC 2002** Data Structures & Algorithms	**ELEC 3105** Basic EM & Power Eng.	**SYSC 3006** Computer Organization	**ELEC 3909** EM Waves	**Elective** BME (Note c)	**Elective** BME (Note c)
CHEM 1000 **General Chemistry**		**Science Elective** (Note a)	**CCDP 2100** Comm. Skills for Eng. Students	**Science Elective** (Note a)	**ECOR 3800** Engineering Economics 3rd	**SYSC 4907** Engineering Project	
						Elective Complementary Studies	**Elective** Complementary Studies

Notes: (a) 0.5 credits each year from BIOC 2200, BIOL 2005, CHEM 2203.
(b) Register in SYSC 4907 if advisor in SCE, or ELEC 4907 if advisor in DoE, Biomed Project topic.
(c) 1.5 credits from ELEC 4709, SYSC 4202, SYSC 4203 or SYSC 4204.
(d) 0.5 credits from SYSC or ELEC at the 4000-level with a lab/PA component

Biomedical and Electrical Engineering (Old Program)



Notes: (a) 0.5 credits each year from BIOC 2200, BIOL 2005, CHEM 2203.
(b) Register in SYSC 4907 if advisor in SCE, or ELEC 4907 if advisor in DoE, Biomed Project topic.
(c) 1.5 credits from ELEC 4709, SYSC 4202, SYSC 4203 or SYSC 4204.
(d) 0.5 credits from SYSC or ELEC at the 4000-level with a lab/PA component

Biomedical and Electrical Engineering

Old 4th year of Program

Fourth year

6. 2.0 credits in SYSC 4201, ECOR 4995, ELEC 4601, SYSC 4405;

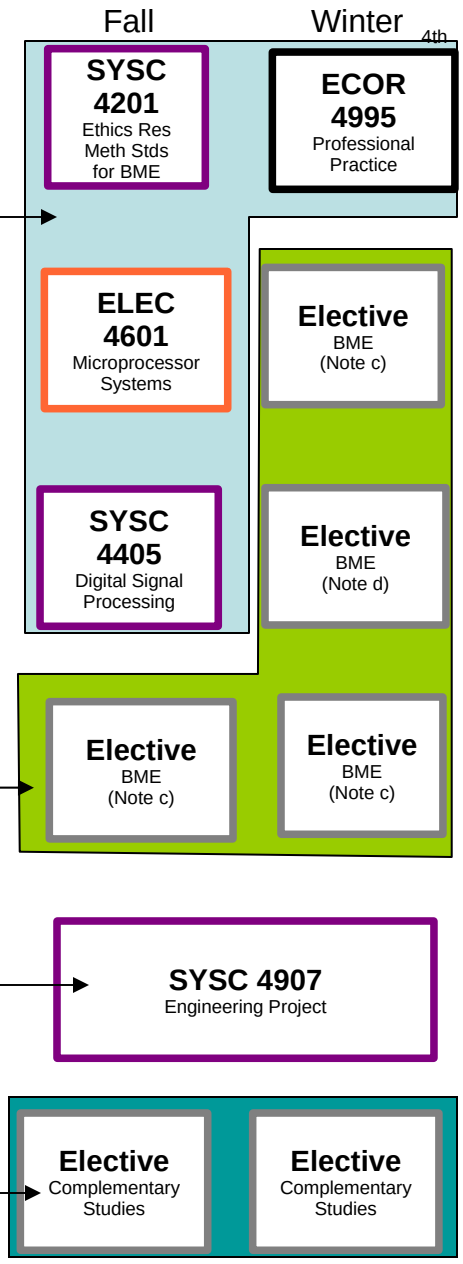
7. 1.0 credit from SYSC 4907 [1.0] or ELEC 4907 [1.0];

8. 1.5 credits from ELEC 4709, SYSC 4202, SYSC 4203, and SYSC 4204;

9. 0.5 credit from SYSC or ELEC at the 4000-level with a laboratory/problem analysis component;

10. 1.0 credit in Complementary Studies Electives.

Note:
For Item 7 above, students should register in ELEC 4907 if their supervisor is in Electronics and in SYSC 4907 if their supervisor is in Systems and Computer Engineering. The project must deal with a biomedical engineering application.



Changes to SYSC 4203 and SYSC 4204

Old Versions:

SYSC 4203 [0.5 credit]

Biomedical Instrumentation

Principles of physiological measurements and related instrumentation with particular applications to cardiology, lung function, cerebral and muscle signals, surgery and anaesthesiology, ultrasound measurements, and critical care for infants.
Prerequisite: fourth-year status in Engineering.
Lectures three hours a week, laboratory/problem analysis three hours alternate weeks.

SYSC 4204 [0.5 credit]

Biological Signal Acquisition and Modeling

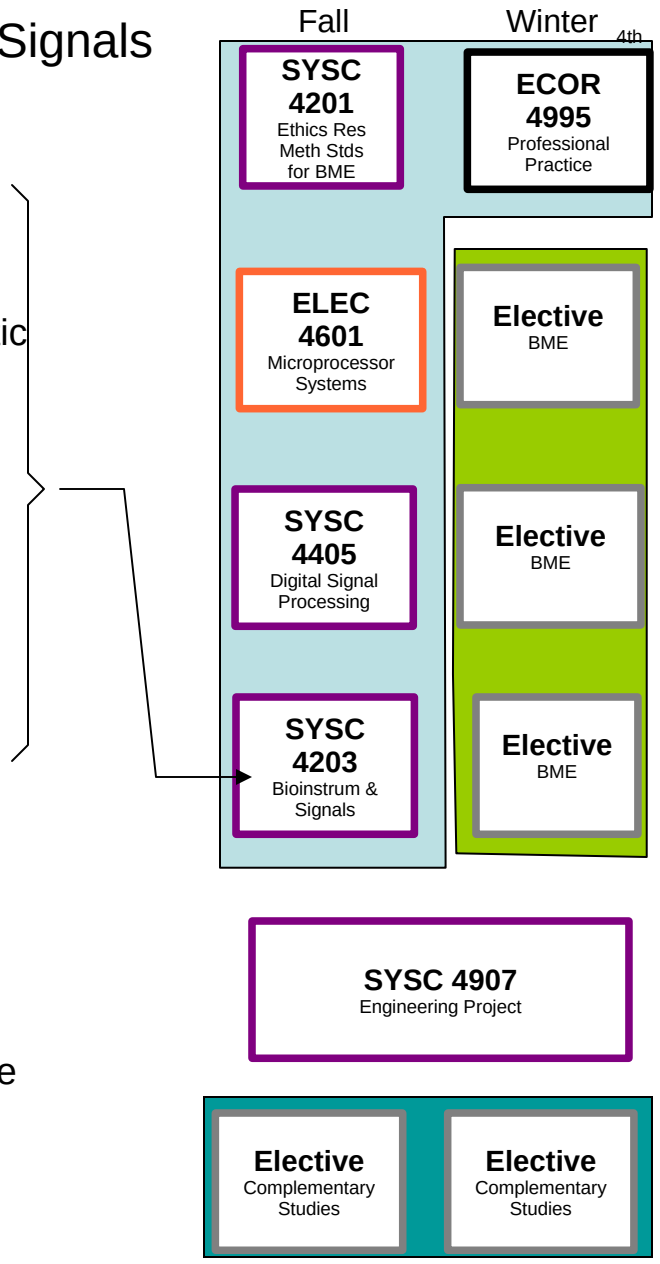
Modeling of neuromuscular biological signals, including transmembrane cell potential, single fibre action potentials, motor unit action potentials, and myoelectric signals. Measurement of biological signals, effects of electrode size and configuration. Time domain, frequency domain, and adaptive filtering techniques for noise reduction.
Prerequisite: SYSC 3600 and ELEC 3509.
Lectures three hours a week, laboratory/problem analysis three hours alternate weeks.

Approved Changes:

- Merge two courses into one course,
- new course called SYSC 4203, Bioinstrumentation and Signals,
- SYSC 4204 no longer exists,
- New SYSC 4203 becomes **Program Compulsory**.

New SYSC 4203, Bioinstrumentation and Signals

New Version:
SYSC 4203 [0.5 credit]
Bioinstrumentation and Signals
Bioinstrumentation and biological signals; instrumentation systems, noise, and electrical safety; bioelectric signals; biomagnetic signals; measurement of flow and pressure; data acquisition; signal processing; biomedical imaging technologies; amplifier design for biosensors; major physiological systems and associated measurements.
Prerequisites: (SYSC 3600 or SYSC 3500) and (ELEC 2507 or ELEC 3605) and (fourth-year status in Biomedical and Electrical Engineering or fourth-year status in Biomedical and Mechanical Engineering).
Lectures three hours a week, laboratory/problem analysis three hours alternate weeks.



Notes:
- SYSC 4203 **must be completed** by all students in program
- SYSC 4203 will be offered **ONLY** in the Fall term
- All students graduating from the program will have exposure to design of Biomedical instrumentation and knowledge of the nature of signals measured.

New Course: SYSC 4205, Image Processing for Medical Applications

SYSC 4205 [0.5 credit]
Image Processing for Medical Applications
Two-dimensional signals, filters, and Fourier transforms. Image acquisition, sampling, quantization and representation. Image perception. Digital and film cameras. Medical imaging technologies. Image processing operations: histogram, convolution, morphological, segmentation, registration. Image compression and formats.
Prerequisites: MATH 3705 and fourth-year status in Engineering.
Lectures three hours a week, laboratory/problem analysis three hours alternate weeks

Notes:
- Becomes a new elective course available to Biomed/EE students
- Will give students instruction in an area that is of great importance to medical diagnosis systems.
- Will ONLY be offered in the winter term

Changes to SYSC 4202

Old Version:

SYSC 4202 [0.5 credit]

Health Care Engineering

The Canadian health care system and its main participants. Biophysical measurements for diagnosis and monitoring; biomedical sensors and technology; telemedicine and its applications; management of medical technologies; development and funding models for clinical engineering departments; considerations for developing countries; reliability and safety of medical devices.
Prerequisite: fourth-year status in Biomedical and Electrical or Biomedical and Mechanical Engineering.
Lectures three hours a week, problem analysis three hours alternate weeks.

New Version:

SYSC 4202 [0.5 credit]

Clinical Engineering

Overview of the Canadian health care system; brief examples of other countries; clinical engineering and the management of technologies in industrialized and in developing countries; safety, reliability, quality assurance; introduction to biomedical sensor technologies; applications of telemedicine; impact of technology on health care.
Prerequisites: (Fourth-year status in Biomedical and Electrical or Biomedical and Mechanical Engineering) or (fourth-year status in Engineering and permission of the Department).
Lectures three hours a week, problem analysis three hours alternate weeks.

Notes:

- Major change is in title, small changes to content
- Now significantly different from Grad course SYSC 5300 and BIOM 5401
- This course available as an elective to Biomed/EE students, Winter Term ONLY

Changes to Technical Electives in Program

Old Version:

8. 1.5 credits from ELEC 4709, SYSC 4202, SYSC 4203, and SYSC 4204;

9. 0.5 credit from SYSC or ELEC at the 4000-level with a laboratory/problem analysis component;

New Version:

8. 1.0 credits from ELEC 4709, SYSC 4202, SYSC 4205;
9. 0.5 credit from SYSC or ELEC at the 3000-level or above with a laboratory/problem analysis component;

Notes:

- Students in Biomed/EE will have three 0.5-credit technical electives slots in their programs
    - **Two** 0.5-credit electives selected from
        - ELEC 4709, Integrated Sensors (Offered in Fall term only)
        - SYSC 4202, Clinical Engineering (Offered in Winter term only)
        - SYSC 4205, Image Processing for Medical Applications (Offered in Winter term only)
    - **One** 0.5-credit elective from SYSC or ELEC at 3000-level or above
        - Must have laboratory or problem analysis component (for Accreditation)
        - May be taken in either fall or winter terms depending on schedule
        - Must satisfy prerequisites

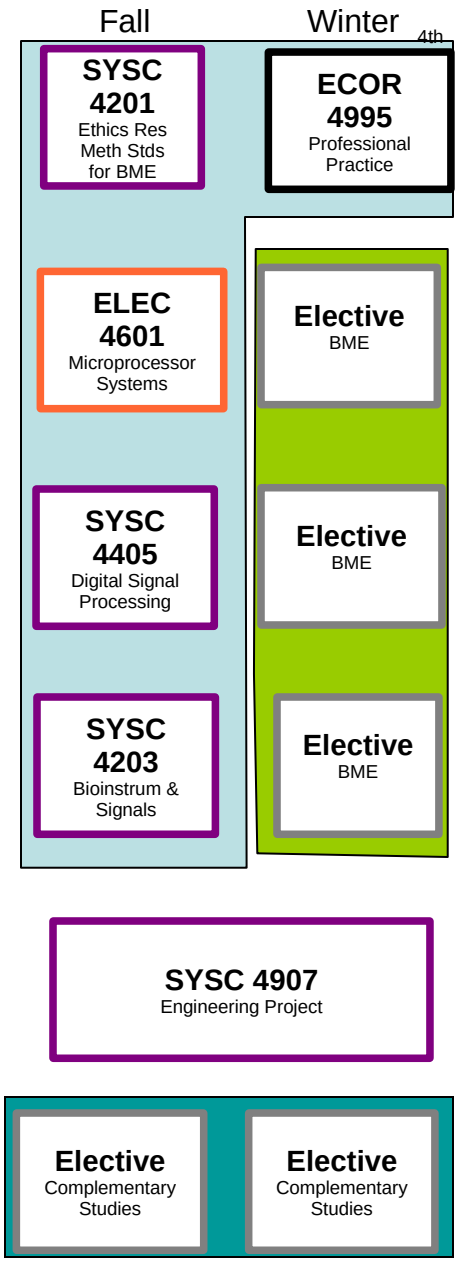
Notes on Fall vs Winter Term Electives

Problems:

- All elective slots in prerequisite tree appear in Winter term only
- ELEC 4709, Integrated Sensors, is offered in fall term only
- What if I want a 3000 or above SYSC or ELEC that is only offered in the fall term?

Solutions:

- SYSC 4405, Digital Signal processing is offered in BOTH Fall and Winter terms – students may decide on which term to complete this course in order to schedule electives
- Students may request permission from the Department of Systems and Computer Engineering to replace ELEC 4601, Microprocessor Systems (only offered in Fall) with SYSC 3601, Microprocessor Systems (offered in both Winter and Summer terms). Such requests **MUST** be made **PRIOR** to the Fall term of 4th year. Such permission **WILL NOT** be automatic, but will be decided on a case-by-case basis and will depend on future evolution of these two courses.



Changes to 4th-Year Project

Old Version:

7. 1.0 credit from SYSC 4907 [1.0] or ELEC 4907 [1.0];

Note:
For Item 7 above, students should register in ELEC 4907 if their supervisor is in Electronics and in SYSC 4907 if their supervisor is in Systems and Computer Engineering. The project must deal with a biomedical engineering application.

New Version:

7. 1.0 credit in SYSC 4917 [1.0];

Note – The old note is now deleted.

New Version:

SYSC 4917 [1.0 credit]

Biomedical Engineering Project

Student teams develop professional-level experience by applying, honing, integrating and extending previously acquired knowledge in a major design project within the field of biomedical engineering. Lectures are devoted to discussing project-related issues and student presentations. A project proposal, interim report, oral presentations, and a comprehensive final report are required.

Prerequisites: fourth-year status in Biomedical and Electrical Engineering and ECOR 4995 (may be taken concurrently). Certain projects may have additional prerequisites or corequisites.

Lecture one hour a week, laboratory seven hours a week

More…

Notes on 4th-Year Project SYSC 4917

- All Biomed/EE students will register in SYSC 4917 for their project
- Requirements for SYSC 4917 are same as those for SYSC 4907 or ELEC 4907
- Students may select a project/supervisor from either Systems or Electronics
- Project MUST have biomedical focus
- Other members of project team may be from any Engineering Program and may be registered in another project course number
- Selection of a project in Systems will be via the 4th-Year Project Website just as for other students

New 4th Year of Program

Fourth year

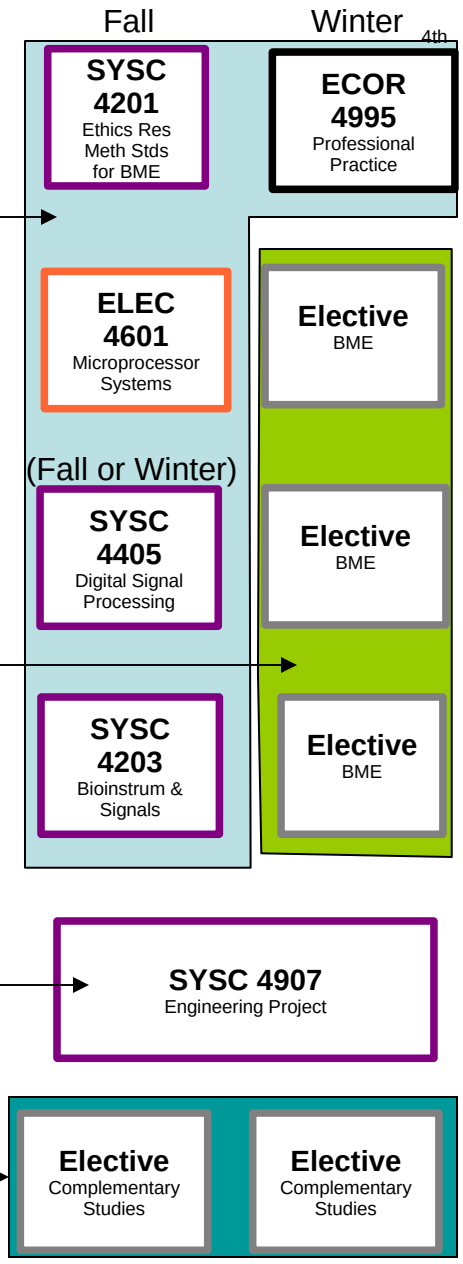
6. 2.5 credits in SYSC 4201, ECOR 4995, ELEC 4601, SYSC 4405, SYSC 4203;

7. 1.0 credit in SYSC 4917 [1.0];

8. 1.0 credits from ELEC 4709, SYSC 4202, SYSC 4205;

9. 0.5 credit from SYSC or ELEC at the 3000-level or above with a laboratory/problem analysis component;

10. 1.0 credit in Complementary Studies Electives.



Biomedical and Electrical Engineering (New Program)

Fall	Winter	Fall	Winter	Fall	Winter	Fall	Winter
MATH 1104 Linear Algebra for Eng. Students	**MATH 1005** Differential Equations and Infinity Series	**MATH 2004** Multivariable Calculus for Eng. Students	**MATH 3705** Mathematical Methods I	**ELEC 3509** Electronics II	**STAT 3502** Probability and Statistics	**SYSC 4201** Ethics Res Meth Stds for BME	**ECOR 4995** Professional Practice
MATH 1004 Calculus for Engineering Students	**PHYS 1004** Introductory Electromag & Wave Motion	**ELEC 2501** Circuits and Signals	**ELEC 2607** Switching Circuits	**ELEC 3908** Physical Electronics	**SYSC 3501** Communications Theory	**ELEC 4601** Microprocessor Systems	**Elective** BME (Note b)
ECOR 1010 Introduction to Engineering	**ECOR 1101** Mechannics I	**ECOR 2606** Numerical Methods	**ELEC 2507** Electronics I	**SYSC 3600** Systems and Simulation	**ELEC 3500** Digital Electronics	(Fall or Winter) **SYSC 4405** Digital Signal Processing	**Elective** BME (Note b)
BIOL 1003 **Introductory Biology**	**ECOR 1606** Problem Solving & Computers	**SYSC 2002** Data Structures & Algorithms	**ELEC 3105** Basic EM & Power Eng.	**SYSC 3006** Computer Organization	**ELEC 3909** EM Waves	**SYSC 4203** Bioinstrum & Signals	**Elective** BME (Note c)
CHEM 1000 **General Chemistry**		**Science Elective** (Note a)	**CCDP 2100** Comm. Skills for Eng. Students	**Science Elective** (Note a)	3rd **ECOR 3800** Engineering Economics	**SYSC 4917** Biomedical Engineering Project	
						Elective Complementary Studies	**Elective** Complementary Studies

Notes: (a) 0.5 credits each year from BIOC 2200, BIOL 2005, CHEM 2203.
(b) 1.0 credits from ELEC 4709, SYSC 4202, SYSC 4205.
(c) 0.5 credits from SYSC or ELEC at the 3000-level with a lab/PA component