MSc by Coursework (Applied Physics)

Core Courses (12 credits)
SMGS 6111 Measurement Techniques and Instrumentation (3)
SMGS 6112 Computational Techniques (3)
SMGS 6113 Industrial Management (3)
SMGS 6161 Case Study Seminar (3)

Elective Courses (choose 2 modules: 12 credits)

Module Semiconductor Technology
SMGS 6341 Semiconductor Devices (3)
SMGS 6411 Semiconductor Technology (3)

Module Laser and Photonics
SMGS 6412 Photonics Technology (3)
SMGS 6342 Optoelectronics (3)

Module Material Science
SMGS 6343 Materials Science (3)
SMGS 6413 Advanced Materials Science (3)

Module Plasma Technology
SMGS 6344 Plasma Technology (3)
SMGS 6414 Plasma Devices (3)

Module Radiation Technology
SMGS 6345 Radiation Technology (3)
SMGS 6415 Radiation Protection (3)

Practical Courses (12 credits)
SMGS 6191 Research Project (10)
SMGS 6171 Applied Physics Laboratory (2)

Assessment

50% examination + 50% continuous assessment for the following courses:

Measurement Techniques and Instrumentation (3)
Computational Techniques (3)
Semiconductors Devices (3)
Semiconductor Technology (3)
Optoelectronics (3)
Photonics Technology (3)
Materials Science (3)
Advance Materials Science (3)
Plasma Technology (3)

Plasma Devices (3)
Radiation Technology (3)
Radiation Protection (3)

100% continuous assessment for the following courses:

Industrial Management (3)
Case Stidoes Seminar (3)
Applied Physics Laboratory (2)
Project (10)

Synopsis courses:

SMGS6111: Measurement Techniques & Instrumentation
Workbench tecniques (experimental).
Pulse techniques.
High voltage techniques.
Laser techniques.
Vacuum techniques.
Spectroscopic techniques.
X-Ray diffraction techniques.
FTIR, XPS
Radiation measurement techniques.
Computer interface.

SMGS6112: Computational Techniques
Computational architecture. Computation theory.
Operating system, carnel, real-time.
Data structure. Computer language.
Database system. Software engineering.
Artificial Intelligence. Symbolic manipulation.
Computational graphic. Image processing.
Computer-human interface, GUI. Virtual Reality.
Signal processing. Data communication,
Computer networking. Internet. Data security.
Parallel processing.

SMGS6113: Industrial Management
Introduction to production and modern operation management.
Locational of infrastructure. Infrastructural planning.
Process strategy and potential planning.
Schedualling and loading. Supply network planning.
Inventory management. Quality management.
Production management. Environmental management.
Employees' health and safety.
Planning management.

SMGS6161: Case Study Seminar

For this course, the student is required to do the following:

1. Choose a research project title after discussion with his/her proposed supervisor.
2. Give a 45 minutes seminar on a general literature survey on the proposed research topic. This will be a Departmental Seminar to be assessed by a panel of three examiners. (50%)
3. Write a report based on the materials of the seminar given. This will be a survey of the up-to-date research around the world in the area of the proposed project title and the proposal of the student's project. The report will be marked by an examiner other than the project supervisor. (50%)

SMGS6171: Applied Physics Lab

This is part of the research project (SMGS6191) where the student is required to:

1. Learn a technique or the operation of special equipment which is useful for his/her research project as determined by the project supervisor.
2. Write a report (in the format of instruction manual) on the technique or special equipment describing the principle, operational procedures and test results (~30 pages).
3. The report will be marked by an examiner other than the supervisor (50%), while the supervisor gives assessment on the student's attitude and effort in carrying out the exercise (50%).

SMGS6191: Research Project

For this course, the student is required to do the following:

1. Choose a research project title after discussion with his/herproposed supervisor and carry out the project under the supervision of the supervisor.
2. Submit a report on the findings of the project (~90 pages) upon completion of the project.
3. The report will be examined by an examiner other than the supervisor; while the supervisor will be asked to comment on the attitude and effort of the student in carrying out the project.
4. The reports of the examiner and the supervisor will be presented to a panel consisting of the Head of Department, the Program Coordinator, the examiner and the supervisor. The panel will meet to decide on whether the report submitted by the student on the project has reached the standard for partial fulfillment of a Master of Science Degree.

The Semiconductor Technology Module

SMGS6341: Semiconductors Devices (3)

Discussions on Semiconductor: energy-band theory, extrisit semiconductor (n-type and p-type), transportation theory and charge carrier, optical sub-levels, p-n junction. Fundamental Device Structure and Mechanism: Schotty diode, metal/insulator/semiconductor, tunneling diode and other transistors.

Photonic Devices: Photo-diode, LED, laser, solar cell. Microwave devices. Microelectronic technology.

SMGS6411: Semiconductor Technology (3)
Crystal growth and semiconductor epitaxial and oxidation/insulator layering, diffusion doping and ion implantation, metalization, masking and photolithography, wet and dry etching, wire-bonding, packaging and insertion.

The Laser and Photonics Module:

SMGS6342: Optoelectronics (3)
Propagation of light through media. Holography, Doppler interferometry and anemometry. Optoelectronic instruments, detectors and noise. Optical fiber and sensors. Optical communication.

SMGS6412: Photonic Technology (3)
Einstein theory for wave-matter interaction. Laser theory. Gain. Optical resonators. Types of laser. Alpha switches, mode-locking. Laser metrology, material processing, medical application, holography and optical communication.

The Materials Science Module:

SMGS6343: Material Science (3)
Daya ikatan, struktur hablur, tak-hablur dan ketaksempurnaan. Struktur mikro, pemejalan, kinetik dan rajah fasa, pembauran. Logam dan aloi. Seramik dan kekaca. Polimer dan adunan. Gentian dan serabut. Komposit. Sifat-sifat mekanik, terma, elektrik, Magnet dan elektronik. Bahan dalam rekaan, khidmat degradasi sekitaran, pemilihan bahan dan bahan termaju.

SMGS6413: Advanced Material Science (3)
Elektron dan foton dalam pepejal. Pemejalan dan pemprosesan serbuk. Pengekstrakan dan kitaran semula. Bahan suhu tinggi. Seramik elektronik. Biobahan. Filem nipis. Bahan feroelektrik. Bahan polimeran. Kaca dan nanobahan. Bahan ionan. Aspek bahan mikroperanti. Bahan magnet dan superkonduktor. Kakisan dan perlindungan. Pemodelan bahan.

The Plasma Technology Module:

SMGS6344: Plasma Technology (3)
Introduction to basic concepts of plasma, techniques of plasma generation including gaseous discharge (DC, RF, pulsed and microwave), simple plasma theory, radiation emission processes in plasma, plasma diagnostic techniques, survey of plasma applications in industry and plasma fusion.

SMGS6414: Plasma Devices (3)
Physics and technology of plasma devices including electromagnetic shock tube,

Z-pinch, plasma focus, vacuum spark, transient hollow cathode discharges, tokamak, RF inductively coupled and capacitively coupled plasma systems

The Radiation Technology Module:

SMGS6345: Radiation Technology (3)
Dosimetri sinaran. Kegunaan sinaran dalam industri: pengukuraan kadar aliran gas, ujian tanpa musnah; pengukuran kadar aliran gas, ujian tanpa musnah; dalam geologi: tentumur gempabumi dan tanah runtuh; dalam perubatan: bateri nuklear untuk pendenyut jantung, pengukuran unsur toksik dan bahan radioaktif, kaedah pengakifan neutron, radioterapi; dalam arkeologi: penentuan umur artifak, kesan C-14 dan termoluminsens; dalam pertanian; pencermaran alam sekitar, radon.

SMGS6415: Radiation Protection (3)
Basic Concepts: Radioactivity, types of radiation, interaction of radiation with matter.
Sources: Radiation units, dose, dose equivalent.
Biological Effect of Radiation: Somatic and genetic.
Principles of Radiation Protection from External Hazard: time, distance, shielding.
Protection from Internal Hazard: ALI, DAC.
Safety procedures for radiographic works.
The legislative structure, dose limitation and reference level.
Radiation monitoring and equipments, personal dosimetry.
Waste disposal and leak test.
Import, export and transportation of radioactive materials.
Plan and procedures for radiological emergency.