FORTITUDE TO SCALE NEW HEIGHTS

Forward-thinking curriculum

School of Electrical and Electronic Engineering Graduate Programmes

A School of the College of Engineering
Contents

02  Why NTU
03  About School of Electrical and Electronic Engineering (EEE)
04  Research Programme
   - Degree by Research • Doctor of Philosophy and Master of Engineering
12  Coursework Programme
   - Master of Science Programme
   - Joint NTU-TUM Master of Science Programme
At NTU’s School of Electrical and Electronic Engineering (EEE), we believe in turning good students into great thought leaders and change makers of tomorrow. Our intensive, innovative and collaborative approach to research and education is fuelled by a dynamic and international faculty and dedicated support staff. Bolstered by our leadership position amongst the most outstanding Universities in the world, we are confident that together with our partners, faculty, students, and collaborators, we are poised for greater engineering achievements and success.
WHY NTU?

No 1 amongst the world’s best young universities

1st in Asia and 6th worldwide: QS World University Ranking 2017 for the Subject Field of Electrical and Electronic Engineering

Young and research-intensive, Nanyang Technological University (NTU Singapore) is ranked 11th globally
School of Electrical and Electronic Engineering (EEE)

“After working for two years in the industry, I felt a need to constantly upgrade myself with a stronger foundation and update my knowledge with the latest technology developments. Hence, I returned to NTU and took up the M.Sc. degree programme. I never regretted my decision as my newly learnt knowledge reinforced the foundation that NTU helped me to build during my Bachelor’s degree. I was able to apply whatever was learnt in class to my daily work, helping me to perform better at work. The programme also gave me a wider perspective of the whole semiconductor industry. It was a truly enriching learning experience.”

Li Chun Yin -
Senior Standard Cell Library Engineer
Mediatek Singapore Pte Ltd
NTU, EEE, M.Sc.(ET), 2016
School of EEE
SHARPENING INQUISITIVE MINDS

Through our collaborative approach to research, our programmes empower our students with the right connections, exposure and learning opportunities to take their journey in learning and discovery to new heights.

“I joined NTU in August 2013 for pursuing my Ph.D. in Electrical Engineering and it has been an extremely enriching experience for me. NTU not only provides a conducive academic environment for gaining invaluable knowledge in one’s areas of interest, but also offers an ideal platform for active collaboration and exchange of ideas with peers and researchers from universities across the world. I would rate my overall postgraduate experience in NTU at 8/10.”

Arijit Bagchi - NTU, EEE, Ph.D. student
REVEALING NEW KNOWLEDGE FOR REAL-WORLD SOLUTIONS

NTU EEE welcomes admissions to graduate programmes by research on a full or part-time basis. The University awards research scholarships to candidates with outstanding academic records to enable them to pursue a Doctor of Philosophy (Ph.D.) programme on a full-time basis.

The research scholarship award will cover a monthly stipend and the annual research fee. Financial top-ups (for selected schemes only) are also available to outstanding candidates.

“In general, the NTU EEE Ph.D. programme is an extremely research intensive programme. It allows me to do independent but supervised research and has provided numerous opportunities to interact with researchers working in the same area. In addition, I get to work with state-of-art equipment which further enhances my research. The Ph.D. training has equipped me with the necessary skills and knowledge to overcome the challenges in this dynamic world.”

Dr Foo Yi Shyh Eddy - Lecturer
School of Electrical and Electronic Engineering
Nanyang Technological University
NTU, EEE, Ph.D., 2016
Students may pursue their research programme in one of the following areas:

- Clean and Renewable Energy Systems
- Efficient Energy Conversion and Utilisation
- Energy Storage Systems
- Intelligent Energy Distribution
- Power Systems and Power Electronics
- Autonomous Robots and Intelligent Systems
- Biomedical Imaging and Signal Processing
- Control Systems Technologies
- Machine Vision and Computational Intelligence
- Process Instrumentation
- 3D Packaging, System on Package and Printable Electronics
- Bio-inspired Integrated Circuits and Systems
- Energy Harvesting and Green Integrated Circuits and Systems
- High-Speed Signal Integrity
- Electromagnetic Compatibility and Reliability
- Mm-wave and Terahertz CMOS IC
- MEMS, Smart Sensors and Advanced Sensing
- Lightwave Communication and Photonics
- Microwave Circuits, Radar, Antennas and Propagation
- Modulation, Coding and Signal Processing
- Secure Communication and Networks
- Cyber-security
- Wireless Networks, Positioning and RFID
- Space Technology
- Vehicular Communication Networks
- Digital Media Processing and Applications
- Intelligent Computing and Information Security
- Internet of Things
- Pervasive Media and Interface
- Artificial Intelligence and Machine Learning
- Big Data and Video Analytic
- Biomedical Devices
- Biophotonics/Nanophotonics
- Compound Semiconductor/ Opto Electronic Devices
- Display and Solid State Lightings
- Silicon/Carbon/Oxide Nanoelectronics and Nanotechnology
- Integrated Photonics
- Specialty Optical Fibres
- Smart Railway Systems

To support advanced research, the School hosts research centres which are well equipped with sophisticated and state-of-the-art equipment. Please visit the URL below for the list of research centres.

http://www.eee.ntu.edu.sg/Research/Pages/ResearchCentresFacilities.aspx

Applicants may visit the URL below to view the faculty listed under the Research Centres

http://www.eee.ntu.edu.sg/aboutus/FacultyandStaff/Pages/Home.aspx
GATEWAY TO LIMITLESS POSSIBILITIES

PROGRAMME STRUCTURE

All successful candidates are admitted as Research Students with the expectation for candidates to be confirmed as Ph.D. candidates or Master candidates after a confirmation exercise. A candidate with a Bachelor’s degree can be admitted as a Research Student pursuing Ph.D. in the first instance. A candidate admitted as a Research Student pursuing Ph.D. is expected to be confirmed as a Ph.D. candidate just as one admitted as a Research Student pursuing M.Eng. can expect to be confirmed as a M.Eng. candidate.

Under the M.Eng./Ph.D. programmes, candidates pursue an independent but supervised research in an approved field of advanced study based on which a thesis must be submitted. Candidates are also required to attend classes and pass the examinations to meet the coursework requirements (such as the Academic Units [AU] requirement and CGPA requirement). Candidates are required to earn at least 9 AU5s (e.g. three 3 AUs courses) and 18 AUs (e.g. six 3 AUs courses) in M.Eng. and Ph.D. study respectively. Full-time Ph.D. candidates must complete two additional courses, namely (1) Graduate English and (2) University Teaching For Teaching Assistants on top of the 18 AUs course requirements.

All candidates are required to complete all courses and undergo a Qualifying Examination cum Confirmation Exercise (QE) within the period stipulated. Upon completion of the research, the candidate is required to submit a thesis on research for examination. For the degree of Doctor of Philosophy, there is also an oral examination on the subject matter of his/her thesis and other related subjects.

PERIOD OF CANDIDATURE

The minimum and maximum periods of candidature for Ph.D. and M.Eng. candidates are as follows:

<table>
<thead>
<tr>
<th>Programmes</th>
<th>Full-Time</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Minimum</td>
<td>Maximum</td>
<td>Minimum</td>
</tr>
<tr>
<td>Ph.D.</td>
<td>2 years</td>
<td>5 years</td>
<td>3 years</td>
</tr>
<tr>
<td>M.Eng.</td>
<td>1 year</td>
<td>3 years</td>
<td>1 year</td>
</tr>
</tbody>
</table>
ADMISSION REQUIREMENTS

The applicant must have a Bachelor’s degree with minimum Second Class Honours, Upper Division, or its equivalent as well as the ability to pursue research in his/her proposed field of advanced study. A good Graduate Record Examinations (GRE) score is required for international applicants from overseas university. Applicants from India may use the Graduate Aptitude Test in Engineering (GATE) score in place of GRE, with a score of at least 90%. For applicants whose native language is not English, a good Test of English as a Foreign Language (TOEFL) score is required. TOEFL test dates must be within 2 years or less from the date of the application. International English Language Testing System (IELTS) score can also be used in place of TOEFL. Please refer to the following website for details: http://www.eee.ntu.edu.sg/Programmes/ProspectiveStudents/Graduate/MEngPhD/Pages/AdmissionReqt.aspx

ADMISSION INFORMATION

Admission is held in August or January of each year. Applicants applying for NTU research scholarships are encouraged to apply online by 31 January and 30 June for the August and January intakes respectively.

<table>
<thead>
<tr>
<th>Intake</th>
<th>Opening of Application Portal</th>
<th>Last day for submission of online application with supporting documents</th>
</tr>
</thead>
<tbody>
<tr>
<td>August Semester</td>
<td>1 October</td>
<td>31 January</td>
</tr>
<tr>
<td>January Semester</td>
<td>1 June</td>
<td>31 July</td>
</tr>
</tbody>
</table>

Please refer to the following websites for details:

(a) Administrative and application procedures for admission to the research programmes
   http://admissions.ntu.edu.sg
   http://www.eee.ntu.edu.sg/Programmes/ProspectiveStudents/Graduate/MEngPhD/Pages/AdmissionReqt.aspx

(b) School of Electrical & Electronic Engineering’s website for details on academic staff and their research areas
   http://www.eee.ntu.edu.sg/aboutus/FacultyandStaff/Pages/Home.aspx

(c) Programme Fees
   http://admissions.ntu.edu.sg/graduate/R-Programs/BeforeApplying-Research/Pages/Fees.aspx
SCHOLARSHIPS

There are various scholarship schemes available to candidates with outstanding academic records. These schemes enable them to pursue a Ph.D. programme on a full-time basis. Selective scholarship schemes are provided below:

Detailed information on scholarships is available at http://admissions.ntu.edu.sg/graduate/scholarships/Pages/default.aspx

1. **Nanyang President’s Graduate Scholarship (NPGS)**
   The NPGS is a prestigious scholarship scheme designed to help outstanding graduates or final year students embark on a leading research career. Ideal candidates should have a First Class Honours degree or equivalent at Bachelor’s level.

   The scholarship covers the full tuition fees with a monthly stipend ranging from S$3,000 to S$3,500.

2. **NTU Research Scholarship**
   A 4-year Ph.D. scholarship worth up to S$200,000, inclusive of tuition fees and monthly stipends ranging from S$2,000 to S$2,700 before Qualifying Examination and S$2,500 to S$3,200 after passing Qualifying Examination.

3. **Singapore International Graduate Award (SINGA)**

4. **A*STAR Graduate Scholarship**

For administrative enquiries on M.Eng./Ph.D. Programmes:

Email: GRAS_EEE@ntu.edu.sg
Tel: (65) 6790 4236/6513 8263
“It was a unique experience at NTU. It provides all opportunities for you to get equipped, enhanced and maybe even a renascence. You are enriched with lifelong mentorship, friendship, love and memory beginning from here. I had the privilege to grow myself at NTU as well as witness and contribute to the growth of herself - now one of the best universities in the world that we are all proud of.”

Prof Qiang Li -
Professor, Vice Dean,
and Head of Institute of Integrated Circuits and Systems
University of Electronic Science and Technology of China
NTU, EEE, Ph.D. 2011
UNLEASHING DYNAMIC TALENTS

Our rigorous course curriculum offers a distinctive and robust education that results in graduates who are thoroughly informed and fired with enthusiasm to apply their learnings to solve real-world problems.

“To juggle between my full-time job and part-time studies is not easy. However, I am very glad that I choose to take up the EEE M.Sc. Programme in NTU. Its evening class taught by leading professors make it possible. The M.Sc. Programme provides a good coverage of various important topics, thus giving me the relevant knowledge and skills in pursuing my engineering career. Thank you NTU!”

Pu Linfeng - NTU, EEE, M.Sc.(ET) student
EMPOWERING LEARNING
AND INNOVATION

NTU EEE offers graduate programmes by coursework on a full-time or part-time basis. Of the seven Master of Science (M.Sc.) programmes offered, two are joint M.Sc. programmes by NTU and Technische Universität München (TUM).

Master of Science (M.Sc.) Programmes

PROGRAMME OVERVIEW

**M.Sc.(Communications Engineering) programme:**
An in-depth study into the broad area of communications engineering, this curriculum is a springboard for aspiring engineers to improve their knowledge and skills in the ever-evolving telecommunications and information industries. Buoyed by our teaching staff’s valuable research experience, this programme promotes and develops career advancements for practising engineers to become talented design engineers, readying them for high calibre R&D and arming them with an array of specialist skills.

**M.Sc.(Electronics) programme:**
The scope of this programme ranges from IC design and microelectronics to optoelectronics. IC design deals with circuit design and analysis, signals in electronics, packaging and reliability. Microelectronics focuses on manufacturing, fabrication and semiconductor devices. Optoelectronics emphasises on display technologies, photonics and related topics. Together with a wide choice of elective courses, this course is designed to meet the global demands of engineers, leaders and researchers.

**M.Sc.(Power Engineering) programme:**
This programme is targeted at professional and practising engineers, R&D managers, power system designers, industry planners and/or professionals working in Renewable Energy field who possess a keen interest in the fields of power generation and energy utilisation. Its robust and up-to-date framework prepares students for the burgeoning demands of the modern power/energy industries as well as renewables, their generation, conversion and utilisation techniques.

**M.Sc.(Signal Processing) programme:**
Signal processing and algorithm development are becoming increasingly multidisciplinary and their applications can be found in many diverse engineering environments. This course is structured to facilitate an in-depth understanding of recent approaches and evolving trends in DSP technologies. It is designed for engineers and postgraduate students who wish to step into this exciting and dynamic engineering discipline.
PROGRAMME STRUCTURE

Each course consists of 39 hours of lectures and is assigned 3 Academic Units (AUs). Classes are held once a week for 3 hours in the evening but the examinations are conducted during office hours at the end of each semester. Students can choose from 2 types of study options to complete their programmes:

<table>
<thead>
<tr>
<th>Type of study option</th>
<th>No. of AUs to graduate</th>
<th>No. of Specialized Elective Courses to complete (Minimum)</th>
<th>No. of Prescribed Elective Courses to complete (Minimum)</th>
<th>No. of General Elective Courses to complete (Maximum)</th>
<th>Dissertation</th>
<th>Minimum CGPA required to graduate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Coursework Only</td>
<td>30 AUs</td>
<td>5</td>
<td>2</td>
<td>3</td>
<td></td>
<td>2.5</td>
</tr>
<tr>
<td>Coursework+ Dissertation</td>
<td>30 AUs</td>
<td>5</td>
<td>1</td>
<td>2</td>
<td>1</td>
<td>2.5</td>
</tr>
</tbody>
</table>

Note: The programme structure will be subject to change without prior notice.

<table>
<thead>
<tr>
<th>Type of Coursework Programme</th>
<th>Candidature</th>
<th>Semester Structure: Semester 1 (Aug - Dec)</th>
<th>Semester 2 (Jan - May)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Master of Science (Full-Time)</td>
<td>1 year</td>
<td>Weeks 1-14*</td>
<td>Weeks 15-17</td>
</tr>
<tr>
<td></td>
<td>3 years</td>
<td>Others</td>
<td></td>
</tr>
<tr>
<td>Master of Science (Part-Time)</td>
<td>2 years</td>
<td>Lectures</td>
<td>Examinations</td>
</tr>
<tr>
<td></td>
<td>4 years</td>
<td></td>
<td>Vacation</td>
</tr>
</tbody>
</table>

* Including 1 recess week

ADMISSION REQUIREMENTS

- A good relevant Bachelor’s degree
- Relevant practical/working experience is an advantage
- TOEFL/IELTS is required for graduates from universities with non-English medium of instruction

Please refer to the following URL for the admission requirements (TOEFL/IELTS)
http://www.eee.ntu.edu.sg/Programmes/ProspectiveStudents/Graduate/MOE_sub_MSc/Pages/Admission_Reqts.aspx
ADMISSION INFORMATION

Applicants must submit their applications with necessary supporting documents electronically via the Coursework Programme Graduate Admission website.
http://admissions.ntu.edu.sg

<table>
<thead>
<tr>
<th>Type of Coursework Programme</th>
<th>Application Period</th>
<th>Class Commencement</th>
</tr>
</thead>
<tbody>
<tr>
<td>Master of Science</td>
<td>January - February</td>
<td>August</td>
</tr>
<tr>
<td>(For all EEE M.Sc. Programmes except the M.Sc.(Green Electronics) and M.Sc.(Integrated Circuit Design) Programmes)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

PROGRAMME FEES

Please refer to the following URL for the programmes fees for all M.Sc. programmes:
http://admissions.ntu.edu.sg/graduate/coursework/BeforeApplying/Fees/Pages/NotesOnFees.aspx

SCHOLARSHIP

ASEAN Graduate Scholarship –
This scholarship is open to nationals of member countries of ASEAN* (except Singapore) to pursue a designated full-time Masters degree by coursework and dissertation.
For more information please visit the following Website: http://admissions.ntu.edu.sg/graduate/scholarships/Pages/ASEANScholarship.aspx

For administrative enquiries on M.Sc. Programmes:
Tel: (65) 6790 4322
Email: eee_msc@ntu.edu.sg
Website: http://www.eee.ntu.edu.sg/Programmes/ProspectiveStudents/Graduate/MOE_sub_MSc/Pages/MOESubsidizedMSc.aspx
M.Sc.(Green Electronics) programme:
This full time programme is jointly offered by NTU EEE and Technische Universität München (TUM). It is designed for training semiconductor researchers and engineers to work in the areas of novel electronic/optoelectronic devices and systems, with particular focus on the energy, sensing/monitoring and semiconductor manufacturing fields. All courses offered by the M.Sc.(Green Electronics) are conducted by faculty from both NTU EEE and TUM.

M.Sc.(Integrated Circuit Design) programme:
This full time programme is jointly offered by NTU EEE and Technische Universität München (TUM). It aims to nurture competent engineers and leaders for the semiconductor industry. The programme addresses digital and analogue/mixed integrated circuit (IC) design over architectural concepts to design methodology/automation for IC. This course also covers fundamental concepts in signal processing and offers cross-discipline modules such as intellectual property law and business management.

PROGRAMME STRUCTURE

M.Sc.(Green Electronics) and M.Sc.(Integrated Circuit Design) Programmes:

<table>
<thead>
<tr>
<th>Total Academic Units (AUs)</th>
<th>No. of Core Courses to Complete</th>
<th>No. of Elective Courses to Complete</th>
<th>English Module (Compulsory)</th>
<th>Internship For 3 months</th>
<th>Dissertation For 6 months</th>
<th>Cross-Discipline Modules</th>
<th>Min. NTU GPA required to graduate</th>
</tr>
</thead>
<tbody>
<tr>
<td>41</td>
<td>8 courses (24 AUs)</td>
<td>4 courses (12 AUs)</td>
<td>1 (5 AUs)</td>
<td>Compulsory</td>
<td>Compulsory</td>
<td>5 modules</td>
<td>2.5</td>
</tr>
</tbody>
</table>

Candidature

<table>
<thead>
<tr>
<th>Minimum</th>
<th>Maximum</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.5 years</td>
<td>3 years</td>
</tr>
</tbody>
</table>

Programme runs over 20 months

<table>
<thead>
<tr>
<th>Month 1 to 11</th>
<th>Month 12 to 14</th>
<th>Month 15 to 20</th>
</tr>
</thead>
<tbody>
<tr>
<td>Core Courses</td>
<td>Internship</td>
<td>Dissertation</td>
</tr>
<tr>
<td>Elective Course</td>
<td></td>
<td></td>
</tr>
<tr>
<td>English Module</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cross-Discipline Modules</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
ADMISSION REQUIREMENTS

M.Sc.(Green Electronics) and M.Sc.(Integrated Circuit Design) Programmes:

M.Sc.(Green Electronics)
http://tum-asia.edu.sg/admissions/graduate/msc-green-electronics/

M.Sc.(Integrated Circuit Design)
http://tum-asia.edu.sg/admissions/graduate/msc-integrated-circuit-design/

ADMISSION INFORMATION

Admission website:
Please refer to the following URL links for the admission information for M.Sc.(Green Electronics) and M.Sc.(Integrated Circuit Design) Programmes:
http://tum-asia.edu.sg/admissions/graduate/application-process/

PROGRAMME FEES

Please refer to the following URL for the programme fees of the two Joint NTU-TUM M.Sc. programmes:

M.Sc.(Green Electronics)
https://tum-asia.edu.sg/admissions/graduate/msc-green-electronics/

M.Sc.(Integrated Circuit Design)
https://tum-asia.edu.sg/admissions/graduate/msc-integrated-circuit-design/

SCHOLARSHIP

Please refer to the following URL for the scholarship of M.Sc.(Green Electronics) and M.Sc.(Integrated Circuit Design) Programmes:
https://tum-asia.edu.sg/admissions/graduate/scholarships/

For administrative enquiries on Joint NTU-TUM M.Sc. Programmes:
Tel: (65) 6777 7407
Email: graduate@tum-asia.edu.sg
Website: http://tum-asia.edu.sg
Career Prospects

A majority of our graduates are equipped with a wide range of career prospects in fields such as:

- Audio, Image, Video & Multimedia Technology
- Biomedical Instrumentation
- Communication R&D industries
- Control Engineering
- Electronic Engineer
- Embedded Systems
- Engineering
- IC Design Engineer
- IC Failure Analysis
- IC Packaging, Testing and EDA
- M&E Consultancies
- Machine Vision
- Managerial
- Optoelectronic Engineer
- Packaging and Reliability Engineer
- Power related Industries
- Printed Organic Electronics
- Process Integration Engineer
- R&D in DSP Communications
- Radar
- Renewable Energy Engineering
- Researcher/Research Engineer
- Robotics and Automotive Industry
- Semiconductor Technologist
- Signal Processing
- Solid State Lighting and Displays
- Sonar & Sensor Signal Analysis
- Strategy Marketing related to IC
- System Analysis
- Wafer Process Engineer

Opportunities are aplenty for graduates to collaborate with the local University and undertake research projects as Project Officer or Research Associates. Our Doctor of Philosophy (Ph.D.) programme also offers a robust framework for graduates with outstanding academic results who are keen on pursuing higher-order research.
Leap forward to success with us at the School of EEE.

Become the change that will make tomorrow a better place for all.