แบบพิมพ์การจัดทำข้อเสนอ หลักสูตรศึกษาระดับปริญญาโทนานาชาติ

(Thailand International Postgraduate Program : TIPP)

ระหว่างปี 2569 - 2571

Theme : Climate Resilience

1. Course Title: Master of Science Program in Smart Grid Technology

2. Master Degree: Master of Science (Smart Grid Technology) /
M.S. (Smart Grid Technology)

3. Academic Institution: Naresuan University,
School of Renewable Energy and Smart Grid Technology (SGtech)

4. Duration: Two (2) Years (Academic year 2026-2027) Master Course will start in June 2026 and end in May 2028

5. Background and Rational:

Evolving power systems to be more responsive, smarter, or more capable, using fewer resources, is the efficient, reliable, safe, sustainable and eco-friendly that can be achieved. By applying the technology of information communication systems, sensor systems, data acquisition systems, and automation control technologies to make the power system more aware of system status information for automated decision-making, these processes must occur throughout the power system covering the production system, transmission system, distribution system, and power-user system. The smart grid network system has fundamental technological elements that are capable of measuring, transmitting data, working with equipment and systems. Other electricity, which is a technology in various groups, including hardware, software, peopleware such as Information and Communication Technology (ICT), Renewable Energy Distributed Generation, Energy Storage Technology, Electric Vehicle Charging Station Infrastructure, Smart Meter, Demand Response, Rea Time Pricing and Energy Management System(EMS): Home Energy Management System (HEMS), Building Energy Management System (BEMS), Factory Energy Management System (FEMS) and Community Energy Management System (CEMS), etc.

The program aims to encourage and develop our students to integrate systematically knowledge for their research and Smart Grid Technology that to respond to energy solving of the country, region and the world scenarios.

6. Objectives:

- Keen in knowledge, skills, and experiences in smart grid technology and able to integrate smart grid technology with other relevant technology focusing on the smart grid technology development for the benefits of the nation
- Competent in smart grid technology research in a systematic
- Equipped with an inquiry mind and professional ethics.

7. Course Synopsis and Methodology:

7.1 Credit Requirement

Requirements	Plan A Type A2
Coursework not less than	18
- Core Courses	9
- Electives	9
Required Non-Credit courses	5
Thesis not less than	18
Independent Study	-
Total	**36**

* Minimum credits required.

7.2 Core Course

Requirements	Plan A Type A2	
	Course No.	Credits
Distributed Energy Resources and Management	853504	3
Smart Grid Technology	853505	3
Information and Communication Technology for Smart Grid	853506	3
Total	**3**	**9**

7.3 Electives

Requirements	Plan A Type A2	
	Course No.	Credits
Digital and Computer Application	853511	3
Algorithm and Energy Management Software for Smart Grid	853512	3
Communication Infrastructure for Smart Grid	853513	3
Artificial Intelligence for Smart Grid	853514	3
Peer-to-Peer (P2P) Energy Trading with Blockchain Technology	853515	3
Data Standard and Big Data Analytics Infrastructure for Smart Grid	853516	3
Smart Grid Infrastructure and Planning	853517	3
Selected Topics in Smart Grid Technology	853518	3
Renewable Energy Power Generation	853521	3
Microgrid System	853522	3
Power Electronic Converters for Smart Grid	853523	3
Electric Vehicle Technology	853524	3
Power Electronic Converters for Renewable Energy Sources and Storages	853525	3
Power Quality and Power System for Renewable Energy	853526	3
Photovoltaic Systems Applications in Smart Grid Network	853527	3
Wind Energy Applications in Smart Grid Network	853528	3
Energy Storage System for Smart Grid	853531	3
Hydrogen and Fuel Cell Technology for Smart Grid	853532	3
Smart Grid for Community Infrastructure	853541	3
Community Smart Micro Grid Technology	853542	3
Utility System Operation for Supporting Smart Grid Technology	853543	3
Electric Vehicle Integration	853544	3

Requirements	Plan A Type A2	
	Course No.	Credits
Demand Response	853545	3
Virtual Power Plant	853546	3
Smart Grid Economic	853551	3
Economic Policy Formulation of Smart Grid	853552	3
Business Management for Smart Grid	853553	3
Greenhouse Gas Emission Mechanism for Smart Grid	853554	3
Carbon Neutrality and Net Zero Greenhouse Gas Emissions	853555	3
Total	29	≥ 9

7.4 Required Non-Credit Courses.

Requirements	Plan A Type A2	
	Course No.	Credits
Research Methodology in Science and Technology	853501	3
Seminar 1	853502	1
Seminar 2	853503	1
Total	3	5

Thesis Credit

7.5 Requirements.

Requirements	Plan A Type A2	
	Course No.	Credits
Thesis 1, Type A2	853591	3
Thesis 2, Type A2	853592	6
Thesis 3, Type A2	853593	9
Total	3	18

7.6 Study Plan

Study plan

The first year

- First Semester

Requirements	Plan A Type A2	
	Course No.	Credits
Research Methodology in Science and Technology	853501	Non-Credit
Distributed Energy Resources and Management	853504	3
Smart Grid Technology	853505	3
Information and Communication Technology for Smart Grid	853506	3
Total	4	9

- Second Semester

Requirements	Plan A Type A2	
	Course No.	Credits
Elective Course	853xxx	3
Elective Course	853xxx	3
Elective Course	853xxx	3
Thesis 1, Type A 2	853591	3
Seminar 1	853502	Non-Credit
Total	5	12

The second year

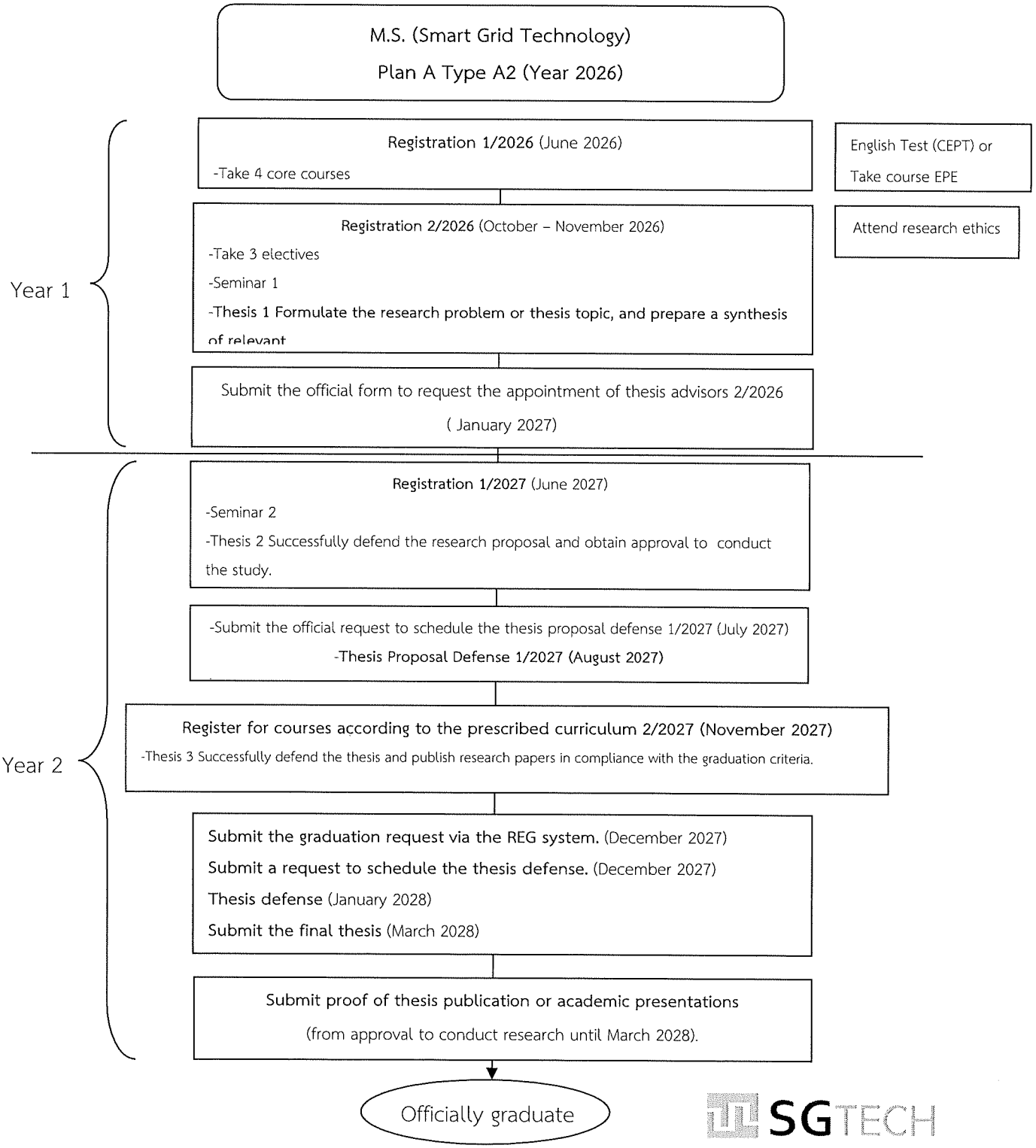
- First Semester

Requirements	Plan A Type A2	
	Course No.	Credits
Thesis 2, Type A 2	853592	6
Seminar 2	853503	Non-credit
Total	2	6

- Second Semester

Requirements	Plan A Type A2	
	Course No.	Credits
Thesis 3, Type A 2	853593	9
Total	1	9

Road to Success: According to the Standard Two-Year Curriculum Plan



7.7 Course Content/Study Topic:

853501 Research Methodology in Science and Technology 3(3-0-6)

Characteristics and research goals, types and research processes, variables and hypothesis, collecting data, proposal and research writing, research evaluation and its application, ethics of researcher, proper techniques of research methodology in science and technology

853502 Seminar 1 1(0-3-1)

Emphasize on encouraging students to learn how to search, criticize the articles and published papers, and practice the oral presentation on selected topics of current research or thesis progress in smart grid technology

853503 Seminar 2 1(0-3-1)

Presentation and discussion of current research topics related to smart grid technology with precise topic and content

853504 Distributed Energy Resources and Management 3(2-3-5)

Definition and types of distributed energy resources; renewable energy resources; centralized electricity generation; distributed generation; energy demand and supply; electricity load profiles (residence, office building, government building, hotel, shopping mall, industrial factory); energy management in electricity grid

853505 Smart Grid Technology 3(2-3-5)

Centralized and distribution generation; distributed generation connected with transmission lines; traditional transmission lines and smart grid system, information and communication technology (ICT); distribution management systems with smart metering; storage technology; EV; smart grid system for managing electricity use in smart building; electricity customer-side systems

853506 Information and Communication Technology for Smart Grid 3(2-3-5)

Information and communication technology; power system information; smart grid communication infrastructures, network coding (NC); compressive sensing

(CS); communication architecture; communication application for smart grid; active network wireless communication information; array record and control electronic component; energy flow monitoring; power demand and supply status

853511 **Digital and Computer Application** 3(2-3-5)

Introduction to digital system, analysis of logic circuit and Boolean algebra, logic circuit design, number system and digital code, counter circuit and application, algorithms and logic circuits for processing, digital computer, microprocessors and microcomputer, application software for measurement, smart grid control system network, interface, data management and evaluation, monitoring and display

853512 **Algorithm and Energy Management Software for Smart Grid** 3(2-3-5)

Algorithm of electricity management from renewable energy, logic and priority of energy production; type of load profile, software development processes concepts, software system analysis and design; database system, network transport protocol, Socket programming, Real-time networking, Devices and gateways for smart grid

853513 **Communication Infrastructure for Smart Grid** 3(2-3-5)

Network architecture, data communication and network, power system information, smart grid communication applications for power monitoring system, wide-area communication network, wireless networks for smart grid applications, data security system in smart grid communications and networking

853514 **Artificial Intelligence for Smart Grid** 3(2-3-5)

Concept of artificial intelligence (AI); machine learning; linear classification; deep learning; data preparation; learning and evaluation process; AI-based renewable energy forecasting; model optimization for renewable energy forecasting; visualization of renewable energy forecasting; application of artificial intelligence on the smart grid

853515 **Peer-to-Peer (P2P) Energy Trading with Blockchain Technology** 3(2-3-5)

Concept of blockchain technology; blockchain architecture; architecture system of P2P energy sharing model; the relationship between blockchain technology; design and development of a peer-to-peer energy trading platform; standard related to blockchain technology; barriers to the implementation; commercially available P2P energy trading platform; case studies on applying P2P energy trading with blockchain technology for smart grid

853516 **Data Standard and Big Data Analytics Infrastructure for Smart Grid** 3(2-3-5)

Concept of big data; big data analysis; data standard and data exchange; big data Infrastructure; big data analytics tools and techniques; design of big data analytics infrastructure; challenges of big data applying in smart grid management; guidelines for the development of data usage from big data; applying big data for the electricity business management; case studies on applying big data for smart grid

853517 **Smart Grid Infrastructure and Planning** 3(2-3-5)

Smart grid infrastructure logistics and transportation for oil, gas, and coal from sources to power plants around the world; modern forms of transmission lines for electrical energy instead of fuel transportation; electricity generation from renewable energy sources that is available in local area; the limited problems of traditional electricity transmission lines from renewable energy; decentralized generation connected with transmission lines; connection of the transmission lines in international; domestic and community levels; smart grid policies in different countries; incentives mechanism for smart grid deployment

853518 **Selected Topics in Smart Grid Technology** 3(2-3-5)

New knowledge in smart grid technology based on current interest such as artificial intelligence, internet of things, energy solutions, energy innovation

853521 Renewable Energy Power Generation 3(2-3-5)

Renewable energy power generation technology in Smart Grid, constraint and algorithm of the power production from solar energy, wind energy, hydro energy and biomass, grid interconnection from renewable energy, intelligent demand response (DR) for energy management system (EMS), weather forecasting for energy usage and storage in battery by using smart grid management system, photovoltaic power generation in smart grid system, renewable energy power generation planning for community

853522 Microgrid System 3(2-3-5)

Definition and types of microgrid in smart grid context; role and advantages of microgrid; architecture and components of microgrid; microgrid design and suitable sizing; distribution generation and power quality control in microgrid; algorithm and energy management system (EMS) for smart microgrid; net zero energy microgrid

853523 Power Electronic Converters for Smart Grid 3(2-3-5)

Power electronic devices, fundamental of power converters, pulse width modulation switching technique, AC-DC converters, DC-AC converters, DC-DC converters, wind energy inverters, photovoltaic inverters, electric vehicle battery chargers, battery inverters, control systems of power converters

853524 Electric Vehicle Technology 3(2-3-5)

Electric vehicle evolution, criterion of internal combustion and electric vehicle, power train structures, traction motors, traction battery, power converters, battery chargers, charging infrastructure, vehicle to grid (V2G) and grid to vehicle (G2V) operations

853525 Power Electronics Converters for Renewable Energy Sources and Storages 3(2-3-5)

Grid integrated converters for renewable energy and storage devices, modeling and control of power converters, grid connection standards, grid synchronization techniques, islanding detection, maximum power point tracking methods, grid-forming operations

853526 Power Quality and Power System for Renewable Energy 3(2-3-5)

Power system components; power system analysis; power quality definitions; impacts of renewable energy power plants on power system stability and the power quality of the power system; power quality standards; computer aided power system analysis and power quality in the power system

853527 Photovoltaic Systems Applications in Smart Grid Network 3(2-3-5)

Solar radiation and photovoltaic cells; semiconductor properties; silicon photovoltaic cells standard; semiconductor materials; photovoltaic module fabrication; photovoltaic system engineering; photovoltaic system design and sizing; photovoltaic applications in smart grid network; performance evaluation of photovoltaic system; photovoltaic system economy

853528 Wind Energy Applications in Smart Grid Network 3(2-3-5)

Introduction of wind energy,; function and structure of wind turbine,; wind energy conversion system,; power generation from wind turbine,; generator simulation and design aspects of wind systems,; wind energy applications in smart grid network;, wind power system economy

853531 Energy Storage System for Smart Grid 3(2-3-5)

Types of energy storage systems currently in use and their benefits; characteristics of energy storage system technology; development trend of energy storage technology; applications of energy storage systems in power grids; the equipment and hardware for grid-connected energy storage systems; energy storage systems for microgrids and smart grids; sizing calculation of the energy storage system; algorithm operation of the energy storage system; large-scale energy storage systems in smart grids

853532 Hydrogen and Fuel Cell Technology for Smart Grid 3(2-3-5)

Concepts of hydrogen production and hydrogen energy carrier, utilization of hydrogen, hydrogen transportation and storage, safety and environmental

impacts of hydrogen, principles of fuel cell, delivering fuel cell power, applications and control algorithm of hydrogen and fuel cell systems connected to smart grid

853541 **Smart Grid for Community Infrastructure** 3(2-3-5)

Type of community, urban, suburb and rural community; load profile analysis of communities; smart grid for electricity management from renewable energy in community; home and Building energy management; IT and Communication management for load balance and demand response (DR)

853542 **Community Smart Micro Grid Technology** 3(2-3-5)

Level of transmission line; national grid; micro grid; electrical operation model for grid connection and island mode; island smart micro gird from renewable energy source; substation of smart micro grid; smart micro grid for campus power; independent smart micro grid for smart community and smart farming

853543 **Utility System Operation for Supporting Smart Grid Technology** 3(2-3-5)

Concept of utility system operation; utility system operation co-operation with smart grid technology; analytic and forecast of variable renewable energy and dynamic demand for operation planning; re-design capacity market for the future; innovation ancillary services with smart grid for TSO; aggregated distributed energy resources support to grid services for DSO, TSO-DSO data exchange and dispatch cooperation

853544 **Electric Vehicle Integration** 3(2-3-5)

Electric Vehicle (EV) penetration with impact on power grid system; the concept of Infrastructure development for EV integration; ICT standard for controlling the EV charging; EV smart charging concept and design; power market working with EV smart charging; analytic incentive for EV charging; EV business development for supporting the grid services; EV charging technology trends for the future

853545 Demand Response 3(2-3-5)

Definition and concept of demand response; demand response infrastructure; demand response architecture and communication system; demand response programs and incentive design; demand response application in smart grid; impacts on grid operation and planning; case studies on implementation of demand response in smart grid; development guidelines for demand response in Thailand

853546 Virtual Power Plant 3(2-3-5)

Definition and concept of virtual power plant; virtual power plant architecture and communication system; features and services in grid network; the relationship between virtual power plants and smart grids; virtual power plant uncertainty; barriers to the implementation; virtual power plant business model and opportunities; commercially available virtual power plant platform; the development guidelines for virtual power plants in the global and Thailand

853551 Smart Grid Economic 3(2-3-5)

Energy forecasting; power generation and power consumption demand; smart grid cost and benefit categorization; the uncertainty of renewable energy resources operation; chargeable and dischargeable storage; network loss and security constraints; scoping and measuring impacts; impact attributable to investments; monetizing smart grid benefits and costs; value of demand response; the cost to maximize smart grid benefits; techno-economic analysis for smart grid implementation

853552 Economic Policy Formulation of Smart Grid 3(2-3-5)

Smart grid market; energy industry and network operator and stakeholder; government roles in smart grid; policy formation and transition for smart grid issues; policies formulating analysis and trends in different countries; policy impact assessment for smart grid deployment; sustainable development goals policy; carbon neutrality and net zero greenhouse gas emission; optimization of smart grid technology deployment under domestic and international context

853553 Business Management for Smart Grid 3(2-3-5)

Electricity system markets and regulations; distribution system operators for smart grid; smart grid market; market efficiency; trading mechanisms; smart grid investment costs and operating savings; real-time pricing; energy billing; supply and value chain in smart grid system; dynamic business model for prosumer; scenario schemes for smart grids; smart grid business solutions

853554 Greenhouse Gas Emission Mechanism for Smart Grid 3(2-3-5)

Perspective to formulate mitigation measures to achieve Nationally Determined Contributions (NDCs); mechanism to reduce greenhouse gases according to various standards; greenhouse gas reduction project development; carbon market and carbon credit; issues/barriers on policy- level mitigation measures planning and implementation; case study of policy level mitigation measures planning and implementation of the energy sector both of domestic and abroad

853555 Carbon Neutrality and Net Zero Greenhouse Gas Emissions 3(2-3-5)

Definition and related greenhouse gas protocol; commitment and standard; measuring, reporting, validation and verification; science based targets (SBT); carbon footprint organization (CFO); standard of various certifications; greenhouse gas management for government and private organization

853591 Thesis 1, Type A 2 3 Credits

Studying the components of a thesis or of samples of thesis studies in related fields; determining the thesis topic/title; developing a concept paper; and preparing a review of related literature and research studies

853592 Thesis 2, Type A 2 6 Credits

Developing research instruments and research methodology and preparing a

thesis proposal and to be presented to the thesis committee and approved dissertation proposal to conduct research

853593 **Thesis 3, Type A 2** **9 Credits**

Collecting data; analyzing data; preparing a progress report to be presented to the thesis advisor(s); and preparing a complete thesis and publishing a research article according to the graduation criteria and passed thesis examination

8. Graduation Conditions: In accordance with the Graduate School Rules and Regulations.

1. Having completed the duration of study as specified by the course
2. Having registered all courses as required by the course
3. Having completed all courses and passed all conditions as specified in the course
4. Having a grade point average of not less than 3.00
5. Having passed the English proficiency test as announced by the University
   - 5.1 Internet-based TOEFL : 35
   - 5.2 International English Language Testing System (IELTS) : 5.0
   - 5.3 CU-TEP : 54
   - 5.4 Cambridge Placement Test (CEPT) : B1 (37)
   - 5.5 Test of English for International Communication (TOEIC) : 601
   - 5.6 TEC-W Score : 76
   - 5.7 English Proficiency Enhancement for Graduates (EPE) : EPE Intermediate
6. Having proposed the thesis defense and passed the final oral thesis defense
7. The thesis or part of the thesis must be published or at least have been accepted for **publication in the form of articles, creative works, innovations, inventions, or other academic works** that can be searched in accordance with the university announcement along with the university council's approval.

9. Applicant Qualifications:

Qualification for Admission

Plan A Type A2

This program is open to applicants who have a Bachelor degree in any relevant field, or are in the final semester of their study

10. Document Required:

Applicant can fill required information in the application form and send it with these enclosed document:

1. The Application Form affixed with colored photographs.
2. A letter of recommendation or a reference
3. A copy of Educational certificate
4. A copy of an Academic transcript
5. A copy of Personal Identity Card or Official Staff Card.
6. A copy of English languages certificates e.g. TOEFL, IELTS, TOEIC or CU-TEP or NULC (if any)
7. Document to certify change of name or surname and/or marital status (if any).
8. Other supporting document

11. Contact:

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