# HANDBOOK

## DOCTORAL PROGRAM OF INDUSTRIAL ENGINEERING

DOCTORAL PROGRAM OF INDUSTRIAL ENGINEERING
DEPARTMENT OF INDUSTRIAL AND SYSTEMS ENGINEERING
FACULTY OF INDUSTRIAL TECHNOLOGY & SYSTEMS ENGINEERING
INSTITUT TEKNOLOGI SEPULUH NOPEMBER

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# FOREWORD

The Doctoral Program essentially aims to produce graduates who are ready to become independent researchers with the ability to carry out and organize research to make significant scientific contributions. A person who graduates from the Doctoral program is expected to have gone through a comprehensive stage starting from attending lectures, making research plans, conducting research systematically, participating in various internal seminars, actively attending, and presenting at scientific meetings at home and abroad, and publishing research results in international journals.

This handbook is intended as a guide in the implementation of the ITS Industrial Engineering Doctoral Program. This guide is intended for students, supervisors, and managers of the Doctoral program. The main purpose of publishing this book is to provide a common perception of the standards and stages of the Doctoral program so that it makes it easier for students and supervisors to understand what an obligation is, how the process is, and what are the targets that must be met during a student's Doctoral program.

This handbook is a complement to the quality standard book published by the ITS Postgraduate Program, so both are expected to be read and understood by students participating in the ITS Industrial Engineering Doctoral program.

Surabaya, March 2023
Head of Postgraduate Study Program
Department of Industrial and Systems Engineering
Institut Teknologi Sepuluh Nopember

**Prof. Iwan Vanany, Ph.D**

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## 1. Background of Industrial Engineering Doctoral Program

The Industrial Engineering Doctoral Program, ITS Department of Systems and Industrial Engineering began to open in 2009, after the Department of Industrial Engineering was established 24 years. At that time there were already several professors in the Department of Industrial Engineering ITS and there was already a master's program in 1999 which lasted about 14 years. Many lecturers in the Department of Industrial Engineering have been active in research activities and many of their results have been published in international journals. Along with the demands to improve the academic atmosphere, especially in relation to research, and with the lack of Industrial Engineering Doctoral programs in Indonesia, the Department of Industrial Engineering ITS in that year opened a Doctoral program. Since January 2, 2020, the Department of Industrial Engineering (DTI) has changed its name to the Department of Systems and Industrial Engineering (DTSI) while the name of the study program remains the Industrial Engineering Doctoral Program.

The ITS Industrial Engineering Doctoral Program was originally established with 3 concentrations, namely manufacturing systems and quality engineering, industrial systems optimization, and logistics and supply chain engineering. At present there are 5 areas of concentration in accordance with the laboratories in the Department of Systems and Industrial Engineering.

Since its inception, the Industrial Engineering Doctoral program has required articles accepted in international journals as a graduation requirement. This is done because the research of doctoral students must be original and contribute significantly to the science of Industrial Engineering.

In its journey, the ITS Industrial Engineering Doctoral program attracts quite a lot of enthusiasts, but only about 60% of applicants can be accepted. Those who are accepted into the ITS Industrial Engineering Doctoral program usually have a good academic track record at the undergraduate and postgraduate levels and have sufficient potential to carry out research tasks.

## 2. Vision and Mission

DTSI ITS Industrial Engineering Doctoral Program has the following vision and mission:

**Vision** : To become a respected provider of Doctoral programs in Industrial Engineering in Asia.

**Mission**: The mission of the ITS Industrial Engineering Doctoral Program is:

1. Organizing Doctoral program education with high quality standards

2. Creating a conducive research climate that can productively produce quality Doctoral graduates whose results can be published in international forums or publications.

3. Creating international networks with providers of Industrial Engineering Doctoral programs or other similar fields, especially those in the Asian region.

## 3. Graduate Profile

Graduates of the ITS Industrial Engineering Doctoral program have the ability as lecturers, researchers, and policy makers either as bureaucrats or professionals in business and industry.

## 4. Learning Outcomes

The ITS Industrial Engineering Doctoral Program has formulated the following three Learning Outcomes that are expected to be achieved by graduates of the Doctoral program:

- **Learning Outcome 1**: Mastering in depth and being able to innovatively develop knowledge in the field of Industrial Engineering through innovative, original, and tested works that emphasize a systems approach in designing, repairing, and installing an integrated system consisting of humans, materials, equipment, information, energy, and other resources.

- **Learning Outcome 2**: Able to formulate problems in an industrial system both at the micro, meso, and macro scope, propose alternative solutions, and conduct multi-disciplinary, interdisciplinary, or transdisciplinary evaluations to obtain the best alternative recommendations in terms of efficiency, effectiveness, and in terms of environmental sustainability considerations.

- **Learning Outcome 3**: Able to manage, lead, and develop research or development activities in the field of Industrial Engineering on the basis of honest and responsible scientific principles and able to communicate ideas and results of research and development effectively in Indonesian and English so that they can gain national and international recognition.

## 5. Field of Concentration

Currently the ITS Industrial Engineering Doctoral Program has five (5) areas of concentration based on the laboratory at the Department of Systems and Industrial Engineering, namely:

1. ***Manufacturing Systems Engineering and Management***
   **by *Manufacturing Systems Laboratory***
   This concentration prepares graduates to understand the concepts and have the ability to design, operate, manage and make continuous improvements to smart Manufacturing Systems to become more efficient by considering environmental issues (green). Graduates from this concentration are suitable to work in various sectors both manufacturing and services.

2. **Policy Design on Industrial Systems and Distribution**
   **by *Quantitative Modelling and Industrial Policy Analysis Laboratory***
   This concentration equips graduates with deep analytical skills, using many mathematical models (optimization), statistical models, and simulation models. Graduates will be suitable to work in various fields of work that require complex system analysis in both manufacturing and service industries.

3. ***Logistics and Supply Chain Management***
   **by *Logistics and Supply Chain Management* Laboratory.**
   This concentration equips graduates with the ability to design, plan, operate, and control the flow of materials from upstream to downstream across organizations. Graduates will be suitable to work in the manufacturing industry for production planning and inventory control functions, procurement, warehousing, and in the logistics industry.

4. **Human Factors and Occupational Safety & Health Engineering**
   **by *Occupational Safety & Health Engineering Laboratory***
   This concentration is designed to equip graduates with knowledge about engineering systems, products, and services so that they can be used by humans effectively and efficiently by taking into account the principles of occupational safety and health. Graduates from this concentration will be suitable to work in various sectors related to system design in which there is a human element and the field of occupational safety & health in various industries.

5. **Engineering Management**
   **by Industrial Management and System Design Laboratory**
   This concentration equips graduates with the knowledge and skills to manage engineering projects, new product design, and innovation. Graduates are suitable to work in the manufacturing industry, services and the public sector.

## 6. Lecturer

The profile of the lecturers of the Department of Industrial Engineering ITS Doctoral Program in general is shown in the following table:

**Table 1. Lecturer of ITS Industrial Engineering Doctoral Program**

| No. | Name of Lecturer | Areas of expertise |
|---|---|---|
| 1. | Budisantoso Wirjodirdjo, *Profesor*<br>Ir (ITB), M.Eng. (AIT), Dr (Rennes) | System Dynamics, Industrial Policy |
| 2. | Moses L. Singgih, *Profesor*<br>Ir (ITB), M.Sc. (ITB), MregSc, Ph.D. (Queensland) | Quality & Productivity Analysis |
| 3. | Udisubakti Ciptomulyono, *Profesor*<br>Ir (ITB), M.Eng.Sc (Melbourne), Dr (Aix Marseille ) | Multicriteria Decision Making, Green Manufacturing |
| 4. | Budi Santosa, *Profesor*<br>Ir (ITB), M.Sc. Ph.D. (Oklahoma) | Optimization, Heuristics Methods, Data Mining |
| 5. | I Nyoman Pujawan, *Profesor*<br>Ir (ITS), M.Eng.(AIT), Ph.D. (Lancaster), CSCP | Supply Chain Engineering, Logistics, PPIC |
| 6. | Iwan Vanany, *Profesor*<br>ST (ITS), MT (ITS), Ph.D. (UTM) | Business Process Re-engineering, Technology in Supply chain |
| 7. | Patdono Suwignjo<br>Ir (ITS), M.Eng.Sc (UNSW), Ph.D. (Stratchlyde) | Performance & Strategic Management |
| 8. | Sri Gunani Partiwi<br>Ir (IPB), MT (ITB), Dr (IPB) | Ergonomics, Industrial Cluster |
| 9. | Bambang Syairudin<br>Ir (ITB), MT (ITB), Dr (ITB) | Knowledge Management |
| 10. | I Ketut Gunarta<br>Ir (ITS), MT (UI), Dr (IPB) | Project Management, Financial Engineering |
| 11. | Ahmad Rusdiansyah<br>Ir (ITS), M.Eng. (Delhouse), Dr.Eng. (TIT) | Distribution and Transportation, Logistics Management |
| 12. | Nurhadi Siswanto<br>ST (ITS), M.Sc. (Purdue), Ph.D. (UNSW) | Operations Research, Large Scale Optimization |
| 13. | Maria Anityasari<br>ST (ITS), M.E. (UNSW), Ph.D. (UNSW) | Sustainable Manufacturing |
| 14. | Dyah Santhi Dewi<br>ST (ITS), M.Eng.Sc (UNSW)., Ph.D. (UNSW) | Ergonomics in Product and Service Systems Design |
| 15. | Nani Kurniati<br>ST (ITS), MT (ITB), Ph.D. (NTUST) | Quality Engineering |
| 16. | Putu Dana Karningsih<br>ST (UI), M.Eng.Sc (UNSW)., Ph.D. (UNSW) | Manufacturing Systems, Supply Chain Risk Management |
| 17. | Erwin Widodo<br>ST (ITS), M.Eng. (Ritsumeikan), Dr.Eng. (Hiroshima) | Game Theory, Dual Channel Supply Chain |
| 18. | Adithya Sudiarno<br>ST(ITS), MT (ITS), Dr (Unair) | Ergonomics Cognitive |
| 19. | Mokh. Suef<br>ST (ITS), M.Eng (Birmingham), Dr (ITS) | Manufacturing Systems |
| 20. | Ratna Sari Dewi<br>ST (ITB) , MT (ITB), Ph.D (NTUST) | Ergonomics |

| No. | Name of Lecturer | Areas of expertise |
|---|---|---|
| 21. | Niniet Indah Arvitrida<br>ST (ITS) , MT (ITS), Ph.D (Loughborough) | Business and Economics |
| 22. | Retno Widyaningrum, PhD<br>St (ITS), MT (ITS-NTUST), PhD (NTUST) | Ergonomic Cognitive |

In addition to the list above, there are still several lecturers who are currently and will pursue Doctoral education at home and abroad which in the near future are expected to strengthen the competence of the ITS Industrial Engineering Department Master Program.

## 7. Curriculum Structure

Doctoral Program is an academic level of education after a master's Program education which is a structured program consisting of basic and specific ability education and research. Industrial Engineering basic skills education consists of lectures, seminars, independent study, and scientific communication. Candidates for Doctoral program education are graduates of the Industrial Engineering Master Program and relevant Master Programs and meet the selection requirements to be accepted into the Doctoral Program education.

The length of education for the Doctoral Program is planned to be 3 years after obtaining a master's Program education, with an educational weight of at least 42 credits outside the S-2 program, including compulsory courses, research, and dissertation writing. Based on Permenristekdikti Number 59 of 2018 concerning the National Diploma Numbering (PIN), Competency Certificates, professional certificates, Degrees, and procedures for writing Degrees in Higher Education article 24, the maximum length of study (including leave) for doctoral program students is 7 years (14 semesters). Doctoral degree is the highest academic degree that can be achieved in a university that has a Postgraduate Program. At ITS, the degree is awarded after the Doctoral Program education participants have successfully fulfilled the lecture requirements, pre-qualification exams, following compulsory courses so that a total of 12 credits are supporting competencies and 30 credits of research activities and dissertation writing as the main competence.

Lectures are usually taken in one (1) first semester, while the next 5 semesters are for dissertation work. In addition, to graduate from the DTSI ITS Industrial Engineering Doctoral Program, students must meet the following requirements:

- Pass all courses and dissertation with a minimum grade of B. minimum TOEFL is 500
- Have a minimum of one (1) article accepted in an international journal.

- Fulfil other requirements that will be described in the following sections of this guide, including presenting papers at several seminars/conferences.

The details of these stages will be explained in the following sections.

## 8. Lectures

Currently, there are 3 compulsory courses that are the same for all concentrations and one compulsory course related to the chosen area of concentration. Table 1 below shows the course structure for the Doctoral program in Industrial Engineering ITS. Some provisions related to lectures are as follows:

- Students who come from non-industrial engineering fields are required to take an additional 12 credits from the S2 courses or Doctoral courses offered. Determination of the field or not is certainly not seen only from the name of the Department taken (especially if graduates from foreign universities), but more on the similarity of the curriculum with Industrial Engineering.
- Doctoral students are allowed to participate (seat in) in S2 classes or DOCTOR classes that are not compulsory courses. Students who seat in must follow the lecture rules but are not required to take exams or work on assignments given by lecturers. The number and type of courses that must be followed through seat in will be determined as needed and decided by the supervisor.

**Table 2**: Course structure of ITS Industrial Engineering Doctoral Program Curriculum 2023-2028

| Concentration | Mandatory course | Mandatory concentration course |
|---|---|---|
| *Manufacturing Systems Engineering and Management* | Philosophy of science and research methodology | Integrated Manufacturing System |
| Industrial System Optimization | Academic Writing | Quantitative Modelling and Analysis |
| Logistics and Supply Chain Management | Dissertation | Supply Chain Modelling |
| Factors and Occupational Safety and Health Engineering | | Human Factors in Industrial Systems Human |
| Engineering Management | Publication | Engineering Project Management |

**Table 3**. Curriculum Structure of ITS Industrial Engineering Doctoral Program 2023-2028

| Semester | Code | Name of Course | Credits |
|---|---|---|---|
| Semester 1 | TI186101 | Philosophy of science and research methodology | 3 |
| Semester 1 | TI186102 | Academic Writing | 2 |
| Semester 1 | TI186111 | Concentration course * | 3 |
| Semester 2 | TI186202 | Dissertation 1: Pre- qualification | 5 |
| Semester 3 | TI186301 | Dissertation 2: qualification | 7 |
| Semester 4 | TI186401 | Dissertation 3: Research results defence | 6 |
| Semester 5 | TI186501 | Publication (required for closed session) | 6 |
| Semester 6 | TI186601 | Dissertation 4: Final defences | 10 |
| Semester 6 | TI186602 | Public defence (optional) | 0 |
| | | **Total** | **42** |

*Integrated Manufacturing System *(Manufacturing Systems Engineering and Management Concentration)*

*Quantitative Modelling and Analysis (Industrial System Optimization Concentration)

*Supply Chain Modelling (Logistics and Supply Chain Management Concentration)

*Human Factors in Industrial Systems Human (Factors and Occupational Safety and Health Engineering Concentration)

* Engineering Project Management (Engineering Management Concentration)

**ELECTIVE COURSES**

For S3 Industrial Engineering students, the elective courses are compulsory courses from different concentrations. For example, S3 students who concentrate on manufacturing can take optimization modelling courses (mandatory concentration of Optimization Management) as an elective course. And vice versa.

| No. | Kode MK | Nama Mata Kuliah (MK) | Credits |
|---|---|---|---|
| 1 | TI186711 | Integrated Manufacturing System | 3 |
| 2 | TI186721 | Quantitative Modelling and Analysis | 3 |
| 3 | TI186731 | Supply chain modelling | 3 |
| 4 | TI186741 | Human Factors in Industrial Systems Human | 3 |
| 5 | TI186751 | Engineering Project Management | 3 |
| 6 | TI186732 | Supply Chain Engineering | 3 |
| 7 | TI186722 | Advanced Operation Research | 3 |
| 8 | TI186723 | Simulation for Industrial Engineering | 2 |
| 9 | TI186724 | Industrial Systems Policy Analysis and Engineering | 3 |
| 10 | TI186725 | Advanced industrial statistics | 2 |
| 11 | TI186733 | Contemporary Logistic | 3 |

# 9. Dissertation

Dissertation is a scientific work of Industrial Engineering Doctoral Program students which is realized in the form of a report and written from the results of research. The dissertation contains academic reasons why research is conducted, contains a link between the research conducted and similar studies that have been conducted by other researchers, the methodology for conducting research, and the results of the research conducted. A dissertation must contain significant scientific contributions. To know that the contribution is significant, students must clearly describe the relationship between previous research and the research conducted and in what way the student contributes. Therefore, a dissertation usually refers to at least 100 papers of other researchers published in academic journals. As a reference, the length of a dissertation ranges from 56,000 - 100,000 words (excluding appendices). Dissertations can be written in Indonesian or English. Decisions on the use of language must be approved by the supervisory team.

The format of writing a thesis book follows the writing guidelines contained in the Guidelines for Preparation of Dissertation for Doctoral Study Programs by the Postgraduate Program, ITS Academic Directorate.

## 9.1 Dissertation Topics

The DTSI ITS Industrial Engineering Doctoral Program aims to produce graduates who have in-depth independent research capabilities in a field within the scientific scope of Systems and Industrial Engineering. The field of Industrial Engineering must be interpreted proportionally and not obscured by other fields of science, such as Operational Management, which has quite a lot of intersections with the field of Industrial Engineering. As written in the Industrial Engineering Core Curriculum by BKSTI, that:

> Accreditation Board for Engineering and Technology (ABET) defines as *"the profession in which a knowledge of the mathematical and natural sciences gained by study, experience, and practice is applied with judgement to develop ways to utilize, economically, the materials and forces of nature for the benefit of mankind.* Furthermore, the main characteristic of engineering science is design, which is defined as "*a systematic, intelligent process in which designers generate, evaluate, and specify concepts for devices, systems, or processes whose form and function achieve clients' objectives or users' needs while satisfying a specified set of constraints* (Dym, et. al., 2005).
>
> *American Institute of Industrial Engineering* (AIIE) defines the field of Industrial Engineering as "*Industrial Engineering is concerned with the design, improvement, and installation of integrated systems of people,*

*materials, information, equipment, and energy. It draws upon specialized knowledge and skill in the mathematical, physical, and social sciences together with the principles and methods of engineering analysis and design to specify, predict and evaluate the results to be obtained from such system".*

From the description above, there are three keywords in the field of Systems and Industrial Engineering, namely:

- Design

- Improvement

- Installation

Therefore, the determination of the dissertation topic should refer to the above definition, where the topics worked on are expected to be topics that are in the core domain of Industrial Engineering science. Dissertation topics should be determined after a gap formulation obtained through a comprehensive literature review (accompanied by an understanding of the real problems that exist in the industry). Along with the explanation above, research topics for the DTSI ITS Industrial Engineering Doctoral Program are more directed at modelling research so that they can be used for the purpose of evaluating a design, generating improvement scenarios, and comparing one design with another from various aspects or performance.

**9.2 Selection of Supervisors and Examiners**

The promoter (main supervisor) will be determined by a meeting of lecturers of the DTSI ITS Industrial Engineering Doctoral Program by considering the suitability of the topic, the maximum limit on the number of mentors, the availability of prospective supervisors, and the communication that has been established previously by prospective students and prospective supervisors. Prospective students may communicate with prospective main supervisors (promoters) **before** the registration process. Some things related to the supervisor:

- - Each student will be supervised by two or three supervisors.
- - The main supervisor must hold the position of Professor or Head Lecturer who has met the requirements stipulated in the applicable ITS Postgraduate Program Quality Standards and DTSI department meetings.
- - It is recommended to choose a co-supervisor from within ITS. Only when necessary may a supervisor from outside ITS be used.
- - The supervisor must be present at all thesis evaluations (starting from internal progress 1 to the closed examination). If there is a supervisor from outside ITS involved and it is not possible to be present at all stages of the evaluation, it is

allowed not to attend internal progress 1, 2, and 3, but with the approval of the Head of the Post-IT Study Program.

- - Co-supervisors can be determined at the beginning (semester 1) or no later than the beginning of semester 2.
- - Other conditions regarding supervisors and co-supervisors regulated by the ITS Postgraduate Program Quality Standards still apply.

Examiners from ITS are determined after the student has completed the draft proposal and is ready to be submitted for pre-qualification. Examiners (internal or external) are determined by the Head of Post-IT Program after consultation with the supervisor. Examiners should be those who have the same or close field to the dissertation work, can come from the same or different departments.

### 9.3 The Mentoring Process

The mentoring process should be carried out regularly with all supervisors. As a rule of thumb, students should meet with their supervisors for a minimum of 2 weeks. Each student must fill out a control form/guidance form every time there is a guidance process. Students are entitled to comprehensive and prompt feedback from their supervisors.

### 9.4 Activeness and Attendance of Academic Activities

Students of the DTSI ITS Industrial Engineering Doctoral Program are essentially full-time students (full time) so they are expected not to work on other binding tasks such as teaching assignments, administrative tasks, consultations, or other tasks that take up a lot of time. DTSI ITS Industrial Engineering Doctoral Program students are also expected to be active in attending various academic activities such as research workshops, scientific writing, internal seminars, or other activities related to the Systems and Industrial Engineering Doctoral Program. All DTSI ITS Industrial Engineering Doctoral Program students are required to attend campus regularly and work in the DTSI ITS Doctoral student residency provided. Based on standards from BAN-PT, the length of attendance is half a full load and or 20 hours / week. Fingerprint facilities can be utilized to ensure attendance and make it easier to recap attendance data. The purpose of monitoring attendance is to ensure that DTSI ITS Industrial Engineering Doctoral Program students work regularly, easily communicate with supervisors and are free from various distractions.

### 9.5 Evaluation of Dissertation Progress

Research for dissertation should be carried out in systematic and directed stages. To assist students and supervisors in the research and mentoring process, progress evaluation guidelines have been made as shown in Tables 2 and 3 below. Table 2

shows the dissertation evaluation components in the DTSI ITS Industrial Engineering Doctoral Program which are further explained in more detail in Table 3. In both tables, the dissertation will go through several stages of evaluation where each is given a certain weight against the total dissertation credits.

If the progress of the dissertation work is considered inadequate and does not show enough potential to be completed properly, students will be required to take Contingency Progress (PK). In this activity, students are asked to explain their achievements at the beginning of the semester, the obstacles that occur and the plans that will be made to overcome the delay in progress, in front of a team of panellists or PK evaluators. If this PK mechanism is deemed insufficient, it is possible that students will be recommended to DO (drop out) or PS (drop out of study) or resign. The decision to recommend DO/PS or resign will go through the following process:

1. The supervisory team submits a letter to conduct a special evaluation for the student to the Head of the ITS Industrial Engineering Postgraduate Study Program.
2. The Head of the Study Program will form a special team to conduct the evaluation. Included in this special team are the supervisors.
3. The special team carries out a special evaluation. Based on the results, recommendations will be made. Some possible outcomes are: (a). The student is allowed to continue the dissertation with changes or without changes in the composition of the supervisor; (b). The student is recommended to drop out / resign.

**Table 4 – Dissertation Evaluation Component of ITS Industrial Engineering Doctoral program**

| Stage of Dissertation | Semester | Evaluated by | Weight | Value of components |
|---|---|---|---|---|
| **Pre-qualification** | 2 | Supervisors & Examiners from ITS | 5/28 | Supervisors 40%; Examiners ITS 60% |
| **Qualification** | 3 | Supervisors & full examiners | 7/28 | Supervisors 40%; Examiners ITS 60% |
| **Research results defence** | 4 | Supervisors & examiners from IE | 6/28 | Supervisors 40%; Examiners ITS 60% |
| **Final defences** | 6 | Supervisors & full examiners | 10/28 | Supervisors 40%; Examiners ITS 60% |

| Stage of Dissertation | Semester | Evaluated by | Weight | Value of components |
|---|---|---|---|---|
| **Public defence (optional)** | 6 | Supervisors & full examiners | 0/28 | Supervisors 40%; Examiners ITS 60% |
| **International publication** | 5 | Examiners form IE | 6 credits | |

Here are some provisions related to the dissertation evaluation process:

- - There should not be more than 2 evaluations in the same semester (exceptions must be submitted in writing and approved in writing by the Head of Post-IT Program). This is to keep the research work process organized where students carry out research with adequate time allocation.
- - Qualification is held at the end of semester 3 at the latest.
- - In evaluations involving examiners, the 40% grade from the supervisor is given once with a different form from the examiner's grade form.
- - Students and supervisors are expected to be active in ensuring that all evaluation stages are carried out on the right schedule.

**Table 5** – Guidelines for dissertation evaluation stages

| Element of Evaluation | Implementation | Results Displayed | Standard |
|---|---|---|---|
| **Pre-qualification** | Students present to their supervisor and two examiners from ITS. This is open to other PhD students | Presentation of a draft proposal consisting of the first 3 or 4 chapters (+ preliminary results if any). | The research gap is clear, the literature review is comprehensive, the research plan must be clear. |
| **Qualification** | The student presents to the supervisor and all examiners (closed examination) | Presentation of a revised proposal that accommodates feedback from pre-qualification. | The research gap is clear, the literature review is comprehensive, the research plan must be clear. The revised proposal approved by the supervisory team is submitted for candidacy decree. |
| **Research results defence** | Student presentations in front of supervisors and examiners from IT ITS. | Presentation of results from the implementation of almost all research (e.g., chapters 4, 5, 6, 7). | Research is almost complete with clear scientific contributions. |

| Element of Evaluation | Implementation | Results Displayed | Standard |
|---|---|---|---|
| **Final defences** | Students present to the supervisor and all examiners. | Presentation of comprehensive results that have accommodated revisions from internal progress 2 and 3. | Research is complete with clear scientific contributions. |
| **Public defence (optional)** | Students present to the supervisor and all examiners and invitees. | Presentation of results for promotional purposes. Students also prepare a dissertation summary book. | Research has been completed and there have been papers accepted in international journals, passing TOEFL, and other requirements. |

Revisions to the evaluation results should be made in consideration of examiner and supervisor feedback. Revisions and responses to examiners' and supervisors' feedback are made formally for qualification hearings and closed examinations (to obtain signatures of approval from supervisors and examiners). For other evaluations, the procedure for making revisions and communicating with the feedback giver can be arranged separately. If the feedback is minor, the examiner can authorize the supervisor to check whether the feedback has been accommodated. However, if the revision or feedback is major, it is advisable for the student to obtain approval from the examiner concerned. The chairperson should provide clarity on this mechanism during the announcement of the trial results.

## 10. Publication in Journals

As a graduation requirement, students are required to have at least one publication (or at least accepted for publication) of the Doctoral research results in an international journal. Publication in journals is a process of dissemination of research results. Articles accepted by journals usually go through a careful review process by experts appointed by the journal editor. One of the important considerations that usually forms the basis of acceptance in journals is significant scientific contribution as well as careful writing with effective language. Some things related to the publication of articles in journals:

- International journals are English-language journals, managed with a reasonable review process, supported by an editorial team with an international reputation.
- Students must consult with their supervisor and/or the Head of the Postgraduate Program in Industrial Engineering before making their journal choice.

- Articles that have been accepted or published can be submitted for assessment by the journal team and will be used as a requirement in the graduation process after the open session. The value of the article in the journal will be based solely on the reputation of the journal that published the article.

- If at the time of the Open Session more than one article has been accepted or published in international journals, students can submit all of these articles for consideration by the journal team. In essence, students can choose the article that is rated the highest, and the second journal and so on can be considered for bonus points.

  As an illustration, journal articles will be assessed with the following score ranges:
- A-grade journal with a minimum score of 86
- A- grade journal with a score of 76 – 85
- B+ class journal with a score of 71 – 75
- Class B journals with a maximum score of 70

Table 6 below lists several international journals and their classifications (If there is a publication in a journal that is not listed, the Department's reviewers will look for the equivalence of the journal to the five categories above). The purpose of this classification is to make it easier for the journal team to assess the journal publications of DOCTOR students. In essence, what is assessed is not the article, but the reputation of the journal that publishes the article.

These guidelines are important as there are currently many international journals published with very low quality (and reputation). Some characteristics of low-quality journals to avoid:

- Offers a very fast review process.
- Published by a new, unknown publisher.
- Request publication reimbursement to the author
- Publishing many articles that fluctuate from issue to issue.
- Almost all articles are accepted for publication.
- Blacklisted (doubtful) journals / publishers issued by DIKTI or other institutions.

**Table 6** – Journal Categorization in Industrial Engineering

| Class | Journal Characteristics | Sample Journal Name |
|---|---|---|
| A | • Published by a well-known association or well-known publisher. | • Management Science<br>• Operations Research<br>• Journal of Operations Management |

| Class | Journal Characteristics | Sample Journal Name |
|---|---|---|
| | • High impact factor (1 or more)<br>• Key journals in the field of IE science<br>• Published more than 15 years.<br>• Low acceptance rate<br>• Almost always appear in the top rank of various IT science journal ranking systems | • European Journal of Operational Research (EJOR)<br>• International Journal of Production Research (IJPR)<br>• IIE Transactions<br>• Decision Sciences<br>• Production and Operations Management (POM)<br>• Manufacturing and Service Operations Management (MSOM)<br>• International Journal of Operations and Production Management (IJOPM)<br>• Naval Research Logistics<br>• International Journal of Production Economics (IJPE)<br>• Computers and Operations Research (COR)<br>• Omega<br>• Transportation Research Part E: Logistics and Transportation Review<br>• Decision Support Systems<br>• Journal of Operational Research Society (JORS)<br>• IEEE on Engineering Management<br>• Journal of Supply Chain Management<br>• Computers &Industrial Eng. |
| A- | • Medium - high impact factor<br>• Journal relevant to the field of IE science<br>• Published more than 10 years.<br>• Low acceptance rate | • Industrial Management and Data Systems<br>• SCM: An International Journal<br>• International Journal of Physical Distribution and Logistics Management (IJPDLM)<br>• Production Planning &Control<br>• Annals of Operations Research<br>• Ergonomics<br>• Human Factors: The Journal of the Human Factors and Ergonomics Society<br>• Applied Ergonomics<br>• International Journal of Industrial Ergonomics<br>• Business Process Management Journal<br>• International Journal of Quality & Reliability Management |

| Class | Journal Characteristics | Sample Journal Name |
|---|---|---|
| | | • Journal of Manufacturing Technology Management<br>• International Journal of Technology Management (Inderscience) |
| B+ | • Journal relevant to the field of IE science<br>• Published more than 5 years or less than 5 years but from reputable publishers such as Elsevier, Taylor & Francis, Wiley, Emerald, Springer<br>• Inderscience publications<br>• Acceptance rate is relatively high | • Operations Research Perspective<br>• Manufacturing and Production Research<br>• International Journal of Logistics Systems and Management<br>• International Journal of Operational Research<br>• International Journal of Systems and Industrial Engineering |
| B | • Journal relevant to the field of IE science<br>• Acceptance rate is relatively high | Journals from relatively new publishers, especially not from highly reputable publishers |

## 11. Presentation at International Seminar

Industrial Engineering Doctoral Program students have an obligation to present at international seminars to disseminate their research results and to create an academic atmosphere and networking with other researchers from within and outside the country. Some of the conditions of this presentation are:

- Students presented 3 paper presentations during the DTSI ITS Industrial Engineering Doctoral Program study period.
- A total of three papers that have been presented orally at seminars, of which at least one paper was presented at a reputable international seminar, with the approval of the supervisor.
- The distance between international seminars attended is at least one semester, but students are expected to do it once a year.
- It is advisable to choose international seminars either held domestically or abroad. However, as a requirement, at least one of the forums attended should be an international seminar.
- The international seminar in question is a seminar that is attended by participants from various countries (at least 4 different countries) and the committee also involves experts from various countries.

Highly reputable international seminars in Industrial Engineering are organized by established associations such as INFORMS, IIE, Decision Science Institute (DSI), Production and Operations Management Society (POMS), Operations Research

Society (UK), International Foundation for Production Research (IFPR), EUROMA, IEEE, APIEMS, etc.

## 12. Closing

This handbook is made to help students and supervisors to understand and make agreements in the work and evaluation of Doctoral students, especially at the research stage (making dissertations). This guide still refers to and is used as a complement to the quality standards of the ITS postgraduate program.