Department of Physics
Faculty of Mathematics and Natural Sciences
Universitas Indonesia

Module Handbook

Doctoral Programme in Materials Science

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Curriculum 2024

UNIVERSITAS INDONESIA

Faculty of Mathematics and Natural Sciences

Department of Physics

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Contents

Literature Review 1 (R)

Module designation	*Literature Review 1 (R)*
Semester(s) in which the module is taught	*1st*
Person responsible for the module	*Team teaching (thesis supervisors)*
Language	*Indonesia*
Relation to curriculum	*Compulsory module for Materials Science Doctoral Program*
Teaching methods	*Independent activities, discussion and project*
Workload (incl. contact hours, self-study hours)	*1. Exercises and assignments: 5 x 60 = 300 minutes per week* *2. Independent study: 5 x 60 = 300 minutes per week*
Credit points	*5/9 (credit points/ECTS)*
Required and recommended prerequisites for joining the module	-
Module objectives/intended learning outcomes	*1. Able to develop logical, critical, systematic and creative thinking in the field of science and technology in accordance with the field of competency in materials science.* *2. Able to explore new scientific problems that are relevant to aspects of materials science knowledge and its applications in a comprehensive and comprehensive manner.* *3. Able to examine laws, theories, or formulas of materials science and their relevant applications to solve new scientific problems comprehensively and scientifically.* *4. Able to apply methods and tools to help solve materials science problems in the form of analytical, numerical or experimental approaches in applying knowledge of materials science and its applications.* *5. Able to utilize information technology in the context of carrying out work by using one of the computer-based applications* *6. Able to compile recommendations on scientific issues and sustainable development based on comprehensive study results involving various fields within the scope of mathematics and science.* *7. Able to adapt to the latest scientific developments by constantly learning new things that are relevant to any job or profession.*

Course description	*Literature Review 1 is a course that contains research preparation in the form of strengthening basic scientific concepts that support research. Students are required to search for, read and analyze the basic theories, concepts of materials science related to research and other supporting research materials, then present the concepts and theories of materials science and have scientific discussions periodically. The main topics of this course are adjusted to the needs of the research theme and other supporting sciences.*
Examination forms	*Oral presentation, discussion and reports*
Study and examination requirements	*Students must obtain a minimum grade B (≥ 70) as detailed in S3.08 Assessment Rubric - Literature Review 1*
Reading list	▪ *Bryan Greetham (2021), How to Write Your Literature Review, Red Globe Press/Macmillan Education* ▪ *C. George Thomas (2021), Research Methodology and Scientific Writing, Springer* ▪ *Gábor L Lövei (2021), Writing and Publishing Scientific Papers: A Primer for the Non-English Speaker, Open Book Publishers* ▪ *Robert E. Berger (2014), A Scientific Approach to Writing for Engineers and Scientists, Wiley-IEEE Press*

Literature Review 2 (R)

Module designation	*Literature Review 2 (R)*
Semester(s) in which the module is taught	*1st*
Person responsible for the module	*Team teaching (thesis supervisors)*
Language	*Indonesia*
Relation to curriculum	*Compulsory module for Materials Science Doctoral Program*
Teaching methods	*Independent activities, discussion and project*
Workload (incl. contact hours, self-study hours)	*1. Exercises and assignments: 5 x 60 = 300 minutes per week* *2. Independent study: 5 x 60 = 300 minutes per week*
Credit points	*5/9 (credit points/ECTS)*
Required and recommended prerequisites for joining the module	-
Module objectives/intended learning outcomes	*1. Able to analyze all aspects of the problems faced based on the concept of materials science and its relevant applications.* *2. Able to analyze comparative data, observations, or calculation results using theoretical, conceptual approaches or related calculation methods.* *3. Able to implement sustainability principles in applying scientific methods and problem-solving strategies in any professional field.* *4. Able to present the latest literature that is relevant to scientific problems or research topics by sourcing it from reputable international journals in sufficient quantities.* *5. Able to analyze trends and developments in a research topic through expert discussions, current literature and other relevant reading sources.* *6. Able to evaluate various current literature related to research topics and criticize them to find potential for developing and updating scientific knowledge in a field of materials science.* *7. Able to present the results of literature studies systematically using good sentence structure and language.*

Course description	*Literature Review 2 is a course that contains presentation and discussion activities on research topics as initial preparation before conducting research. Students are required to search for, read and analyze reputable journal scientific publications, prepare a literature review plan starting from determining the title, problem, background, method in conducting the study and the results of the literature review. Students are asked to review at least 50 reputable scientific journals related to a particular research topic, criticize, explain current research and get research opportunities. Students present the results of the literature review and have scientific discussions periodically. The main topics of this course include the breadth and depth of research topics, mastery of material and scientific systematics.*
Examination forms	*Oral presentation, discussion and reports*
Study and examination requirements	*Students must obtain a minimum grade B ($\geq$ 70) as detailed in S3.09 Assessment Rubric - Literature Review 2*
Reading list	▪ *Bryan Greetham (2021), How to Write Your Literature Review, Red Globe Press/Macmillan Education* ▪ *C. George Thomas (2021), Research Methodology and Scientific Writing, Springer* ▪ *Gábor L Lövei (2021), Writing and Publishing Scientific Papers: A Primer for the Non-English Speaker, Open Book Publishers* ▪ *Robert E. Berger (2014), A Scientific Approach to Writing for Engineers and Scientists, Wiley-IEEE Press*

Proposal (R)

Module designation	*Proposal (R)*
Semester(s) in which the module is taught	*2nd*
Person responsible for the module	*Team teaching (thesis supervisors)*
Language	*Indonesia*
Relation to curriculum	*Compulsory module for Materials Science Doctoral Program*
Teaching methods	*Independent activities, discussion and project*
Workload (incl. contact hours, self-study hours)	*1. Exercises and assignments: 8 x 60 = 480 minutes per week* *2. Independent study: 8 x 60 = 480 minutes per week*
Credit points	*8/14.4 (credit points/ECTS)*
Required and recommended prerequisites for joining the module	-
Module objectives/intended learning outcomes	*1. Able to evaluate various current literature related to research topics and criticize them to find potential for developing and updating scientific knowledge in a field of materials science.* *2. Able to compile new ideas and concepts in the form of research proposals in accordance with scientific problems and topics that will be resolved responsibly based on academic ethics.* *3. Able to design the distribution of workload and time well for working independently and in a team* *4. Able to compile a proposal book in accordance with the systematics and writing techniques determined by the guidelines applicable at the university.* *5. Able to present research plan proposals systematically using good sentence structure and language.*

Course description	*The Research Proposal course prepares students in planning and writing research proposals. This course prepares important steps in preparing a quality research plan, starting from formulating research questions, developing a theoretical framework, designing a research methodology, to planning data analysis. This course involves discussions, writing assignments, and possibly small projects that allow students to apply the concepts learned in practical situations. The goal is for students to have strong competencies in designing and writing good research proposals, which can be the basis for conducting further research during the education process.*
Examination forms	*Oral presentation, discussion and reports*
Study and examination requirements	*Students must obtain a minimum grade B (≥ 70) as detailed in S3.12 Research Proposal Exam Assessment Form*
Reading list	▪ *UI Chancellor's Decree No. 2143 of 2017 concerning Technical Guidelines for Writing Final Assignments for Universitas Indonesia Students.* ▪ *On Being a Scientist: A Guide to Responsible Conduct in Research , Third Edition, National Academy of Sciences, USA, 2009.* ▪ *Guidelines for Scientific Publication, Lukman, Suminar Setiadi Ahmadi, Wasmen Manalu, Deden Sumirat Hidayat, Ministry of Research, Technology, and Higher Education Directorate General of Research and Development Strengthening, 2017.* ▪ *C. George Thomas (2021), Research Methodology And Scientific Writing, Springer* ▪ *Gábor L Lövei (2021), Writing and Publishing Scientific Papers: A Primer for the Non-English Speaker, Open Book Publishers* ▪ *Jay D. Gatrell, Gregory D. Bierly, Ryan R. Jensen, Rajiv R. Thakur (2020), Research Design and Proposal Writing in Spatial Science, Springer* ▪ *Robert E. Berger (2014), A Scientific Approach to Writing for Engineers and Scientists, Wiley-IEEE Press*

Scientific Publication (R)

Module designation	*Scientific Publication (R)*
Semester(s) in which the module is taught	*3rd*
Person responsible for the module	*Team teaching (thesis supervisors)*
Language	*Indonesia*
Relation to curriculum	*Compulsory module for Materials Science Doctoral Program*
Teaching methods	*Independent activities, discussion and project*
Workload (incl. contact hours, self-study hours)	*1. Exercises and assignments: 8 x 60 = 480 minutes per week* *2. Independent study: 8 x 60 = 480 minutes per week*
Credit points	*8/14.4 (credit points/ECTS)*
Required and recommended prerequisites for joining the module	-
Module objectives/intended learning outcomes	*1. Able to deepen or expand the knowledge of materials science by producing an original, accurate, tested and innovative model, method or theory development that is useful for industry and society.* *2. Able to present contributions of valuable insights and knowledge appropriately and comprehensively in the form of scientific writing.* *3. Able to communicate ideas, thoughts and scientific arguments through scientific writings*
Course description	*The Scientific Publication course prepares students to understand, evaluate, and produce quality scientific publications. This course guides students in choosing the type of publication, writing an abstract, introduction, methods, results, discussion, and bibliography, choosing an appropriate journal or conference for publication, knowing the principles of ethics in scientific publication, including copying and other academic fraud. In addition, students are also guided to learn about how to evaluate the quality of scientific publications, both in terms of content and the reputation of the journal or conference. This course involves discussions, writing assignments, and analysis and criticism of existing scientific publications. The goal is to equip students with the skills and knowledge needed to succeed in the scientific publication process, both as writers and critical readers to succeed in publishing their own research results.*

Examination forms	*Reports*
Study and examination requirements	*Students must have minimum a manuscript under review in an international conference proceeding*
Reading list	▪ *On Being a Scientist: A Guide to Responsible Conduct in Research, Third Edition, National Academy of Sciences, USA, 2009.* ▪ *Guidelines for Scientific Publication, Lukman, Suminar Setiadi Ahmadi, Wasmen Manalu, Deden Sumirat Hidayat, Ministry of Research, Technology, and Higher Education Directorate General of Research and Development Strengthening, 2017* ▪ *C. George Thomas (2021), Research Methodology and Scientific Writing, Springer* ▪ *Gábor L Lövei (2021), Writing and Publishing Scientific Papers: A Primer for the Non-English Speaker, Open Book Publishers* ▪ *Robert E. Berger (2014), A Scientific Approach to Writing for Engineers and Scientists, Wiley-IEEE Press*

Research Progress 1 (R)

Module designation	*Research Progress 1 (R)*
Semester(s) in which the module is taught	*3rd*
Person responsible for the module	*Team teaching (thesis supervisors)*
Language	*Indonesia*
Relation to curriculum	*Compulsory module for Materials Science Doctoral Program*
Teaching methods	*Independent activities, discussion and project*
Workload (incl. contact hours, self-study hours)	*1. Exercises and assignments: 10 x 60 = 600 minutes per week* *2. Independent study: 10 x 60 = 600 minutes per week*
Credit points	*10/18 (credit points/ECTS)*
Required and recommended prerequisites for joining the module	-
Module objectives/intended learning outcomes	*1. Able to implement sustainability principles in applying scientific methods and problem-solving strategies in any professional field.* *2. Able to apply scientific methodology in conducting research by considering guidelines, ethics, safety, and environmental impact.* *3. Able to implement and update knowledge of materials science and its applications through research to contribute to solving problems in industry and society.* *4. Able to work with colleagues in completing a research and development project* *5. Able to decide the goals, strategies, and tasks*
Course description	*The Research Results Examination 1 course aims to determine and evaluate students' ability to present research findings clearly and cohesively, obtain constructive feedback, and practice communicating effectively. This course guides students in constructing a logical and orderly presentation structure, including the use of images, tables, and graphs to support data presentation. This course also encourages the development of strong oral communication skills, including the ability to speak clearly, explain complex concepts, and answer questions confidently. Student success is based on clear criteria for evaluating presentations and students' knowledge of their own research, as well as providing useful feedback for further development.*

Examination forms	*Oral presentation, discussion and reports*
Study and examination requirements	*Students must obtain a minimum grade B (≥ 70) as detailed in S3.18 Assessment Rubric for Research Results Examination 1*
Reading list	▪ *On Being a Scientist: A Guide to Responsible Conduct in Research , Third Edition, National Academy of Sciences, USA, 2009.* ▪ *Guidelines for Scientific Publication, Lukman, Suminar Setiadi Ahmadi, Wasmen Manalu, Deden Sumirat Hidayat, Ministry of Research, Technology, and Higher Education Directorate General of Research and Development Strengthening, 2017* ▪ *C. George Thomas (2021), Research Methodology and Scientific Writing, Springer* ▪ *Gábor L Lövei (2021), Writing and Publishing Scientific Papers: A Primer for the Non-English Speaker, Open Book Publishers* ▪ *Robert E. Berger (2014), A Scientific Approach to Writing for Engineers and Scientists, Wiley-IEEE Press*

Research Progress 2 (R)

Module designation	*Research Progress 2 (R)*
Semester(s) in which the module is taught	*4th*
Person responsible for the module	*Team teaching (thesis supervisors)*
Language	*Indonesia*
Relation to curriculum	*Compulsory module for Materials Science Doctoral Program*
Teaching methods	*Independent activities, discussion and project*
Workload (incl. contact hours, self-study hours)	*1. Exercises and assignments: 10 x 60 = 600 minutes per week* *2. Independent study: 10 x 60 = 600 minutes per week*
Credit points	*10/18 (credit points/ECTS)*
Required and recommended prerequisites for joining the module	-
Module objectives/intended learning outcomes	*1. Able to internalize the spirit of independence, struggle, and entrepreneurship based on academic values, norms, and ethics.* *2. Able to analyze data, observations, calculation results or simulations obtained through research supported by related theories* *3. Able to solve new scientific problems and sustainable development through an inter- or multidisciplinary approach characterized by the production of comprehensive valuable insights, methods, knowledge and technology.* *4. Able to communicate effectively in research and development projects* *5. Able to monitor and evaluate the objectives, strategies and tasks of each member of the research team in carrying out research periodically.* *6. Able to convey data information, observations, or calculation results in detail using images, tables and graphs that support research results.*

Course description	*The Research Results Examination 2 course aims to determine and evaluate students' ability to present research findings clearly and cohesively, obtain constructive feedback, and practice communicating effectively. This course guides students in constructing a logical and orderly presentation structure, including the use of images, tables, and graphs to support data presentation. This course also encourages the development of strong oral communication skills, including the ability to speak clearly, explain complex concepts, and answer questions confidently. Student success is based on clear criteria for evaluating presentations and students' knowledge of their own research, as well as providing useful feedback for further development.*
Examination forms	*Oral presentation, discussion and reports*
Study and examination requirements	*Student must obtain a minimum grade B (≥ 70) as detailed in S3.18B Assessment Rubric for Research Results Examination 2*
Reading list	▪ *On Being a Scientist: A Guide to Responsible Conduct in Research , Third Edition, National Academy of Sciences, USA, 2009.* ▪ *Guidelines for Scientific Publication, Lukman, Suminar Setiadi Ahmadi, Wasmen Manalu, Deden Sumirat Hidayat, Ministry of Research, Technology, and Higher Education Directorate General of Research and Development Strengthening, 2017* ▪ *C. George Thomas (2021), Research Methodology and Scientific Writing, Springer* ▪ *Gábor L Lövei (2021), Writing and Publishing Scientific Papers: A Primer for the Non-English Speaker, Open Book Publishers* ▪ *Robert E. Berger (2014), A Scientific Approach to Writing for Engineers and Scientists, Wiley-IEEE Press*

International Publication 1 (R)

Module designation	*International Publication 1 (R)*
Semester(s) in which the module is taught	*4th*
Person responsible for the module	*Team teaching (thesis supervisors)*
Language	*Indonesia*
Relation to curriculum	*Compulsory module for Materials Science Doctoral Program*
Teaching methods	*Independent activities, discussion, project and seminar*
Workload (incl. contact hours, self-study hours)	*1. Exercises and assignments: 8 x 60 = 480 minutes per week* *2. Independent study: 8 x 60 = 480 minutes per week*
Credit points	*8/14.4 (credit points/ECTS)*
Required and recommended prerequisites for joining the module	-
Module objectives/intended learning outcomes	*1. Able to analyze data, observations, calculation results or simulations obtained through research supported by related theories* *2. Able to deepen or expand scientific knowledge of materials by producing original, accurate, tested and innovative models, methods or theoretical developments that are useful for industry and society.* *3. Able to convey data information, observations, or calculation results in detail using images, tables and graphs that support research results.* *4. Able to present contributions of valuable insights and knowledge accurately and comprehensively in the form of scientific paper drafts.*
Course description	*The International Publication course examines all activities for scientific publications starting with selecting the journal to be targeted, understanding the guide for authors, creating a writing framework, processing and analyzing data, literature searches, to compiling manuscripts and submitting them to the target journal. Students become the main authors accompanied by a supervisor. The output of this course is an international journal indexed by SCOPUS.*
Examination forms	*Reports*
Study and examination requirements	*Students must have an article manuscript with target publication in scopus indexed journals*

Reading list	▪ *On Being a Scientist: A Guide to Responsible Conduct in Research , Third Edition, National Academy of Sciences, USA, 2009.* ▪ *Guidelines for Scientific Publication, Lukman, Suminar Setiadi Ahmadi, Wasmen Manalu, Deden Sumirat Hidayat, Ministry of Research, Technology, and Higher Education Directorate General of Research and Development Strengthening, 2017* ▪ *C. George Thomas (2021), Research Methodology and Scientific Writing, Springer* ▪ *Gábor L Lövei (2021), Writing and Publishing Scientific Papers: A Primer for the Non-English Speaker, Open Book Publishers* ▪ *Robert E. Berger (2014), A Scientific Approach to Writing for Engineers and Scientists, Wiley-IEEE Press*

International Publication 2 (R)

Module designation	*International Publication 2 (R)*
Semester(s) in which the module is taught	*5th*
Person responsible for the module	*Team teaching (thesis supervisors)*
Language	*Indonesia*
Relation to curriculum	*Compulsory module for Materials Science Doctoral Program*
Teaching methods	*Independent activities, discussion, project and seminar*
Workload (incl. contact hours, self-study hours)	*1. Exercises and assignments: 10 x 60 = 600 minutes per week* *2. Independent study: 10 x 60 = 600 minutes per week*
Credit points	*10/18 (credit points/ECTS)*
Required and recommended prerequisites for joining the module	-
Module objectives/intended learning outcomes	*1. Able to analyze data, observations, calculation results or simulations obtained through research supported by related theories* *2. Able to deepen or expand the scientific knowledge of materials science or applied materials science by producing an original, accurate, tested and innovative model, method or theory development that is useful for industry and society.* *3. Able to convey data information, observations, or calculation results in detail using images, tables and graphs that support research results.* *4. Able to present contributions of valuable insights and knowledge accurately and comprehensively in the form of scientific paper drafts.*
Course description	*The International Publication 2 course examines all activities for scientific publications starting with selecting the journal to be targeted, understanding the guide for authors, creating a writing framework,* *processing and analyzing data, literature searches, to compiling manuscripts and submitting them to the target journal. Students become the main authors accompanied by a supervisor. The output of this course is an international journal indexed by SCOPUS.*
Examination forms	*Reports*

Study and examination requirements	*Students must achieve a final grade of B or higher (Having a minimum publication status of "under reviewed" at the International Journal indexed by Scopus).*
Reading list	▪ *On Being a Scientist: A Guide to Responsible Conduct in Research , Third Edition, National Academy of Sciences, USA, 2009.* ▪ *Guidelines for Scientific Publication, Lukman, Suminar Setiadi Ahmadi, Wasmen Manalu, Deden Sumirat Hidayat, Ministry of Research, Technology, and Higher Education Directorate General of Research and Development Strengthening, 2017* ▪ *C. George Thomas (2021), Research Methodology and Scientific Writing, Springer* ▪ *Gábor L Lövei (2021), Writing and Publishing Scientific Papers: A Primer for the Non-English Speaker, Open Book Publishers* ▪ *Robert E. Berger (2014), A Scientific Approach to Writing for Engineers and Scientists, Wiley-IEEE Press*

Dissertation Exam 1

Module designation	*Dissertation Exam 1*
Semester(s) in which the module is taught	*5th*
Person responsible for the module	*Team teaching (thesis supervisors)*
Language	*Indonesia*
Relation to curriculum	*Compulsory module for Materials Science Doctoral Program*
Teaching methods	*Independent activities, discussion, project and seminar*
Workload (incl. contact hours, self-study hours)	*1. Exercises and assignments: 8 x 60 = 480 minutes per week* *2. Independent study: 8 x 60 = 480 minutes per week*
Credit points	*8/14.4 (credit points/ECTS)*
Required and recommended prerequisites for joining the module	-
Module objectives/intended learning outcomes	*1. Able to analyze data, observations, calculation results or simulations obtained through research supported by related theories* *2. Able to implement and update knowledge of materials science and its applications through research to contribute to solving problems in industry and society.* *3. Able to manage networks with colleagues, peers within institutions and the wider Materials Science research community.* *4. Able to resolve technical problems and constraints for each team member in conducting research to complete targets according to the specified time.* *5. Able to present work and research results systematically using good sentence structure and language.*

Course description	*Dissertation Examination 1 is the final stage in the doctoral program where students are examined on their dissertation, which is the student's original contribution to knowledge in the field of materials science and its applications. This course evaluates the student's ability to design, conduct, and present original and substantial scientific research. This course also provides guidance on the proper structure of a dissertation, including the required chapters such as introduction, literature review, research methodology, results, analysis, and conclusion. The course introduces the dissertation defence process, where students will present their research results to a panel of examiners and answer questions and provide clarification on the material presented. This course has clear evaluation criteria to assess the quality of the dissertation and the student's performance during the defence, as well as provide constructive feedback for further development.*
Examination forms	*Oral presentation and reports*
Study and examination requirements	*Based on the S3.26. Assessment Rubric for Dissertation 1, students must achieve a final score of 70 or higher, and their research achievement must be at least 85%.*
Reading list	▪ *On Being a Scientist: A Guide to Responsible Conduct in Research, Third Edition, National Academy of Sciences, USA, 2009.* ▪ *Guidelines for Scientific Publication, Lukman, Suminar Setiadi Ahmadi, Wasmen Manalu, Deden Sumirat Hidayat, Ministry of Research, Technology, and Higher Education Directorate General of Research and Development Strengthening, 2017* ▪ *C. George Thomas (2021), Research Methodology and Scientific Writing, Springer* ▪ *Gábor L Lövei (2021), Writing and Publishing Scientific Papers: A Primer for the Non-English Speaker, Open Book Publishers* ▪ *Robert E. Berger (2014), A Scientific Approach to Writing for Engineers and Scientists, Wiley-IEEE Press*

Dissertation Exam 2

Module designation	*Dissertation Exam 2*
Semester(s) in which the module is taught	*6th*
Person responsible for the module	*Team teaching (thesis supervisors)*
Language	*Indonesia*
Relation to curriculum	*Compulsory module for Materials Science Doctoral Program*
Teaching methods	*Independent activities, discussion, project and seminar*
Workload (incl. contact hours, self-study hours)	*1. Exercises and assignments: 12 x 60 = 720 minutes per week* *2. Independent study: 12 x 60 = 720 minutes per week*
Credit points	*12/21.6 (credit points/ECTS)*
Required and recommended prerequisites for joining the module	-
Module objectives/intended learning outcomes	*1. Able to conclude research results carefully related to the discussion of research results and answer research problems and objectives clearly* *2. Able to solve new scientific problems and sustainable development through an inter- or multidisciplinary approach characterized by the production of comprehensive valuable insights, methods, knowledge and technology.* *3. Able to be accountable for the results of research and development project work* *4. Able to resolve technical problems and constraints for each team member in conducting research to complete targets according to the specified time.* *5. Able to compile a dissertation book systematically in accordance with the writing techniques determined by the guidelines applicable at the university.* *6. Able to argue in presenting work and research results clearly, straightforwardly, precisely, and well/politely based on data evidence.*

Course description	*Dissertation Défense 2 is the final stage in the doctoral program where students are examined on their dissertation, which is the student's original contribution to knowledge in the field of materials science and its applications. This course evaluates the student's ability to design, conduct, and present original and substantial scientific research. This course also provides guidance on the proper structure of a dissertation, including the required chapters such as introduction, literature review, research methodology, results, analysis, and conclusion. The course introduces the dissertation defense process, where students will present their research results to a panel of examiners and answer questions and provide clarification on the material presented. This course has clear evaluation criteria to assess the quality of the dissertation and the student's performance during the defense, as well as provide constructive feedback for further development. The defense examination of this course is conducted privately in front of the promoter team and the examiner team.*
Examination forms	*Oral presentation and reports*
Study and examination requirements	*Based on the S3.26. Assessment Rubric for Dissertation 2, students must achieve a final score of 70 or higher, and their research achievement must be at 100%.*
Reading list	▪ *UI Chancellor Decree No. 2143 of 2017 concerning Technical Guidelines for Writing Final Assignments for Universitas Indonesia Students* ▪ *On Being a Scientist: A Guide to Responsible Conduct in Research, Third Edition, National Academy of Sciences, USA, 2009.* ▪ *Guidelines for Scientific Publication, Lukman, Suminar Setiadi Ahmadi, Wasmen Manalu, Deden Sumirat Hidayat, Ministry of Research, Technology, and Higher Education Directorate General of Research and Development Strengthening, 2017* ▪ *C. George Thomas (2021), Research Methodology and Scientific Writing, Springer* ▪ *Gábor L Lövei (2021), Writing and Publishing Scientific Papers: A Primer for the Non-English Speaker, Open Book Publishers* ▪ *Robert E. Berger (2014), A Scientific Approach to Writing for Engineers and Scientists, Wiley-IEEE Press*

Doctor Promotion

Module designation	*Doctor Promotion*
Semester(s) in which the module is taught	*6th*
Person responsible for the module	*Team teaching (thesis supervisors)*
Language	*Indonesia*
Relation to curriculum	*Compulsory module for Materials Science Doctoral Program*
Teaching methods	*Independent activities, discussion, project and seminar*
Workload (incl. contact hours, self-study hours)	*1. Exercises and assignments: 4 x 60 = 240 minutes per week* *2. Independent study: 4 x 60 = 240 minutes per week*
Credit points	*4/7.2 (credit points/ECTS)*
Required and recommended prerequisites for joining the module	-
Module objectives/intended learning outcomes	*1. Able to conclude research results carefully related to the discussion of research results and answer research problems and objectives clearly* *2. Able to solve new scientific problems and sustainable development through an inter- or multidisciplinary approach characterized by the production of comprehensive valuable insights, methods, knowledge and technology.* *3. Able to communicate ideas, thoughts and scientific arguments through scientific media to the academic community and the wider community.* *4. Able to argue in presenting work and research results clearly, straightforwardly, precisely, and well/politely based on data evidence.*
Course description	*This Doctoral Promotion course is the final stage of the doctoral program where students complete their research and prepare their dissertation to be defended in front of a panel of examiners in public. This course develops strong oral presentation skills, both in preparing presentation materials and in presenting them confidently and clearly. The Doctoral Promotion Defense is conducted to complete and defend their dissertation, and obtain a doctoral degree.*
Examination forms	*Oral presentation and reports*

Study and examination requirements	*Based on the S3.26. Assessment Rubric for Doctoral Promotion, students must achieve a final score of 70 or higher, and their research achievement must be at 100%.*
Reading list	▪ *UI Chancellor Decree No. 2143 of 2017 concerning Technical Guidelines for Writing Final Assignments for Universitas Indonesia Students* ▪ *On Being a Scientist: A Guide to Responsible Conduct in Research , Third Edition, National Academy of Sciences, USA, 2009.* ▪ *Guidelines for Scientific Publication, Lukman, Suminar Setiadi Ahmadi, Wasmen Manalu, Deden Sumirat Hidayat, Ministry of Research, Technology, and Higher Education Directorate General of Research and Development Strengthening, 2017* ▪ *C. George Thomas (2021), Research Methodology and Scientific Writing, Springer* ▪ *Gábor L Lövei (2021), Writing and Publishing Scientific Papers: A Primer for the Non-English Speaker, Open Book Publishers* ▪ *Robert E. Berger (2014), A Scientific Approach to Writing for Engineers and Scientists, Wiley-IEEE Press*

Scientific Literacy

Module designation	*Scientific Literacy*
Semester(s) in which the module is taught	*1st*
Person responsible for the module	*Prof. Dr. Azwar Manaf*
Language	*Indonesia*
Relation to curriculum	*Compulsory module for Materials Science Doctoral Program*
Teaching methods	*Independent activities, discussion, lectures and projects*
Workload (incl. contact hours, self-study hours)	*1. Lectures: 2 x 50 minutes per week = 100 minutes per week* *2. Exercises and assignments: 2 x 60 = 120 minutes per week* *3. Independent study: 2 x 60 = 120 minutes per week*
Credit points	*2/3.6 (credit points/ECTS)*
Required and recommended prerequisites for joining the module	-
Module objectives/intended learning outcomes	*1. Able to explain the structure of science philosophically* *2. Able to act independently intellectually, tolerantly, and free from dogmatic entanglements* *3. Able to apply ethics in science* *4. Able to select, organize and critically evaluate the latest scientific information sources* *5. Able to apply positivist and phenomenological thinking* *6. Able to apply correct research methodology with strong academic integrity*

Course description	*The Scientific Literacy course is a compulsory course given to first-semester students taking the Research Course path. First-semester students are expected to be able to critically evaluate the latest developments in material science and technology, then be able to identify and analyze problems in the field of material science and be able to formulate scientifically responsible solutions through a multidisciplinary approach and be beneficial to humanity. The scope of this course includes written, numerical, and digital literacy related to the understanding of science, methodology, observation, and theory. Lecture delivered with flipped classroom and cooperative learning methods. Lectures are presented online via EMAS and delivered in Indonesian.*
Examination forms	*Exam and reports*
Study and examination requirements	*1. Students must have attended at least 75% of the lectures to be able to sit in the final exam and submit a final report.* *2. Students must achieve a final grade of B or higher (≥70).*
Reading list	▪ *Scientific journal articles* ▪ *Textbooks and monographs related to specific topics*

Advanced Material Structures

Module designation	*Advanced Material Structures*
Semester(s) in which the module is taught	*1st*
Person responsible for the module	*Prof. Dr. Azwar Manaf* *Prof. Dra. Ariadne Lakshmidevi, M.Eng., Ph.D.*
Language	*Indonesia*
Relation to curriculum	*Compulsory module for Materials Science Doctoral Program*
Teaching methods	*Independent activities, discussion, lectures and projects*
Workload (incl. contact hours, self-study hours)	*1. Lectures: 3 x 50 minutes per week = 150 minutes per week* *2. Exercises and assignments: 3 x 60 = 180 minutes per week* *3. Independent study: 3 x 60 = 180 minutes per week*
Credit points	*3/5.4 (credit points/ECTS)*
Required and recommended prerequisites for joining the module	-
Module objectives/intended learning outcomes	*1. Able to conduct an integrated study of advanced crystal structures* *2. Able to examine advanced metal structures* *3. Able to study advanced Ceramic structures* *4. Able to study advanced polymer structures* *5. Able to examine advanced composite structures*
Course description	*The Advanced Material Structure course is a compulsory course given to first semester students. After taking the Advanced Material Structure course, students are able to develop the basics of crystallography and relate them to various developments and current developments regarding advanced metal structures, advanced ceramics, advanced polymers and advanced composites appropriately. Lectures are delivered using the Interactive Lecture method, Flipped classroom, Cooperative Learning and case studies. Lectures are presented online through EMAS and delivered in Indonesian.*
Examination forms	*Exams and reports*
Study and examination requirements	*1. Students must have attended at least 75% of the lectures to be able to sit in the final exam and submit a final report.* *2. Students must achieve a final grade of B or higher (≥70).*

Reading list	▪ *J. Martin, Elementary Crystallography: An Introduction to the Fundamental Geometrical Features of Crystals. Cambrige, MA: MIT Press, 1978.* ▪ *Robert E. Reed-Hill, Reza Abbaschian, Lara Abbaschian, Physical Metallurgy Principles, Stanford, CT, 2008.*

Advanced Material Properties and Performance

Module designation	*Advanced Material Properties and Performance*
Semester(s) in which the module is taught	*1st*
Person responsible for the module	*Januar Widakdo, S.Si., M.Sc., Ph.D.* *Ferry Anggoro Ardy Nugroho, B.Eng., M.Sc., Ph.D.*
Language	*Indonesia*
Relation to curriculum	*Compulsory module for Materials Science Doctoral Program*
Teaching methods	*Independent activities, discussion, lectures and projects*
Workload (incl. contact hours, self-study hours)	*1. Lectures: 3 x 50 minutes per week = 150 minutes per week* *2. Exercises and assignments: 3 x 60 = 180 minutes per week* *3. Independent study: 3 x 60 = 180 minutes per week*
Credit points	*3/5.4 (credit points/ECTS)*
Required and recommended prerequisites for joining the module	-
Module objectives/intended learning outcomes	*1. Able to identify and examine advanced mechanical properties* *2. Able to identify and examine advanced electrical and optical properties)* *3. Able to identify and examine advanced magnetic and thermal properties* *4. Able to identify and examine metal corrosion and advanced material degradation*
Course description	*Advanced Material Properties and Performance course is a compulsory course given to first semester students. Students are expected to be able to examine in an integrated manner the latest developments and developments in the structure, properties, processing, and performance of material systems. Lectures are delivered using the Flipped classroom and Cooperative Learning methods. Lectures are presented online through EMAS and delivered in Indonesian.*
Examination forms	*Exam and reports*
Study and examination requirements	*1. Students must have attended at least 75% of the lectures to be able to sit in the final exam and submit a final report.* *2. Students must achieve a final grade of B or higher (≥70).*

Reading list	▪ *Singleton, John. Band Theory and Electronic Properties of Solids. Oxford, England: Oxford University Press, 2001. ISBN: 9780198506447.* ▪ *Fox, Mark. Optical Properties of Solids. Oxford, England: Oxford University Press, 2002. ISBN: 9780198506126.* ▪ *Kittel, Charles. "Physical Theory of Ferromagnetic Domains." Reviews of Modern Physics 21 (October 1949): 541-583.* ▪ *Blundell, Stephen. Magnetism in Condensed Matter. New York, NY: Oxford University Press USA, 2001. ISBN: 9780198505914.* ▪ *Ashcroft, Neil W., and N. David Mermin. Solid State Physics. Belmont, CA: Brooks/Cole, 1976. ISBN: 9780030839931.* ▪ *Kittel, Charles. Introduction to Solid State Physics. Hoboken, NJ: Wiley, 2004. ISBN: 9780471415268.* ▪ *Bransden, B. H., and C. J. Joachain. Quantum Mechanics. 2nd ed. San Francisco, CA: Benjamin Cummings, 2000. ISBN: 9780582356917.* ▪ *Physics of Atoms and Molecules. 2nd ed. San Francisco, CA: Benjamin Cummings, 2003. ISBN: 9780582356924.* ▪ *Jiles, David. Introduction to Magnetism and Magnetic Materials. New York, NY: Chapman and Hall, 1998. ISBN: 9780412798603.* ▪ *Cullity, B. D., and C. D. Graham. Introduction to Magnetic Materials. New York, NY: Wiley-IEEE Press, 2008. ISBN: 9780471477419.* ▪ *Morrish, Allan H. The Physical Principles of Magnetism. New York, NY: Wiley-IEEE Press, 2001. ISBN: 9780780360297.* ▪ *Spaldin, Nicola A. Magnetic Materials: Fundamentals and Device Applications. Cambridge, UK: Cambridge University Press, 2003. ISBN: 9780521016582.* ▪ *O'Handley, Robert C. Modern Magnetic Materials: Principles and Applications. New York, NY: Wiley-Interscience, 1999. ISBN: 9780471155669.*

Integrated Science and Mathematics

Module designation	*Integrated Science and Mathematics*
Semester(s) in which the module is taught	*1st*
Person responsible for the module	*Team teaching*
Language	*Indonesia*
Relation to curriculum	*Compulsory module for Materials Science Doctoral Program*
Teaching methods	*Independent activities, discussion, lectures and projects*
Workload (incl. contact hours, self-study hours)	*1. Lectures: 4 x 50 minutes per week = 200 minutes per week* *2. Exercises and assignments: 4 x 60 = 240 minutes per week* *3. Independent study: 4 x 60 = 240 minutes per week*
Credit points	*4/7.2 (credit points/ECTS)*
Required and recommended prerequisites for joining the module	-
Module objectives/intended learning outcomes	*- Able to develop logical, critical, systematic and creative thinking in examining sustainable development problems.* *- Able to recommend collaborative solutions to sustainable development problems by involving various fields in the scope of mathematics and science.* *- Able to adapt to the latest scientific developments through lifelong learning that is relevant to work or profession.*
Course description	*This course combines various disciplines of science and mathematics to provide a comprehensive understanding of solving a scientific problem. The course is a cross-border study that cannot be limited to one academic discipline. The focus is on explaining how to use mathematical and scientific principles to understand, analyze, and explain various scientific problems in a multi-disciplinary manner. This course aims to help students develop analytical, problem-solving, and critical thinking skills needed to address challenges in modern science. It also helps them understand the close relationship between mathematics and science, and the relevance of mathematics in understanding and research in various fields of science.*
Examination forms	*Oral presentation and reports*

Study and examination requirements	1. *Students must have attended at least 75% of the lectures to be able to have a presentation and submit a final report.* 2. *Students must achieve a final grade of B or higher (≧70).*
Reading list	▪ *Scientific journal articles* ▪ *Textbooks and monographs related to specific topics*

Philosophy of Science

Module designation	*Philosophy of Science*
Semester(s) in which the module is taught	*1st*
Person responsible for the module	*Prof. Dr. Terry Mart, S.Si.*
Language	*Indonesia*
Relation to curriculum	*Compulsory module for Materials Science Doctoral Program*
Teaching methods	*Independent activities, discussion, lectures and projects*
Workload (incl. contact hours, self-study hours)	*1. Lectures: 2 x 50 minutes per week = 100 minutes per week* *2. Exercises and assignments: 2 x 60 = 120 minutes per week* *3. Independent study: 2 x 60 = 120 minutes per week*
Credit points	*2/3.6 (credit points/ECTS)*
Required and recommended prerequisites for joining the module	-
Module objectives/intended learning outcomes	*- Able to develop logical, critical, systematic and creative thinking based on the concept of the philosophy of science* *- Able to recognize the philosophy of science as a basis for understanding science comprehensively and thoroughly* *- Able to link science and culture as an inseparable part of the philosophy of science* *- Able to adapt to the latest scientific developments by continually learning new things that are relevant to any job or profession*
Course description	*Philosophy of Science courses address fundamental concepts and questions about the nature, limits, and methodology of science. It is the study of the origins, development, and nature of human knowledge, and the ways in which we understand the world around us. It examines the history of philosophical thought about the nature of science, including concepts such as reality, truth, justification, reasoning, the scientific method, and the relationship between science and other beliefs such as religion or philosophy. The focus of the course may include analysis of classical and modern philosophical theories and their application to contemporary issues in science and society. In addition, the course often encourages students to think critically, evaluate arguments, and develop a deeper understanding of the nature and limits of human knowledge.*

Examination forms	*Oral presentation and reports*
Study and examination requirements	1. *Students must have attended at least 75% of the lectures to be able to have a presentation and submit a final report.* 2. *Students must achieve a final grade of B or higher (≥70).*
Reading list	▪ *Kuhn, T.S., Sautoy, D.M., & Hacking, I. (2020). The structure of Scientific Revolutions. Folio Society Ltd.* ▪ *Poincaré, H., Smith, A.E., Stump, D.J., & Frappier, M. (2022). Science and hypothesis. Bloomsbury Academic.* ▪ *Popper, K. R. (2014). The logic of Scientific Discovery. Martino Publishing.*

Advanced Thermodynamics and Kinetics of Materials

Module designation	*Advanced Thermodynamics and Kinetics of Materials*
Semester(s) in which the module is taught	*2nd*
Person responsible for the module	*Team teaching*
Language	*Indonesia*
Relation to curriculum	*Compulsory module for Materials Science Doctoral Program*
Teaching methods	*Independent activities, discussion, lectures and projects*
Workload (incl. contact hours, self-study hours)	*1. Lectures: 3 x 50 minutes per week = 150 minutes per week* *2. Exercises and assignments: 3 x 60 = 180 minutes per week* *3. Independent study: 3 x 60 = 180 minutes per week*
Credit points	*3/5.4 (credit points/ECTS)*
Required and recommended prerequisites for joining the module	-
Module objectives/intended learning outcomes	*1. Able to apply advanced thermodynamic principles in the solidification process (liquid-solid phase transformation) and reconstruct phase diagrams* *2. Able to apply advanced thermodynamic principles in analyzing phase diagrams* *3. Time Temperature Transformation (TTT) and Continuous Cooling Transformation (CCT) diagrams as well as advanced material interphase equilibrium* *4. Able to apply electrochemical principles to oxidation and degradation events of materials*

Course description	*The Advanced Thermodynamics and Kinetics of Materials course is intended to be a comprehensive reference for Doctoral students of materials science in solving material problems, evaluating them, making design analysis and theoretical and experimental designs from the aspects of thermodynamics and kinetics of phase transformations. The discussion of the material includes the explanation and application of statistical and classical thermodynamic principles to materials, including enthalpy, entropy, free energy, and others. The use of thermodynamic laws on the relationship of material properties includes chemical potential, heat capacity, compressibility, magnetism, and others.* *In this course, the relationship of multiphase equilibrium in solutions (liquid and solid) is demonstrated, constructing, interpreting and using phase diagrams, explaining phase changes, introducing statistical aspects in thermodynamics in relation to macroscopic equilibrium phenomena, crystal defect formation, and electrochemical equilibrium.* *This course also discusses aspects of phase transformation kinetics such as changes in system free energy, nucleation and transformation rates, free energy diagrams, phase diagrams, transformation diagrams (TTT and CCT diagrams) and diffusion kinetics and shows the role of aspects of phase transformation and its kinetics in material problems when subjected to thermal treatment. After completing the learning from the Advanced Thermodynamics and Kinetics of Materials course, students are able to apply the principles of material thermodynamics in planning material research and evaluate the material response to thermal treatment received by the material with the latest developments.*
Examination forms	*Exams and reports*
Study and examination requirements	*1. Students must have attended at least 75% of the lectures to be able to sit in the final exam and submit a final report.* *2. Students must achieve a final grade of B or higher (≥70).*
Reading list	▪ *David V. Ragone, Thermodynamics of Materials, Volumes I & II, John Wiley & Sons, 1995.* ▪ *DA Porter and KE Easterling, Phase Transformations in Metals and Alloys , Van Nostrand Reinhold, New York, 1981* ▪ *Robert W. Balluffi, Samuel M. Allen, and W. Craig Carter, Kinetics of Materials, Hoboken, NJ: J. Wiley and Sons, 2005.*

Advanced Materials Characterization and Analysis

Module designation	*Advanced Materials Characterization and Analysis*
Semester(s) in which the module is taught	*2nd*
Person responsible for the module	*Dr. Budhy Kurniawan R., M.Si.* *Ferry Anggoro Ardy Nugroho, B.Eng., M.Sc., Ph.D.*
Language	*Indonesia*
Relation to curriculum	*Compulsory module for Materials Science Doctoral Program*
Teaching methods	*Independent activities, discussion, lectures and projects*
Workload (incl. contact hours, self-study hours)	*1. Lectures: 3 x 50 minutes per week = 150 minutes per week* *2. Exercises and assignments: 3 x 60 = 180 minutes per week* *3. Independent study: 3 x 60 = 180 minutes per week*
Credit points	*3/5.4 (credit points/ECTS)*
Required and recommended prerequisites for joining the module	-
Module objectives/intended learning outcomes	*1. Able to analyze the results of X-Ray & Neutron Diffraction characterization and various types of microscopes responsibly* *2. Able to analyze the results of FTIR and Raman spectroscopy characterization, as well as the results of mechanical property testing according to standards* *3. magnetic and thermal properties tests according to standards* *4. Able to analyze the results of electrical and optical properties tests according to standards*
Course description	*Material Characterization & Analysis course is a compulsory course given to 2nd semester students. Students are expected to be able to analyze deeply and be able to scientifically justify various types of advanced characterization. Scope of the course Advanced Material Characterization & Analysis is characterization with Advanced X-Ray & Neutron Diffraction Techniques, with various types of microscopes, FTIR and Raman spectroscopy, testing of mechanical properties, magnetic properties, thermal properties, electrical properties and optical properties. Lecture delivered with method Flipped classroom, Cooperative Learning, case study and Focus Group Discussion. Lectures are presented online via EMAS and delivered in Indonesian.*

Examination forms	*Oral presentation and reports*
Study and examination requirements	*1. Students must have attended at least 75% of the lectures to be able to sit in the final exam and submit a final report.* *2. Students must achieve a final grade of B or higher (≥70).*
Reading list	• *O'Handley, R. C. Modern Magnetic Materials, Principles and Applications. New York: John Wiley and Sons, 1999. ISBN: 9780471155669.* • *Saleh, B. E. A., and M. C. Teich. Fundamentals of Photonics. New York, NY: Wiley, 1991. ISBN: 9780471839651.* • *Singleton, John. Band Theory and Electronic Properties of Solids. Oxford, England: Oxford University Press, 2001. ISBN: 9780198506447.*

Scientific Publication

Module designation	*Scientific Publication*
Semester(s) in which the module is taught	*3rd*
Person responsible for the module	*Thesis Supervisor*
Language	*Indonesia*
Relation to curriculum	*Compulsory module for Materials Science Doctoral Program*
Teaching methods	*Independent activities, discussion, projects and seminar*
Workload (incl. contact hours, self-study hours)	*1. Exercises and assignments: 6 x 60 = 360 minutes per week* *2. Independent study: 6 x 60 = 360 minutes per week*
Credit points	*6/10.8 (credit points/ECTS)*
Required and recommended prerequisites for joining the module	-
Module objectives/intended learning outcomes	*1. Able to deepen or expand the scientific knowledge of materials science by producing an original, accurate, tested and innovative model, method or theory development that is useful for industry and society.* *2. Able to present contributions of valuable insights and knowledge appropriately and comprehensively in the form of scientific writing.* *3. Able to communicate ideas, thoughts and scientific arguments through scientific media to the academic community and the wider community.*

Course description	*The Scientific Publication course prepares students to understand, evaluate, and produce quality scientific publications. This course guides students in choosing the type of publication, writing an abstract, introduction, methods, results, discussion, and bibliography, choosing an appropriate journal or conference for publication, knowing the principles of ethics in scientific publication, including copying and other academic fraud. In addition, students are also guided to learn about how to evaluate the quality of scientific publications, both in terms of content and the reputation of the journal or conference. This course involves discussions, writing assignments, and analysis and criticism of existing scientific publications. The goal is to equip students with the skills and knowledge needed to succeed in the scientific publication process, both as writers and critical readers to success in publishing their own research results.*
Examination forms	*Reports*
Study and examination requirements	*1 Article under review process. (International conference proceedings not indexed by Scopus, accompanied by a presentation certificate from the International Conference).*
Reading list	▪ *On Being a Scientist: A Guide to Responsible Conduct in Research , Third Edition, National Academy of Sciences, USA, 2009.* ▪ *Guidelines for Scientific Publication, Lukman, Suminar Setiadi Ahmadi, Wasmen Manalu, Deden Sumirat Hidayat, Ministry of Research, Technology, and Higher Education Directorate General of Research and Development Strengthening, 2017* ▪ *Sources related digital libraries C. George Thomas (2021), Research Methodology and Scientific Writing, Springer* ▪ *Gábor L Lövei (2021), Writing and Publishing Scientific Papers: A Primer for the Non-English Speaker, Open Book Publishers* ▪ *Robert E. Berger (2014), A Scientific Approach to Writing for Engineers and Scientists, Wiley-IEEE Press*

International Publication 1

Module designation	*International Publication 1*
Semester(s) in which the module is taught	*4th*
Person responsible for the module	*Team teaching (thesis supervisors)*
Language	*Indonesia*
Relation to curriculum	*Compulsory module for Materials Science Doctoral Program*
Teaching methods	*Independent activities, discussion, lectures and projects*
Workload (incl. contact hours, self-study hours)	*1. Exercises and assignments: 6 x 60 = 360 minutes per week* *2. Independent study: 6 x 60 = 360 minutes per week*
Credit points	*6/10.8 (credit points/ECTS)*
Required and recommended prerequisites for joining the module	-
Module objectives/intended learning outcomes	*1. Able to analyze data, observations, calculation results or simulations obtained through research supported by related theories* *2. Able to deepen or expand scientific knowledge of materials by producing original, accurate, tested and innovative models, methods or theoretical developments that are useful for industry and society.* *3. Able to convey data information, observations, or calculation results in detail using images, tables and graphs that support research results.* *4. Able to present contributions of valuable insights and knowledge accurately and comprehensively in the form of scientific paper drafts.*
Course description	*The International Publication course examines all activities for scientific publications starting with selecting the journal to be targeted, understanding the guide for authors, creating a writing framework, processing and analyzing data, literature searches, to compiling manuscripts and submitting them to the target journal. Students become the main authors accompanied by a supervisor. The output of this course is an international journal indexed by SCOPUS.*
Examination forms	*Reports*
Study and examination requirements	*Student must have an article manuscript for publication (Publication Target: Q2 journal)*

Reading list	▪ *On Being a Scientist: A Guide to Responsible Conduct in Research , Third Edition, National Academy of Sciences, USA, 2009.* ▪ *Guidelines for Scientific Publication, Lukman, Suminar Setiadi Ahmadi, Wasmen Manalu, Deden Sumirat Hidayat, Ministry of Research, Technology, and Higher Education Directorate General of Research and Development Strengthening, 2017* ▪ *C. George Thomas (2021), Research Methodology and Scientific Writing, Springer* ▪ *Gábor L Lövei (2021), Writing and Publishing Scientific Papers: A Primer for the Non-English Speaker, Open Book Publishers* ▪ *Robert E. Berger (2014), A Scientific Approach to Writing for Engineers and Scientists, Wiley-IEEE Press*

International Publication 2

Module designation	*International Publication 2*
Semester(s) in which the module is taught	*5th*
Person responsible for the module	*Team teaching (thesis supervisors)*
Language	*Indonesia*
Relation to curriculum	*Compulsory module for Materials Science Doctoral Program*
Teaching methods	*Independent activities, discussion, lectures and projects*
Workload (incl. contact hours, self-study hours)	*1. Exercises and assignments: 6 x 60 = 360 minutes per week* *2. Independent study: 6 x 60 = 360 minutes per week*
Credit points	*6/10.8 (credit points/ECTS)*
Required and recommended prerequisites for joining the module	-
Module objectives/intended learning outcomes	*1. Able to analyze data, observations, calculation results or simulations obtained through research supported by related theories* *2. Able to deepen or expand the scientific knowledge of materials science or applied materials science by producing an original, accurate, tested and innovative model, method or theory development that is useful for industry and society.* *3. Able to convey data information, observations, or calculation results in detail using images, tables and graphs that support research results.* *4. Able to present contributions of valuable insights and knowledge accurately and comprehensively in the form of scientific paper drafts.*
Course description	*The International Publication 2 course examines all activities for scientific publications starting with selecting the journal to be targeted, understanding the guide for authors, creating a writing framework, processing and analyzing data, literature searches, to compiling manuscripts and submitting them to the target journal. Students become the main authors accompanied by a supervisor. The output of this course is an international journal indexed by SCOPUS.*
Examination forms	*Reports*

Study and examination requirements	*Student must have an article published in* International journal indexed by scopus
Reading list	▪ *On Being a Scientist: A Guide to Responsible Conduct in Research, Third Edition, National Academy of Sciences, USA, 2009.* ▪ *Guidelines for Scientific Publication, Lukman, Suminar Setiadi Ahmadi, Wasmen Manalu, Deden Sumirat Hidayat, Ministry of Research, Technology, and Higher Education Directorate General of Research and Development Strengthening, 2017* ▪ *C. George Thomas (2021), Research Methodology and Scientific Writing, Springer* ▪ *Gábor L Lövei (2021), Writing and Publishing Scientific Papers: A Primer for the Non-English Speaker, Open Book Publishers* ▪ *Robert E. Berger (2014), A Scientific Approach to Writing for Engineers and Scientists, Wiley-IEEE Press*