MODUL HANDBOOK

Undergraduate Program of **Physics Education**



Faculty of Mathematics and Natural Sciences

UNIVERSITAS NEGERI SURABAYA

UNESA

Approval

MODULE HANDBOOK UNDERGRADUATE PROGRAM OF PHYSICS EDUCATION

Best regards

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COMPULSORY COURSE FOR EACH SEMESTER

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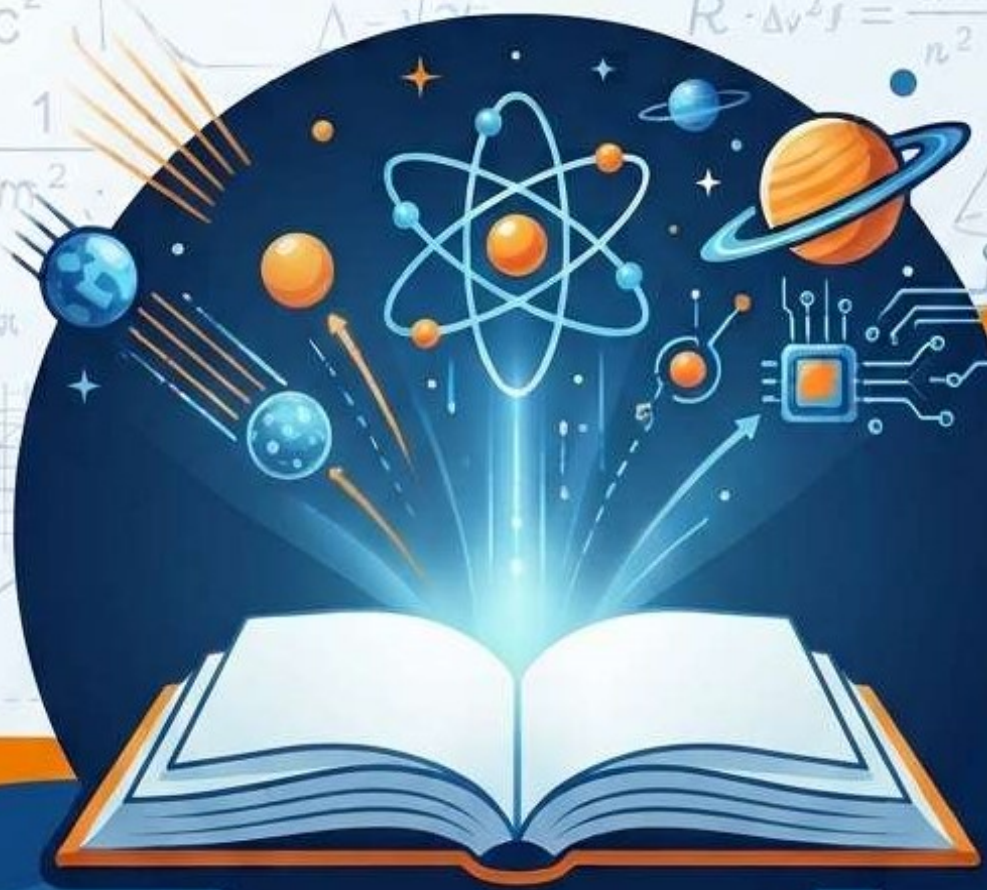
1st Semester



Module Descriptions

Module designation	*8420302188*
Semester(s) in which the module is taught	*1*
Person responsible for the module	*Abd. Kholiq, S.Pd., M.T.*
Language	Indonesian
Relation to curriculum	*Compulsory / elective / specialisation*
Teaching methods	*Lecture, Lesson, Discussion, case study lab works, project, seminar*
Workload (incl. contact hours, self-study hours)	*(Estimated) Total workload: 136 work hours per-semester* *Contact hours (please specify whether lecture, exercise, laboratory session, etc.): 40 work hours per-semester* *Private study including examination preparation, specified in hours: 94 work hours per-semester*
Credit points	3.18 ECTS
Required and recommended prerequisites for joining the module	-
Module objectives/intended learning outcomes	*Key question: what learning outcomes should students attain in the module?* *E.g. in terms of:* • *Attitude: -* • *Competences -* • *Knowledge:* *a. Masters and demonstrates the principles of classical and modern physics theory.* • *Skills:* *a. Develops logical, critical, systematic and creative thinking in carrying out specific work in the field of expertise and in accordance with the work competency standards in the relevant field.* *b. Masters the principles of developing physics learning media based on science, contextual technology, especially ICT (information and communication technology), and the surrounding environment.*

Content	*This course explains the concepts of physical measurement systems, measurement techniques, error analysis in measurements, and the application of measurement instruments in the laboratory, including: rulers, calipers, micrometers, measuring cups, Ohaus balances, stopwatches, thermometers, voltmeters, ammeters, ohmmeters, and oscilloscopes in everyday life. The lectures are conducted using case methods, question-and-answer sessions, presentations, and assignments.*
Examination forms	*essay*
Study and examination requirements	***Requirements for successfully passing the module:*** *a. Minimum attendance of 75%* *b. Minimum score of 55 out of 100*
Reading list	*a. Bell, D. A. 2004. Electronics Instrumentation and Measurement. USA: Springer.* *b. Fornasini, P. 2008. The Uncertainty In Physical Measurements An Introduction to Data Analysis In The Physics Laboratory. New York: Springer.* *c. Gupta, S.V. 2012. Measurement Uncertainties Physical Parameters and Calibrations of Instruments. New York: Springer.* *d. Keithley. 2004. Low Level Measurement Handbook Precision DC Current, Voltage, and Resistance Measurements. USA: Keithley Instruments Inc.* *e. Moris, A. S. 2001. Measurement and Instrumentation Principles, Third Edition. Butterworth Heinemann*

Module Descriptions

Module designation (kode MK)	8420302236
Semester(s) in which the module is taught	2
Person responsible for the module	*Woro Setyarsih, S.Pd., M.Si.*
Language	Indonesian
Relation to curriculum	*Compulsory / elective / specialisation*
Teaching methods	*Lecture, Lesson, Discussion, case study lab works, project, seminar*
Workload (incl. contact hours, self-study hours)	*(Estimated) Total workload: 90.7 work hours per-semester* *Contact hours (please specify whether lecture, exercise, laboratory session, etc.): 26.7 work hours per-semester* *Private study including examination preparation, specified in hours: 64 work hours per-semester*
Credit points	3.18 ECTS
Required and recommended prerequisites for joining the module	-
Module objectives/intended learning outcomes	*Key question: what learning outcomes should students attain in the module?* *E.g. in terms of:* • *Attitude:* *a. Demonstrates religious, national and cultural values, as well as academic ethics in carrying out their duties.* • *Competences : -* • *Knowledge:* *a. Masters the pedagogical knowledge in planning, teaching, and evaluating physics learning as well as resource management in organizing classes, physics laboratories and educational institutions* • *Skills:* *a. Develops self sustainably and collaborate.*
Content	*A study of the principles and methods of student learning according to behavioral learning theory, social learning theory, cognitive*

	learning theory, constructivist approaches, and student motivation to learn; and its application in learning through analysis of classroom case studies. Learning is conducted through lectures, discussions, presentations, and modeling.
Examination forms	*Essay*
Study and examination requirements	***Requirements for successfully passing the module:*** *a. Minimum attendance of 75%* *b. Minimum score of 55 out of 100*
Reading list	*a. Budayasa, I Ketut. 2000.Teori Belajar Perilaku (BUKU I). Ed 2. Diringkas dari Teori Pembelajaran Perilaku Bab Panduan Studi* *untuk Teori dan Praktek Psikologi Pendidikan Slavin: Edisi Kelima oleh Charles Alberti & Catherine E. McCartney. Allyn dan* *Bacon. 1997.Surabaya: IKIP Surabaya.* *b. Dahar, Ratna Wilis. 1989. Teori-teori Belajar. Jakarta: DEPDIKBUD.* *b. Motevalli, S., Perveen, A., & Tresa Anak Michael, M. (2020). Motivating Students to Learn: An Overview of Literature in* *Educational Psychology. International Journal of Academic Research in Progressive Education and Development, 9(3), 63-74.* *d. Smillie, I., & Newton, M. (2020). Educational psychologists' practice: obtaining and representing young people's views.* *Educational Psychology in Practice, 36(3), 328-344.* *e. Nolen, S. B. (2020). Challenging research norms in educational psychology. Educational Psychologist, 55(4), 267-272.* *e. Taniredja, T., Faridli, E. M., & Harmianto, S. (2015). Model-model pembelajaran inovatif dan efektif.*

Module Descriptions

Module designation (kode MK)	8420302236
Semester(s) in which the module is taught	2
Person responsible for the module	*Woro Setyarsih, S.Pd., M.Si.*
Language	Indonesian
Relation to curriculum	*Compulsory / elective / specialisation*
Teaching methods	*Lecture, Lesson, Discussion, case study lab works, project, seminar*
Workload (incl. contact hours, self-study hours)	*(Estimated) Total workload: 90.7 work hours per-semester* *Contact hours (please specify whether lecture, exercise, laboratory session, etc.): 26.7 work hours per-semester* *Private study including examination preparation, specified in hours: 64 work hours per-semester*
Credit points	3.18 ECTS
Required and recommended prerequisites for joining the module	-
Module objectives/intended learning outcomes	*Key question: what learning outcomes should students attain in the module?* *E.g. in terms of:* • *Attitude:* *a. Demonstrates religious, national and cultural values, as well as academic ethics in carrying out their duties.* • *Competences : -* • *Knowledge:* *a. Masters the pedagogical knowledge in planning, teaching, and evaluating physics learning as well as resource management in organizing classes, physics laboratories and educational institutions* • *Skills:* *a. Develops self sustainably and collaborate.*
Content	*A study of the principles and methods of student learning according to behavioral learning theory, social learning theory, cognitive*

	learning theory, constructivist approaches, and student motivation to learn; and its application in learning through analysis of classroom case studies. Learning is conducted through lectures, discussions, presentations, and modeling.
Examination forms	*Essay*
Study and examination requirements	***Requirements for successfully passing the module:*** *a. Minimum attendance of 75%* *b. Minimum score of 55 out of 100*
Reading list	*a. Budayasa, I Ketut. 2000.Teori Belajar Perilaku (BUKU I). Ed 2. Diringkas dari Teori Pembelajaran Perilaku Bab Panduan Studi* *untuk Teori dan Praktek Psikologi Pendidikan Slavin: Edisi Kelima oleh Charles Alberti & Catherine E. McCartney. Allyn dan* *Bacon. 1997.Surabaya: IKIP Surabaya.* *b. Dahar, Ratna Wilis. 1989. Teori-teori Belajar. Jakarta: DEPDIKBUD.* *b. Motevalli, S., Perveen, A., & Tresa Anak Michael, M. (2020). Motivating Students to Learn: An Overview of Literature in* *Educational Psychology. International Journal of Academic Research in Progressive Education and Development, 9(3), 63-74.* *d. Smillie, I., & Newton, M. (2020). Educational psychologists' practice: obtaining and representing young people's views.* *Educational Psychology in Practice, 36(3), 328-344.* *e. Nolen, S. B. (2020). Challenging research norms in educational psychology. Educational Psychologist, 55(4), 267-272.* *e. Taniredja, T., Faridli, E. M., & Harmianto, S. (2015). Model-model pembelajaran inovatif dan efektif.*

Module Descriptions

Module designation (kode MK)	8420303291
Semester(s) in which the module is taught	3
Person responsible for the module	*Dr. Z. A. Imam Supardi, M.Si.*
Language	Indonesian
Relation to curriculum	*Compulsory / elective / specialisation*
Teaching methods	*Lecture, Lesson, Discussion, case study*
Workload (incl. contact hours, self-study hours)	*(Estimated) Total workload: 90.7 work hours per-semester* *Contact hours (please specify whether lecture, exercise, laboratory session, etc.): 26.7 work hours per-semester* *Private study including examination preparation, specified in hours: 64 work hours per-semester*
Credit points	4.77 ECTS
Required and recommended prerequisites for joining the module	-
Module objectives/intended learning outcomes	*Key question: what learning outcomes should students attain in the module?* *E.g. in terms of:* • *Attitude:* *Demonstrate character traits of resilience, collaboration, adaptability, innovation, inclusiveness, lifelong learning, and an entrepreneurial mindset.* • *Competences :* *Develop logical, critical, systematic, and creative thinking in carrying out specific tasks within their field of expertise in accordance with relevant occupational competency standards* • *Knowledge:* *Formulate physical phenomena and problems based on observational and experimental results, and model them using mathematics and computation for sound decision-making in both familiar and novel contexts*

	Skills: -
Content	*"This course examines linear and transcendental functions and their graphs, limits of functions, differentiation, function integration, line integrals, and multiple integrals through IT-assisted active learning using the case study method.*
Examination forms	*Essay*
Study and examination requirements	***Requirements for successfully passing the module:*** *a. Minimum attendance of 75%* *b. Minimum score of 55 out of 100*
Reading list	*1. Boas, M.L. 2006. Mathematical Methods in the Physical Science, edisi 3, John Wiley & Sons, New York.* *2. Varberg, Purcell, Rigdon. 2021. Calculus, 9th ed, Illinois, USA.*

Module Descriptions

Module designation (kode MK)	*8420302275*
Semester(s) in which the module is taught	*1*
Person responsible for the module	*Nurita Apridiana Lestari, S.Pd., M.Pd.*
Language	Indonesian
Relation to curriculum	*Compulsory / elective / specialisation*
Teaching methods	*Lecture, Lesson, Discussion, case study lab works, project, seminar*
Workload (incl. contact hours, self-study hours)	*(Estimated) Total workload: 90.6 work hours per-semester* *Contact hours (please specify whether lecture, exercise, laboratory session, etc.): 53.3 work hours per-semester* *Private study including examination preparation, specified in hours: 37.3 work hours per-semester*
Credit points	3.18 ECTS
Required and recommended prerequisites for joining the module	-
Module objectives/intended learning outcomes	*Key question: what learning outcomes should students attain in the module?* *E.g. in terms of:* • *Attitude:* *a. Demonstrates religious, national and cultural values, as well as academic ethics in carrying out their duties.* *b. Demonstrates a resilient, collaborative, adaptive, innovative, inclusive, lifelong learning, and entrepreneurial character.* • *Competences -* • *Knowledge:* *a. Masters the pedagogical knowledge in planning, teaching, and evaluating physics learning as well as resource management in organizing classes, physics laboratories and educational institutions.* • *Skills:*

	a. Develops logical, critical, systematic and creative thinking in carrying out specific work in the field of expertise and in accordance with the work competency standards in the relevant field. *b. Develops self sustainably and collaborate.*
Content	*To equip prospective teachers and/or in-service teachers with the basic concepts of education, the nature of humans and their development, the foundations of education, education as a system, the national education system, teachers as a profession, educational issues, educational innovations in Indonesia, and character education both in and outside of school, as well as to be able to work effectively in solving education-related cases both individually and in groups.*
Examination forms	*Essay*
Study and examination requirements	***Requirements for successfully passing the module:*** *a. Minimum attendance of 75%* *b. Minimum score of 55 out of 100*
Reading list	*a. M.V. Roesminingsih dan Lamijan Hadi Susarno. 2015. Teori Dan Praktek Pendidikan . Surabaya: Lembaga Pengkajian dan* *b. Pengembangan Ilmu Pendidikan Fakultas Ilmu Pendidikan Universitas Negeri Surabaya kerjasama dengan Penerbit Bintang.* *c. 2. Tim Redaksi Pustaka Yustisia. 2009. Kompilasi Perundangan Bidang Pendidikan : Seri Kompilasi Perundangan Terlengkap dan* *d. Terbaru. Yogyakarta: Pustaka Yustisia.* *e. 3. Peraturan perundang-undangan pendidikan yang berlaku dan relevan.* *f. 4. Referensi yang relevan dengan karakteristik dan profesi lulusan di jurusan/program studi masing-masing.* *g. Hasbullah. 2012. Dasar-dasar Ilmu Pendidikan. Jakarta: PT Raja Grafindo Persada* *h. 2. Kadir, Abdul dkk. 2012. Dasar-dasar Pendidikan. Jakarta: Kencana Prenada Media Group* *i. 3. Mudyaharjo, R. 2012. Pengantar Pendidikan. Jakarta: PT Raja Grafindo Persada*

Module Descriptions

Module designation	*8420302030*
Semester(s) in which the module is taught	*1*
Person responsible for the module	*Dr. Tarzan Purnomo, M.Si.,*
Language	*Indonesian*
Relation to curriculum	*Compulsory / elective / specialisation*
Teaching methods	*lecture, lesson, Discussion, case study*
Workload (incl. contact hours, self-study hours)	*(Estimated) Total workload: 136 work hours per-semester* *Contact hours:* *a. Lecture, exercise: 26.7 work hours per-semester ,* *b. Laboratory session: 45.3 work hours per-semester* *Private study including examination preparation: 64 work hours per-semester*
Credit points	*3.18 ECTS*
Required and recommended prerequisites for joining the module	-
Module objectives/intended learning outcomes	*Key question: what learning outcomes should students attain in the module?* *E.g. in terms of:* • *Attitude:* *a. Demonstrates religious, national and cultural values, as well as academic ethics in carrying out their duties.* *b. Demonstrates a resilient, collaborative, adaptive, innovative, inclusive, lifelong learning, and entrepreneurial character* • *Competences* • *Knowledge:* • *Skills:* *a. Develops logical, critical, systematic and creative thinking in carrying out specific work in the field of expertise and in accordance with the work competency standards in the relevant field.* *b. Develops self sustainably and collaborate*

Content	*To equip prospective teachers and/or in-service teachers with the basic concepts of education, the nature of human beings and their development, the foundations of education, education as a system, the national education system, teachers as a profession, educational problems, educational innovations in Indonesia, and character education both in schools and outside of schools and to be able to work effectively in solving educational-related case problems both individually and in groups.*
Examination forms	*essay*
Study and examination requirements	***Requirements for successfully passing the module:*** *a. Minimum attendance of 75%* *b. Minimum score of 55 out of 100*
Reading list	*a. Campbell, Neil A, Jane B.Reece dan Lawrence G.Mitchell. 2003. Biologi . California: Benjamin Cummings.* *b. Kimball, J.W. 1989. Biologi Jilid I, II, III . Edisi Kelima. Cetakan Kedua. Jakarta: Penerbit Erlangga.* *c. Rachmadiarti, F.,Yuliani, Widowati B., Rinie P, Mahanani T.A, Dyah H.,Herlina F.2007. Biologi Umum . Surabaya: UNESA Press.* *d. Luria. 1981. A View of Life . California: Benyamin Cumming.*

Module Descriptions

Module designation (kode MK)	*8420304294*
Semester(s) in which the module is taught	*1*
Person responsible for the module	*Tim Dosen*
Language	Indonesian
Relation to curriculum	*Compulsory / elective / specialisation*
Teaching methods	*Lecture, Lesson, Discussion, case study lab works, project, seminar*
Workload (incl. contact hours, self-study hours)	*(Estimated) Total workload: 136 work hours per-semester* *Contact hours:* *a. Lecture, exercise: 26.7 work hours per-semester ,* *b. Laboratory session: 45.3 work hours per-semester* *Private study including examination preparation: 64 work hours per-semester*
Credit points	4.77 ECTS
Required and recommended prerequisites for joining the module	-
Module objectives/intended learning outcomes	*Key question: what learning outcomes should students attain in the module?* *E.g. in terms of:* • *Attitude: -* • *Competences: -* • *Knowledge:* *a. Masters and demonstrates the principles of classical and modern physics theory.* *b. Formulates physical symptoms and problems based on the results of observations and experiments, and model them using mathematics and computing for appropriate decision making in both familiar and new problems.* • *Skills:*

	a. Develops logical, critical, systematic and creative thinking in carrying out specific work in the field of expertise and in accordance with the work competency standards in the relevant field.
Content	*This course examines quantities, units, significant figures, and vectors, particle kinematics: 1D and 2D motion; particle dynamics; work and energy: work and energy conservation and their applications; conservative forces; impulse and momentum; rigid body equilibrium; static and dynamic fluids; vibrations and waves; thermometry; temperature and heat; the kinetic theory of ideal gases; and the laws of thermodynamics through observation of physical phenomena with simple mathematical analysis by applying case studies and learning experiences in laboratory activities.*
Examination forms	*Essay*
Study and examination requirements	***Requirements for successfully passing the module:*** *a. Minimum attendance of 75%* *b. Minimum score of 55 out of 100*
Reading list	*a. Nowikow, I. and Heimbecker, B. 2017. Physics: concepts and connections: Book 1. Toronto, Canada: Irwin Publ., pp. 1-720.* *b. Heimbecker, B., Nowikow, I., Howes, C. T., Mantha, J., Smith, B. P., van Bemmel, H. M. 2002. Physics: concepts and* *connections: Book 2. Toronto, Canada: Irwin Publ., pp. 1-816.* *c. Serway, R. A. 2018. College Physics. Belmont, US: ThomsonLearning Publ., pp. 1-1058.* *c. Halliday, R. Resnick, J. Walker. Fundamental of Physiscs, 10th Edition. Wiley: 2014.*

Module Descriptions

Module designation	*1000002018*
Semester(s) in which the module is taught	*1*
Person responsible for the module	*Tim MBKM*
Language	Indonesian
Relation to curriculum	*Compulsory / elective / specialisation*
Teaching methods	*Lecture, Lesson, Discussion, case study, Project, Seminar, lab works*
Workload (incl. contact hours, self-study hours)	*(Estimated) Total workload: 136 work hours per-semester* *Contact hours (please specify whether lecture, exercise, laboratory session, etc.): 40 work hours per-semester* *Private study including examination preparation, specified in hours: 94 work hours per-semester*
Credit points	3.18 ECTS
Required and recommended prerequisites for joining the module	-
Module objectives/intended learning outcomes	*Key question: what learning outcomes should students attain in the module?* *E.g. in terms of:* • *Attitude: -* • *Competences:-* • *Knowledge:* *a. Able to demonstrate religious, national and cultural values, as well as academic ethics in carrying out their duties.* *b. Demonstrating a character that is resilient, collaborative, adaptive, innovative, inclusive, committed to lifelong learning, and entrepreneurial.* *c. Developing logical, critical, systematic, and creative thinking in carrying out specific tasks within one's field of expertise, in accordance with the relevant professional competency standards.* *d. Engaging in continuous self-development and collaborating.*

	• *Skills:-*
Content	*This course examines the concepts and essence of Pancasila as the foundation and ideology of the state, as well as the nation's philosophy of life. It explores Pancasila from historical, juridical, and philosophical perspectives, along with its actualization within the life of the nation and the state. The course positions Pancasila as a cornerstone for political ethics and a paradigm for development, addressing its implementation in society, the nation, and the state through conceptual analysis, presentations, discussions, case studies, and both individual and group assignments. The instructional approach incorporates problem/case analysis, Problem-Based Learning (PBL), presentations, discussions, Project-Based Learning (PjBL) assignments, and reflection. This course is integrated to support the Sustainable Development Goals (SDGs), specifically: (1) No Poverty; (4) Quality Education; (5) Gender Equality; (16) Peace, Justice, and Strong Institutions; and (17) Partnerships for the Goals..*
Examination forms	*Essay*
Study and examination requirements	***Requirements for successfully passing the module:*** *a. Minimum attendance of 75%* *b. Minimum score of 55 out of 100*
Reading list	*a. Tim MKU Pendidikan Pancasila Unesa. 2022. Pendidikan Pancasila. Surabaya: Unesa University Press .* *b. Direktorat Jenderal Pendidikan Tinggi. 2012. Materi Ajar Mata Kuliah Pendidikan Pancasila. Jakarta: Direktorat Pembelajaran dan Kemahasiswaan.* *c. Pusat Studi Pancasila UGM. 2012. Pancasila Dasar Negara. Yogyakarta: PSP Press.* *d. Thaib, Dahlan. 1991. Pancasila Yuridis Ketatanegaraan. Yogyakarta: UPP AMP YKPN.* *e. Majelis Permusyawaratan Rakyat Indonesia (MPR-RI). 2002. Undang-Undang Dasar 1945 Hasil Amandemen IV .* *f. Suplemen Arah Pembangunan (RPJM) 2014-2019* *g. Tim MPK Pendidikan Pancasila Unesa. 2022. Pendidikan Pancasila. Surabaya: Unesa University Press* *h. Dirjen Belmawa Kemristekdikti RI. 2016. Pendidikan Pancasila Untuk Perguruan Tinggi. Jakarta: Kemristekdikti*

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2nd Semester



Module Descriptions

Module designation (kode MK)	*8420304292*
Semester(s) in which the module is taught	*2*
Person responsible for the module	*Dr. Nugrahani Primary Putri, M. Si.*
Language	Indonesian
Relation to curriculum	*Compulsory / elective / specialisation*
Teaching methods	*Lecture, Lesson, Discussion, case study lab works, project, seminar*
Workload (incl. contact hours, self-study hours)	*(Estimated) Total workload: 181.3 work hours per-semester* *Contact hours (please specify whether lecture, exercise, laboratory session, etc.): 53.3 work hours per-semester* *Private study including examination preparation, specified in hours: 128 work hours per-semester*
Credit points	6.36 ECTS
Required and recommended prerequisites for joining the module	-
Module objectives/intended learning outcomes	*Key question: what learning outcomes should students attain in the module?* *E.g. in terms of:* • *Attitude: -* • *Competences -* • *Knowledge:* *a. Formulates physical symptoms and problems based on the results of observations and experiments, and model them using mathematics and computing for appropriate decision making in both familiar and new problems.* • *Skills:* *a. Develops logical, critical, systematic and creative thinking in carrying out specific work in the field of expertise and in accordance with the work competency standards in the relevant field.*

Content	*The course Series and Linear Algebra for Physics is a course that discusses basic concepts in series and linear algebra applied in the context of physics. This course aims to provide a deep understanding of series and linear algebra concepts and their application in solving physics problems. The course scope includes discussions on infinite series, series convergence, complex numbers, linear algebra, algebraic vectors, and partial differential equations. Students are expected to master these concepts and apply them in solving physics problems systematically and logically by combining discussion methods, question-and-answer sessions, and assignments using Python software.*
Examination forms	*Essay*
Study and examination requirements	***Requirements for successfully passing the module:*** *a. Minimum attendance of 75%* *b. Minimum score of 55 out of 100*
Reading list	*a. Boas, M.L. 2006. Mathematical Methods in the Physical Science, edisi 3, John Wiley & Sons, New York.* *b. 2. Arfken, G. 1995. Mathematical Methods for Physicists. Academic Press.* *c. Arfken, G. 1995. Mathematical Methods for Physicists. Academic Press.* *d. 2. Riley, K.F., Hobson, M.P., Bence, S.J. 2006. Mathematical Methods for Physics and Engineering, edisi 3, Cambridge Univ.* *e. Press.* *f. 3. Hassani, Sadri. 2009. Mathematical Methods for Students of Physics and Related Fields, 2nd ed. Illinois: Springer.*

Module Descriptions

Module designation	8420303279
Semester(s) in which the module is taught	2
Person responsible for the module	*Mita Anggaryani, M.Pd.,Ph.D.*
Language	Indonesian
Relation to curriculum	*Compulsory / elective / specialisation*
Teaching methods	*Lecture, Lesson, Discussion, case study lab works, project, seminar*
Workload (incl. contact hours, self-study hours)	*(Estimated) Total workload: 181.3 work hours per-semester* *Contact hours (please specify whether lecture, exercise, laboratory session, etc.): 53.3 work hours per-semester* *Private study including examination preparation, specified in hours: 128 work hours per-semester*
Credit points	4.77 ECTS
Required and recommended prerequisites for joining the module	-
Module objectives/intended learning outcomes	*Key question: what learning outcomes should students attain in the module?* *E.g. in terms of:* • *Attitude:* • *Competences* • *Knowledge:* *a. Masters and demonstrates the principles of classical and modern physics theory.* *b. Masters the pedagogical knowledge in planning, teaching, and evaluating physics learning as well as resource management in organizing classes, physics laboratories and educational institutions.* • *Skills:* *a. Develops logical, critical, systematic and creative thinking in carrying out specific work in the field of expertise and in accordance with the work competency standards in the relevant field.*

	b. Develops self sustainably and collaborate *c. Masters the principles of developing physics learning media based on science, contextual technology, especially ICT (information and communication technology), and the surrounding environment.*
Content	*This course equips students with the basic (pre-intermediate) language skills and components essential to supporting an understanding of English-based physics literacy. This course also introduces standardized tests that include exercises in reading skills, listening comprehension, and grammar and vocabulary, geared toward preparing for international standard English language tests. All lectures will be presented through lectures and discussions.*
Examination forms	*Product*
Study and examination requirements	***Requirements for successfully passing the module:*** *a. Minimum attendance of 75%* *b. Minimum score of 55 out of 100*
Reading list	*a. Sharpe, Pamela. J. 2003. How to prepare for the TOEFL. Barron 19s Educational Series. NY* *b. Official Guide to the TOEFL Test With CD-ROM, 4th Edition (Official Guide to the Toefl Ibt). McGraw-Hill. USA. 4. Phillips,* *c. Deborah. 2001. Longman Introductory Course for the TOEFL Test: iBT, 2nd ed. Pearson Education. NY* *d. Worcester, Adam, et al. 2008. Building Skill for the TOEFL iBT: Beginning. Compass Publishing.* *e. Cullen, Pauline, et al. 2014. The Official Cambridge Guide to IELTS Students Book With Answers with DVD-ROM. Oxford* *University Press.* *f. Parthare, Emma; Parthare, Gary; May, Peter. 2013. Headway Academic Skills IELTS Study Skills Edition: Level 1 Students* *Book. Oxford University Press. Lougheed, Lin. 2007. Longman Preparation Series for the TOEIC Test: Listening and Reading, 5th Edition. Pearson Education. NY* *g. Smith, C. (2004). Environmental physics. Routledge* *g. Murphy, R. 2012. English Grammar in Use. Cambridge University Press.* *g. Serway, R. A. 2005. College Physics. Belmont, US: ThomsonLearning Publ.* *g. Jurnal, referensi lain, dan link web terkait*

Module Descriptions

Module designation (kode MK)	8420302250
Semester(s) in which the module is taught	3
Person responsible for the module	*Dra. Suliyanah, M.Si.*
Language	Indonesian
Relation to curriculum	*Compulsory / elective / specialisation*
Teaching methods	*Lecture, Lesson, Discussion, case study lab works, project, seminar*
Workload (incl. contact hours, self-study hours)	*(Estimated) Total workload: 90.7 work hours per-semester* *Contact hours (please specify whether lecture, exercise, laboratory session, etc.): 26.7 work hours per-semester* *Private study including examination preparation, specified in hours: 64 work hours per-semester*
Credit points	3.18 ECTS
Required and recommended prerequisites for joining the module	-
Module objectives/intended learning outcomes	*Key question: what learning outcomes should students attain in the module?* *E.g. in terms of:* • *Attitude:* • *Competences* • *Knowledge:* *a. Masters the pedagogical knowledge in planning, teaching, and evaluating physics learning as well as resource management in organizing classes, physics laboratories and educational institutions* • *Skills:* *a. Develops logical, critical, systematic and creative thinking in carrying out specific work in the field of expertise and in accordance with the work competency standards in the relevant field.* *b. Conducts physics education research in the form of studies and evaluations of physics learning with a quantitative and/or*

	qualitative approach in the form of oral and academic writing effectively.
Content	*A study of the definition of curriculum, school curriculum development, adaptation of the current curriculum to curriculum implementation in schools, curriculum analysis including task and material analysis, formulation of objectives and achievement indicators, and accommodation of inclusive education, essential concepts and their learning, misconceptions and strategies for addressing them using ICT.*
Examination forms	*Product*
Study and examination requirements	***Requirements for successfully passing the module:*** *a. Minimum attendance of 75%* *b. Minimum score of 55 out of 100*
Reading list	*a. Goos, M., Stillman, G., Vale, C. 2007. Teaching Secondary School Mathematics Reasearch and Practice for the 21st Century.* *Australia: Allen & Unwin.* *b. Hamdani, Hamid. 2012. Pengembangan Kurikulum Pendidikan. Bandung: Pustaka Setia.* *b. Ibrahim, dkk. 2013. Kurikulum Dan Pembelajaran. Jakarta: RajaGrafindo Persada.* *b. Sukmadinata, Nana Syaodih. 2013. Pengembangan Kurikulum. Bandung: Remaja Rosdakarya.* *b. Yee, Lee Peng. 2006. Teaching Secondary School Mathematics a Resource Book. McGraw-Hill.* *b. Dokumen kurikulum yang berlaku dan kurikulum-kurikulum sebelumnya.* *b. Buku Guru dan Buku Siswa SMP dan SMA dan yang sederajat Pelajaran IPA dan Fisika* *b. Suliyanah, dkk. 2023. Kurikulum Sekolah: Esensi, Pengembangan, Perkembangan, dan Disertai Modul Ajar Fisika SMA.Sidoarjo: PT Mitra Edukasi dan Publikasi*

Module Descriptions

Module designation	8420304295
Semester(s) in which the module is taught	*2/ First Year*
Person responsible for the module	Dr. Z.A. Imam Supardi, M.Si
Language	*indonesia*
Relation to curriculum	*Compulsory*
Teaching methods	*lecture, lesson, lab works*
Workload (incl. contact hours, self-study hours)	*(Estimated) Total workload: 181.2 work hours per-semester* *a. Lecture, exercise: 45.3 work hours per-semester,* *b. Laboratory session: 90.6 work hours per-semester* *Private study including examination preparation: 45,3 work hours per-semester*
Credit points	*6.36 ECTS*
Required and recommended prerequisites for joining the module	Basic Electromagnetism and Optics
Module objectives/intended learning outcomes	*Key question: what learning outcomes should students attain in the module?* *E.g. in terms of:* • *Attitude:* *a. Demonstrates religious, national and cultural values, as well as academic ethics in carrying out their duties.* *b. Demonstrates a resilient, collaborative, adaptive, innovative, inclusive, lifelong learning, and entrepreneurial character* • *Competences* *a. Develops logical, critical, systematic and creative thinking in carrying out specific work in the field of expertise and in accordance with the work competency standards in the relevant field.* *b. Develops self sustainably and collaborate* • *Knowledge:*

	Masters the pedagogical knowledge in planning, teaching, and evaluating physics learning as well as resource management in organizing classes, physics laboratories and educational institutions • *Skills: -*
Content	*To equip prospective teachers and/or in-service teachers with the basic concepts of education, the nature of human beings and their development, the foundations of education, education as a system, the national education system, teachers as a profession, educational problems, educational innovations in Indonesia, and character education both in schools and outside of schools and to be able to work effectively in solving educational-related case problems both individually and in groups.*
Examination forms	*Essay*
Study and examination requirements	***Requirements for successfully passing the module:*** *a. Minimum attendance of 75%* *Minimum score of 55 out of 100.*
Reading list	1. Nowikow, I. and Heimbecker, B. 2001. Physics: concepts and connections: Book 1. Toronto, Canada: Irwin Publ., pp.1-720. 2. Heimbecker, B., Nowikow, I., Howes, C. T., Mantha, J., Smith, B. P., van Bemmel, H. M. 2002. Physics: concepts and connections: Book 2. Toronto, Canada: Irwin Publ., pp.1-816. 3. Serway, R. A. 2005. College Physics. Belmont, US: Thomson-Learning Publ., pp.1-1058. 4. Abdullah, M. 2017. Fisika Dasar II. E-book. Tidak dipublikasikan. pp. 1-917.

Module Descriptions

Module designation	1000002047 – Pendidikan Jasmani dan Kebugaran (Physical Education and Fitness)
Semester(s) in which the module is taught	1
Person responsible for the module	*MBKM Team (Tim MBKM)*
Language	Indonesian
Relation to curriculum	*Compulsory / elective / specialisation*
Teaching methods	*Lecture, Lesson, Discussion, case study, lab works, project, seminar, sports and physical activity practice*
Workload (incl. contact hours, self-study hours)	*(Estimated) Total workload: 90.7 work hours per-semester* *Contact hours:* *a. Lecture, exercise: 28 work hours per-semester (2 hours per week × 14 weeks)* *Private study including examination preparation: 62.7 work hours per-semester (private study ± 51.7 hours; examination preparation ± 11 hours)*
Credit points	3.18 ECTS
Required and recommended prerequisites for joining the module	-
Module objectives/intended learning outcomes	*Key question: what learning outcomes should students attain in the module?* *E.g. in terms of:* • *Attitude:* *a. Demonstrate good scientific manners, critical thinking, and innovation skills in educational, research, and professional fields (PLO-11/SOC-1).* *b. Demonstrate the appreciation of religious and cultural values in conducting their tasks as a professional (PLO-12/SOC-2).* • *Competences:* *a. Make a decision based on the data information and evaluation in order to fulfil the responsibility of the task (PLO-9/COM-2).*

	b. Work as an individual as well as a team effectively, have an entrepreneur skill, and awareness of environmental issues (PLO-10/COM-3). • *Knowledge: -* • *Skills:* *a. Improve their knowledge and be able to continue their study in a higher degree program (PLO-7/SKI-3).*
Content	*This course provides an understanding and mastery of the nature, functions and objectives of physical education, and introduces experience in carrying out various sports and game activities to increase the level of physical activity in line with research and WHO recommendations. The topics cover: the legal basis of physical education; holistic health and an active lifestyle; violence and bullying; physical fitness and fitness testing (pre-test and post-test); healthy living theory and its application in daily life; mental health, social health and social involvement in physical activity; recreational sports through traditional games and small games (with and without equipment); the meaning of sportsmanship; competitive games; sports management and competition systems; and organising a sports festival (class meeting). Students design their own physical education programme to improve and maintain physical fitness, measure fitness levels using various methods, and determine indicators and measurements of an ideal body shape. The course supports the goals of no poverty, good health and well-being, quality education, gender equality and partnerships. Learning is conducted using project-based learning with demonstrations, discussions and practice.*
Examination forms	*Participatory activities (12.5%), project/product assessment (56.25%), portfolio assessment (1.25%), practicum assessment (1.25%), practice/performance assessment (20%), written test (8.75%)*
Study and examination requirements	***Requirements for successfully passing the module:*** *a. Minimum attendance of 75%* *b. Minimum score of 55 out of 100*
Reading list	*a. Kristiyandaru, A., dkk. (2020). Pendidikan Jasmani Sadarkan Arti Hidupku. Sidoarjo: Zifatama Jawara.* *b. Dinata, V. C., dkk. (2024). Pengembangan Kesehatan dan Kebugaran. Jakarta: Erlangga.* *c. Dugan, S. A., Gabriel, K. P., Lange-Maia, B. S., & Karvonen-Gutierrez, C. (2018). Physical Activity and Physical Function: Moving and Aging. Obstetrics and Gynecology Clinics of North America, 45(4), 723–736. https://doi.org/10.1016/J.OGC.2018.07.009* *d. Griera, J. L., Manzanares, J. M., Barbany, M., Contreras, J., Amigó, P., & Salas-Salvadó, J. (2007). Physical activity, energy balance*

	and obesity. Public Health Nutrition, 10(10A), 1194–1199. https://doi.org/10.1017/S1368980007000705 *e. Lopes, V. P., Malina, R. M., Gomez-Campos, R., Cossio-Bolaños, M., Arruda, M. de, & Hobold, E. (2019). Body mass index and physical fitness in Brazilian adolescents. Jornal de Pediatria, 95(3), 358–365. https://doi.org/10.1016/J.JPED.2018.04.003* *f. Nurhasan, dkk. 2005. Petunjuk Praktis Pendidikan Jasmani (Bersatu Membangun Manusia yang Sehat Jasmani dan Rohani). Surabaya: Unesa University Press.* *g. Sallis, J. F., McKenzie, T. L., Alcaraz, J. E., Kolody, B., Faucette, N., & Hovell, M. F. (1997). The effects of a 2-year physical education program (SPARK) on physical activity and fitness in elementary school students. American Journal of Public Health, 87(8), 1328–1334. https://doi.org/10.2105/AJPH.87.8.1328* *h. SCY, Hartati, dkk. 2013. Permainan Kecil. Malang: Wineka Media.* *i. World Health Organization. (2010). Global Recommendations on Physical Activity for Health. Geneva: WHO Press.*

Module Descriptions

Module designation (kode MK)	8420302107
Semester(s) in which the module is taught	2
Person responsible for the module	*TIM Dosen Pengampu*
Language	Indonesian
Relation to curriculum	*Compulsory / elective / specialisation*
Teaching methods	*Lecture, Lesson, Discussion, case study lab works, project, seminar*
Workload (incl. contact hours, self-study hours)	*(Estimated) Total workload: 90.7 work hours per-semester* *Contact hours (please specify whether lecture, exercise, laboratory session, etc.): 26.7 work hours per-semester* *Private study including examination preparation, specified in hours: 64 work hours per-semester*
Credit points	3.18 ECTS
Required and recommended prerequisites for joining the module	-
Module objectives/intended learning outcomes	*Key question: what learning outcomes should students attain in the module?* *E.g. in terms of:* • *Attitude:* *a. Demonstrates a resilient, collaborative, adaptive, innovative, inclusive, lifelong learning, and entrepreneurial character* • *Competences* *a. Develops logical, critical, systematic and creative thinking in carrying out specific work in the field of expertise and in accordance with the work competency standards in the relevant field.* *b. Develops self sustainably and collaborate* • *Knowledge:* • *Skills:*

	a. Develops logical, critical, systematic and creative thinking in carrying out specific work in the field of expertise and in accordance with the work competency standards in the relevant field *b. Develops self sustainably and collaborate.*
Content	*This course discusses 1) The scope of conservation which includes: Definition, objectives, benefits, and efforts to preserve natural resources and the environment; 2) Environmental ethics which includes: Definition, Paradigm, and Principles of Environmental Ethics; 3) Natural resources which include: Definition, Types, and benefits of Natural Resources; 4) Local wisdom which includes: Definition, approaches, challenges and local wisdom in the lives of people in the future; 5) Management and problems of natural resources and the environment which include: issues, problems, and management of natural resources and the environment; 6) Awareness of conservation which includes awareness of the importance of preserving natural resources and the environment, as well as eco campus and conservation campus; 7) Regulation of natural resources and the environment; 8) Ecocampus Movement and Efforts to realize it, 9) Legal Regulation of Environmental Management. Lecture activities are carried out in a student-centered manner by implementing the PjBL learning model. Students learn the material by conducting discussions, observations, presentations and carrying out project assignments accompanied by the development of eduecopreneurship characteristics.*
Examination forms	*Product*
Study and examination requirements	***Requirements for successfully passing the module:*** *a. Minimum attendance of 75%* *b. Minimum score of 55 out of 100*
Reading list	*a. Cluras, D. D. and Reganold, J.P. 2010. Natural Resources Conservation Future. Washington: Washington State University.* *b. Indrawan, Mochamad., Primack, Richard B., Supriatna, Jatna. 2007. Biologi Konservasi . Jakarta : Yayasan Obor Indonesia* *c. Rachmadiarti, F., Faizah, U., Kuntjoro, S. 2017. Buku Ajar Mahasiswa Konservasi Sumber Daya Alam dan Lingkungan. Surabaya: Unesa University Press.* *d. Faizah, U., Rachmadiarti,F., Prastiwi, Muji Sri., Kuntjoro, S. 2017. Buku Ajar Konservasi Sumber Daya Alam dan Lingkungan berbasi* *e. Problem Based Learning untuk melatih Sadar Konservasi. Surabaya: Airlangga University Press.*

	f. Bicker, A., Sillitoe, P., & Pottier, J. 2004. Development and Local Knowledge (New approaches to issues in natural resources management, conservation and agriculture). New York: Routledge. *g. T. Burt & D. Thompson. (2020). Ecology, Biodiversity and Conservation. In T. Burt & D. Thompson (Eds.), Curious about Nature: A Passion for Fieldwork (Ecology, Biodiversity and Conservation, pp. Ii-Iv). Cambridge: Cambridge University Press.* *g. Van Dyke, F. 1993. Conservation Biology. Boston: University of Arkansas, Inc.* *g. Sanggetha, J., Thangadurai, D., Goh, H.C., & Islam, S. 2019. Biodiversity and Conservation (Characterization and Utilization of Plants, Microbes, and Natural Resources for Sustainable Development and Ecosystem Management). Canada: Apple Academic Press, Inc.*

Module Descriptions

Module designation	1000002026 – Agama Islam (Islamic Religious Education)
Semester(s) in which the module is taught	1
Person responsible for the module	*MBKM Team (Tim MBKM)*
Language	Indonesian
Relation to curriculum	*Compulsory / elective / specialisation*
Teaching methods	*Lecture, Lesson, Discussion, case study, lab works, project, seminar*
Workload (incl. contact hours, self-study hours)	*(Estimated) Total workload: 90.7 work hours per-semester* *Contact hours:* *a. Lecture, exercise: 28 work hours per-semester (2 hours per week × 14 weeks)* *Private study including examination preparation: 62.7 work hours per-semester (private study ± 51.7 hours; examination preparation ± 11 hours)*
Credit points	3.18 ECTS
Required and recommended prerequisites for joining the module	-
Module objectives/intended learning outcomes	*Key question: what learning outcomes should students attain in the module?* *E.g. in terms of:* • *Attitude:* *a. Demonstrate good scientific manners, critical thinking, and innovation skills in educational, research, and professional fields (PLO-11/SOC-1).* *b. Demonstrate the appreciation of religious and cultural values in conducting their tasks as a professional (PLO-12/SOC-2).* • *Competences:* *a. Make a decision based on the data information and evaluation in order to fulfil the responsibility of the task (PLO-9/COM-2).*

	b. Work as an individual as well as a team effectively, have an entrepreneur skill, and awareness of environmental issues (PLO-10/COM-3). • *Knowledge: -* • *Skills:* *a. Improve their knowledge and be able to continue their study in a higher degree program (PLO-7/SKI-3).*
Content	*This course prepares students to develop a complete (kaffah) personality by making Islamic teachings the foundation of thinking, behaving and acting in the development of their knowledge and profession, built on Islamic knowledge, religious disposition, Islamic skills, Islamic commitment, Muslim confidence and Islamic competence as individuals, family members, members of society and Indonesian citizens. The topics cover: the nature of Islamic Religious Education in higher education and society; Islamic Religious Education at Universitas Negeri Surabaya; approaching God through good religious practice; iman, islam and ihsan; mental health through tasawuf; building an ideal interaction with the Qur'an and the sources of Islamic law; the role and function of the mosque; the methodology of Islamic studies; religious moderation; grounding Islam in Indonesia through cultural acculturation; economic activities in the Islamic perspective; Muslim identity in the global era and environmental care; the development of science and technology in the Islamic perspective; politics in Islam; gender equality and violence in the Islamic view; and building a harmonious family through marriage. The course upholds the values of Pancasila, integrates anti-violence (bullying, intolerance, sexual, physical and psychological violence), anti-corruption education and religious moderation, and contributes to SDGs 1, 4, 5 and 17. Learning is conducted using case study analysis, presentation and discussion, project/problem-solving assignments, and reflection.*
Examination forms	*Participatory activities (62%), project/product assessment (32%), written test (6%)*
Study and examination requirements	***Requirements for successfully passing the module:*** *a. Minimum attendance of 75%* *b. Minimum score of 55 out of 100*
Reading list	*a. Tim Dosen Pendidikan Agama Islam Unesa. 2019. Pendidikan Agama Islam Kontekstual di Perguruan Tinggi (Edisi Revisi). Surabaya: Unesa University Press.* *b. Tim Dosen Pendidikan Agama Islam Unesa. 2023. Pendidikan Agama Islam Kontekstual di Perguruan Tinggi (Edisi Revisi III). Surabaya: Unesa University Press.*

	c. Alquran dan Terjemahannya. 2019. Jakarta: Kementerian Agama Republik Indonesia. *d. Ausop, Asep Zaenal. 2014. Islamic Character Building. Bandung: Salamadani.* *e. Achmad Sauqi. 2010. Meraih Kedamaian Hidup; Kisah Spiritualitas Orang Modern. Yogyakarta: Sukses Offset.* *f. Juhaya S. Praja. 2002. Filsafat dan Metodologi Ilmu dalam Islam dan Penerapannya di Indonesia. Jakarta: Teraju.* *g. Maman. 2012. Pola Berpikir Sains Membangkitkan Kembali Tradisi Keilmuan Islam. Bogor: QMM Publishing.* *h. Munawar Rahmat. 2010. Pendidikan Insan Kamil Berbasis Sufisme Syaththariah. Bandung: ADPISI Press.* *i. Mustaqim, Abdul. 2012. Epistemologi Tafsir Kontemporer. Yogyakarta: LKIS.* *j. Nurcholis Madjid. 2008. Islam Kemoderenan dan Keindonesiaan. Bandung: PT Mizan Pustaka.* *k. Nurcholis Madjid. 2008. Islam Agama Peradaban. Jakarta: Paramadina.* *l. Sukidi. 2002. Kecerdasan Spiritual. Jakarta: Gramedia.* *m. Syahidin. 2005. Pemberdayaan Umat Berbasis Masjid. Bandung: CV Alfabeta.* *n. Tim Penulis Kemendikbud. 2014. Pendidikan Agama Islam pada Perguruan Tinggi Umum. Jakarta: Kementerian Pendidikan dan Kebudayaan Republik Indonesia.* *o. Tim Dosen PAI-Unesa. 2010. Pendidikan Agama Islam pada Perguruan Tinggi Umum. Surabaya: Unesa University Press.* *p. Toshihiko, Izutsu. 2003. Konsep-konsep Etika Religius dalam Al-Quran (Penerjemah AE Priyono dkk.). Yogyakarta: Tiara Wacana Yogya.* *q. Mukhayyarotin Niswati R. J., Roihana Waliyyul Mursyidah, Titin Sunarti, dan Wasis. 2025. Pembelajaran Sains Terintegrasi Nilai-Nilai Religius dalam Mendukung Tercapainya SDGs untuk Meningkatkan Kreativitas Ilmiah dan Sikap Eco-Religius Siswa Madrasah Aliyah Bilingual Al-Amanah Junwangi Krian Sidoarjo.*

Module Descriptions

Module designation	*1000002033*
Semester(s) in which the module is taught	*2/first year*
Person responsible for the module	Drs. I Made Suwanda, M.Si. Dr. Hj. Raden Roro Nanik Setyowati, M.Si. Prof. Dr. Darni, M.Hum. Hendrik Pandu Paksi, S.Pd., M.Pd. Dra. Siti Mutmainah, M.Pd. Drs. I Made Suwanda, M.Si. Septina Alrianingrum, S.S., M.Pd. Refti Handini Listyani, S.Sos., M.Si. Siti Maizul Habibah, S.Pd., M.A. Katon Galih Setyawan, S.Sos., M.Sosio. Eko Satriya Hermawan, S.Hum, M.A Rojil Nugraha Bayu Aji, S.Hum,
Language	*Indonesian*
Relation to curriculum	*Compulsory*
Teaching methods	*Lecture, lesson, project*
Workload (incl. contact hours, self-study hours)	*(Estimated) Total workload: 90.6 work hours per-semester* *Contact hours (please specify whether lecture, exercise, laboratory session, etc.): 53.3 work hours per-semester* *Private study including examination preparation, specified in hours: 37.3 work hours per-semester*
Credit points	*3.18 ECTS*
Required and recommended prerequisites for joining the module	_
Module objectives/intended learning outcomes	*Key question: what learning outcomes should students attain in the module?* *E.g. in terms of:*

	• *Knowledge: -* • *Attitude : Demonstrates religious, national and cultural values, as well as academic ethics in carrying out their duties.* • *Skills: Develops self sustainably and collaborate.* • *Competences: -*
Content	This subject is an introduction to the nature of Civics, which is continued by discussing the rights and obligations of citizens in accordance with the constitution in the context of national identity and national integration, implemented democratically and based on applicable law. Then deepened by talking about law enforcement and Human Rights, Gender, Archipelago Insights, followed by National Resilience and ending on Anti-Corruption Education. Lectures are carried out with a system of case study analysis, presentations and discussions, problem solving tasks (problem solving), and reflection
Examination forms	*Practice*
Study and examination requirements	***Requirements for successfully passing the module:*** *a. Minimum attendance of 75%* *b. Minimum score of 55 out of 100*
Reading list	• Affandi, Idrus and Karim Suryadi. 2005. Human Rights. Jakarta: Open University Publishing Center • Cogan, Johan L and Murry Print. 2012. Civic Education in The Asia Pacific Regional. Roeledge. ISBN -0415932130 • Niemi, Richard G and Jane Junn. 2005. Civic Education: What Make Student Learn. The University of Chicago Press. • S. Sumarsono, et al, Citizenship Education, Publisher PT. Gramedia Pustaka Utama, Jakarta, 2001 • Team. MPK-Unesa Citizenship Education. 2015. Citizenship Education. Surabaya: Unesa University Press • UGM Lecturer Team. 2002. Citizenship Education. Yogyakarta: Paradigm • … .., RI Law no. 3 of 2002 concerning National Defense. Publisher "Citra Umbara", Bandung, 2002 • Law No. 12 of 2006 on Indonesian Citizenship. Publisher "Cemerlang", Jakarta, 2006. • Laws relevant to learning materials.

UNESA

3rd Semester



Module Descriptions

Module designation (kode MK)	8420303218
Semester(s) in which the module is taught	3
Person responsible for the module	*Dr. Frida Ulfah Ermawati, M.Sc.*
Language	Indonesian
Relation to curriculum	*Compulsory / elective / specialisation*
Teaching methods	*Lecture, Lesson, Discussion, case study lab works, project, seminar*
Workload (incl. contact hours, self-study hours)	*(Estimated) Total workload: 136 work hours per-semester* *Contact hours:* *a. Lecture, exercise: 26.7 work hours per-semester ,* *b. Laboratory session: 45.3 work hours per-semester* *Private study including examination preparation: 64 work hours per-semester*
Credit points	4.77 ECTS
Required and recommended prerequisites for joining the module	-
Module objectives/intended learning outcomes	*Key question: what learning outcomes should students attain in the module?* *E.g. in terms of:* • *Attitude: -* • *Competences: -* • *Knowledge:* *a. Masters and demonstrates the principles of classical and modern physics theory.* *b. Formulates physical symptoms and problems based on the results of observations and experiments, and model them using mathematics and computing for appropriate decision making in both familiar and new problems.* • *Skills:* *a. Develops self sustainably and collaborate.*

Content	*This Thermodynamics course discusses the fundamental macroscopic and microscopic concepts of thermodynamics, thermal equilibrium, the Zeroth Law of Thermodynamics, equations of state, and thermodynamic processes (quasi-static, reversible and irreversible, and cyclic). It also covers the First Law of Thermodynamics, the relationship among internal energy, heat, and work in ideal gas systems, as well as isolated, closed, and open systems, along with their applications in everyday life. The course further includes isothermal, isochoric, isobaric, and adiabatic processes; heat engines; the Carnot cycle in ideal gas systems; entropy in thermodynamic systems; enthalpy; the Gibbs function; the Helmholtz function; the Second Law of Thermodynamics; and its real-life applications through PROJECT activities, such as: (1) the working principles of gasoline and diesel engines, (2) investigating the relationship between cylinder size in gasoline and diesel engines and vehicle engine displacement (cc), (4) the working principle of refrigerators, and (5) analyzing potential system failures.*
Examination forms	*Essay*
Study and examination requirements	***Requirements for successfully passing the module:*** *a. Minimum attendance of 75%* *b. Minimum score of 55 out of 100*
Reading list	*a. Mark W. Zemansky and Richard H. Dittman. 1982. Heat andThermodynamics, Sixth Edition, McGraw- Hill,Inc. Diterjemahkan kedalamBahasa Indonesia oleh The Houw Liong. 1986. Kalor dan termodinamika, terbitan* *b. ke enam, Bandung, Institut Teknologi Bandung (ITB). 2. F W Sears and G L Salinger, Thermodynamics, Kinetic Theory and Statistical Thermodynamics. Addison Wesley. ISBN-13: 978-0201068948. (for explanations and problems).* *c. Yunus A. Çengel and Michael A. Boles ,2015,,Thermodynamics: An Engineering Approach, 8th edition,ISSN: 978-981-4595-29-2.*

Module Descriptions

Module designation (kode MK)	*8420303296*
Semester(s) in which the module is taught	*3*
Person responsible for the module	*Imam Sucahyo*
Language	Indonesian
Relation to curriculum	*Compulsory / elective / specialisation*
Teaching methods	*Lecture, Lesson, Discussion, case study lab works, project, seminar*
Workload (incl. contact hours, self-study hours)	*(Estimated) Total workload: 136 work hours per-semester* *Contact hours:* *a. Lecture, exercise: 26.7 work hours per-semester ,* *b. Laboratory session: 45.3 work hours per-semester* *Private study including examination preparation: 64 work hours per-semester*
Credit points	4.77 ECTS
Required and recommended prerequisites for joining the module	-
Module objectives/intended learning outcomes	*Key question: what learning outcomes should students attain in the module?* *E.g. in terms of:356* • *Attitude:* *a. Demonstrates a resilient, collaborative, adaptive, innovative, inclusive, lifelong learning, and entrepreneurial character.* • *Competences: -* • *Knowledge:* *a. Masters and demonstrates the principles of classical and modern physics theory.* *b. Formulates physical symptoms and problems based on the results of observations and experiments, and model them using mathematics and computing for appropriate decision making in both familiar and new problems.*

	• *Skills:* *a. Develops logical, critical, systematic and creative thinking in carrying out specific work in the field of expertise and in accordance with the work competency standards in the relevant field.*
Content	*The Basic Electronics 1 course covers two main topics. The first topic is the fundamentals of electronics, which include direct current, alternating current, passive components, and the basic principles of measuring instruments and electrical measurements. The second topic relates to active components, covering the working principles and applications of semiconductors, p-n junctions, diodes, and bipolar junction transistors (BJTs).*
Examination forms	*Essay*
Study and examination requirements	***Requirements for successfully passing the module:*** *a. Minimum attendance of 75%* *b. Minimum score of 55 out of 100*
Reading list	*a. Sutrisno. 1978. Elektronika 1. Teori dan Penerapannya. Bandung: Penerbit ITB Bandung.* *b. Tooley, M. 2006. Electronics Circuit: Fundamnetals and Applications. Oxford: Elesevier Ltd.* *c. Boylestad, R ., and Nashelsky, L. Electronics Devices and Circuits: Theory. London: Prentice Hall.* *d. Floyd, T. L . 2012. Electronics Devices. New York: Prentice Hall.* *e. Tim. 2010. Panduan Praktikum Elektronika Dasar 1. Surabaya: Unesa.*

Module Descriptions

Module designation (kode MK)	*8420302144*
Semester(s) in which the module is taught	*3*
Person responsible for the module	*Setyo Admoko, S.Pd., M.Pd.*
Language	Indonesian
Relation to curriculum	*Compulsory / elective / specialisation*
Teaching methods	*Lecture, Lesson, Discussion, case study lab works, project, seminar*
Workload (incl. contact hours, self-study hours)	*(Estimated) Total workload: 181 work hours per-semester* *Contact hours:* *a. Lecture, exercise: 82.4 work hours per-semester ,* *b. Laboratory session: 45.3 work hours per-semester* *Private study including examination preparation: 53.3 work hours per-semester*
Credit points	6.36 ECTS
Required and recommended prerequisites for joining the module	-
Module objectives/intended learning outcomes	*Key question: what learning outcomes should students attain in the module?* *E.g. in terms of:* • *Attitude:* *a. Demonstrates a resilient, collaborative, adaptive, innovative, inclusive, lifelong learning, and entrepreneurial character.* • *Competences: -* • *Knowledge:* *a. Masters and demonstrates the principles of classical and modern physics theory.* *b. Formulates physical symptoms and problems based on the results of observations and experiments, and model them using mathematics and computing for appropriate decision making in both familiar and new problems.*

	• *Skills:* *a. Develops logical, critical, systematic and creative thinking in carrying out specific work in the field of expertise and in accordance with the work competency standards in the relevant field.*
Content	*A study of the concepts, principles, and theories of mechanics and their applications in various real-world cases within the student environment, covering vector and vector-space concepts; particle-motion kinematics in various coordinate systems; the dynamics of object motion under different force functions (including instantaneous motion, motion in fluids, oscillatory systems, momentum conservation, work and energy); motion under central-force influence; reference-frame transformations; the dynamics of particle systems (rigid-body mechanics); Lagrangian mechanics; and Hamilton's equations. A case-based study approach is implemented through discussion methods, explanatory–argumentative activities, individual and group assignments, as well as laboratory experiments compiled in the form of a personal portfolio.*
Examination forms	*Essay*
Study and examination requirements	***Requirements for successfully passing the module:*** *a. Minimum attendance of 75%* *b. Minimum score of 55 out of 100*
Reading list	*a. Arya, P. Atam, 1990. Introduction to Classical Mechanics. Prentice Hall.* *b. Spiegel, M.R., 1982. Theory and Problems of Theoretical Mechanics. McGraw-Hill* *c. Fowles, G.R., 1999. Analytical Mechanics. New York: Saunders College Publishing* *d. Greiner, W., 2004.Classical Mechanics-Point Particles and Relativity. Springer.* *e. MIT Open Course Ware. 2016. Classical-Mechanics. Massachusetts Institute of Technology. updated in 2022.* *f. Peter Dourmashkin. 2023. Classical-Mechanics. Massachusetts Institute of Technology. Open Education Resource (OER) LibreTexts Project.*

Module Descriptions

Module designation	*8420303081*
Semester(s) in which the module is taught	*3/second year*
Person responsible for the module	1. Dr. Titin Sunarti, M.Si 2. Dr. Asnawi, M.Si 3. Setyo Admoko, M.Pd
Language	*Inddnesian*
Relation to curriculum	*Compulsory*
Teaching methods	*Lecture, lesson, lab works*
Workload (incl. contact hours, self-study hours)	*(Estimated) Total workload: 136 work hours per-semester* *Contact hours:* *a. Lecture, exercise: 26.7 work hours per-semester ,* *b. Laboratory session: 45.3 work hours per-semester* *Private study including examination preparation: 64 work hours per-semester*
Credit points	*4.77 ECTS*
Required and recommended prerequisites for joining the module	*Waves*
Module objectives/intended learning outcomes	*Key question: what learning outcomes should students attain in the module?* *E.g. in terms of:* • *Knowledge:* *Masters and demonstrates the principles of classical and modern physics theory.* *Formulates physical symptoms and problems based on the results of observations and experiments, and model them using mathematics and computing for appropriate decision making in both familiar and new problems.* • *Skills: Develops logical, critical, systematic and creative thinking in carrying out specific work in the field of expertise and in accordance with the work competency standards in the relevant field.*

	• *Competences: -*
Content	*Waves in a medium have more than one dimension: flat waves, water waves, wave equations and their solutions in cartesian coordinates, spherical and cylindrical, reflection and refraction, stationary waves.* *Transverse mechanical waves, impedance, reflection and transmission, stationary waves, dispersion, polarization, Fourier techniques, modulation. Longitudinal mechanical waves: sound waves in solids and fluids. Electromagnetic waves (EM): Maxwell's system of equations for EM fields in medium, EM waves, medium impedance, wave kinematics and energetics, dispersion linkages, Doppler effect.* *Propagation on the border of two mediums, in waveguide, optical fiber and non-isotropic medium. Coherence, interference, diffraction (Fraunhofer and Fresnel), slit and lattice diffraction patterns, interferometry*
Examination forms	*Essay*
Study and examination requirements	***Requirements for successfully passing the module:*** *a. Minimum attendance of 75%* *b. Minimum score of 55 out of 100*
Reading list	1. Akira Hirose, Introduction to Wave Phenomena, John Willey & Sons.Inc1985 2. Alonso M & Finn, E.I. Dasar-Dasar Fisika Untuk Universitas Jilid I. Penerbit Erlangga. Jakarta.,1992 3. Tjia May On, Gelombang, Institut teknologi bandung, 2005 4. PASCO Scientific 2011, Instruction Sheet by Pasco Scientific, 10101 Fotthills Blvd , PO Box, 619011 Roseville CA

Module Descriptions

Module designation	*8420304293*
Semester(s) in which the module is taught	*3*
Person responsible for the module	*Mita Anggaryani, M.Pd., Ph.D.*
Language	Indonesian
Relation to curriculum	*Compulsory / elective / specialisation*
Teaching methods	*Lecture, Lesson, Discussion, case study lab works, project, seminar*
Workload (incl. contact hours, self-study hours)	*(Estimated) Total workload: 181.3 work hours per-semester* *Contact hours (please specify whether lecture, exercise, laboratory session, etc.): 123 work hours per-semester* *Private study including examination preparation, specified in hours: 53.3 work hours per-semester*
Credit points	6.36 ECTS
Required and recommended prerequisites for joining the module	-
Module objectives/intended learning outcomes	*Key question: what learning outcomes should students attain in the module?* *E.g. in terms of:* • *Attitude:* *a. Demonstrates a resilient, collaborative, adaptive, innovative, inclusive, lifelong learning, and entrepreneurial character.* • *Competences -* • *Knowledge:* *a. Formulates physical symptoms and problems based on the results of observations and experiments, and model them using mathematics and computing for appropriate decision making in both familiar and new problems.* *b. Masters the pedagogical knowledge in planning, teaching, and evaluating physics learning as well as resource management in organizing classes, physics laboratories and educational institutions.* • *Skills:*

	a. Develops logical, critical, systematic and creative thinking in carrying out specific work in the field of expertise and in accordance with the work competency standards in the relevant field. *Conducts physics education research in the form of studies and evaluations of physics learning with a quantitative and/or qualitative approach in the form of oral and academic writing effectively..*
Content	*This course examines advanced mathematical concepts used to solve various physics problems, including ordinary differential equations, Fourier series, special functions, and partial differential equations. The learning process is supported by the use of Python software (NumPy, SciPy, Matplotlib, SymPy) for numerical computation, modeling, and visualization. Students will be trained to develop logical, critical, and systematic thinking in modeling physical phenomena through mathematical and computational approaches, as well as to communicate analytical results effectively, both orally and in academic writing.*
Examination forms	*Essay*
Study and examination requirements	***Requirements for successfully passing the module:*** *a. Minimum attendance of 75%* *b. Minimum score of 55 out of 100*
Reading list	*a. Boas, M.L. 2006. Mathematical Methods in the Physical Science, edisi 3, John Wiley & Sons, New York.* *b. Newman, M. 2024. Computational Physics with Python.* *c. Power point pendukung dari dosen pengampu* *d. Jurnal ilmiah terkait materi berdasarkan subject yang terkait* *e. Komputasi Jilid 1, M.N. Fahmi, dkk, Catvari, 2024*

Module Descriptions

Module designation	*1000002003*
Semester(s) in which the module is taught	*1*
Person responsible for the module	*Tim MBKM*
Language	Indonesian
Relation to curriculum	*Compulsory / elective / specialisation*
Teaching methods	*Lecture, Lesson, Discussion, case study, Project, Seminar, lab works*
Workload (incl. contact hours, self-study hours)	*(Estimated) Total workload: 136 work hours per-semester* *Contact hours (please specify whether lecture, exercise, laboratory session, etc.): 40 work hours per-semester* *Private study including examination preparation, specified in hours: 94 work hours per-semester*
Credit points	3.18 ECTS
Required and recommended prerequisites for joining the module	-
Module objectives/intended learning outcomes	*Key question: what learning outcomes should students attain in the module?* *E.g. in terms of:* • *Attitude: -* • *Competences:-* • *Knowledge:* *a. Able to demonstrate religious, national and cultural values, as well as academic ethics in carrying out their duties.* *b. Demonstrating a character that is resilient, collaborative, adaptive, innovative, inclusive, committed to lifelong learning, and entrepreneurial.* *c. Developing logical, critical, systematic, and creative thinking in carrying out specific tasks within one's field of expertise, in accordance with the relevant professional competency standards.* *d. Engaging in continuous self-development and collaborating.*

	• *Skills:-*
Content	*The Indonesian Language course aims to enhance students' proficiency in both spoken and written Indonesian, in accordance with linguistic rules and appropriate contexts. It also seeks to strengthen students' academic skills in writing scholarly and popular texts, as well as disseminating them through journals or social media. Through this course, students are expected to develop academic and professional competencies, alongside effective communication skills. The learning activities are grounded in a project-based approach, resulting in creative outputs that benefit society by addressing linguistic challenges and contributing to scholarly discourse in Indonesia. The course integrates the 4th and 5th Sustainable Development Goals (SDGs)—Quality Education and Gender Equality—across several topics: 1) the history, functions, and status of the Indonesian language; 2) politeness in the use of Indonesian; 3) critical reading; 4) the scholarly register of the Indonesian language; 6) ethics and plagiarism; 7) academic writing; and 10) scholarly presentations..*
Examination forms	*Essay*
Study and examination requirements	***Requirements for successfully passing the module:*** *a. Minimum attendance of 75%* *b. Minimum score of 55 out of 100*
Reading list	*a. Alwi, Hasan, dkk. 2014. Tata Bahasa Baku Bahasa Indonesia (Edisi 3). Jakarta: Balai Pustaka..* *b. Arifin, Zaenal dan Amran Tasai. 2004. Cermat Berbahasa. Jakarta: Akademika Pressindo.* *c. Badan Bahasa. 2015. Kamus Besar Bahasa Indonesia (daring). www.kbbidaring.kemendikbud* *d. Dalman. 2014. Keterampilan Menulis. Jakarta: Raja Grafindo Persada.* *e. Depdiknas. 2015. Ejaan Bahasa Indonesia. Jakarta: Depdiknas. (Peraturan Pemerintah No.50 Tahun 2015)* *f. Wijayanti, Sri Hapsari, dkk. 2013. Bahasa Indonesia: Penulisan dan Penyajian Karya Ilmiah. Jakarta: Rajawali Pers.* *g. Tim Penulis. 2022. Menulis Ilmiah: Buku Ajar MPK Bahasa Indonesia. Surabaya: University Press (Unesa Press).* *h. Tim Penulis. 2025. Bahasa Indonesia Akademik. Buku Ajar MKWK Bahasa Indonesia. Unesa. Gresik: Delima*

Module Descriptions

Module designation	8420302224 – Kewirausahaan (Entrepreneurship)
Semester(s) in which the module is taught	3
Person responsible for the module	*Prof. Dr. Titin Sunarti, M.Si.*
Language	Indonesian
Relation to curriculum	*Compulsory / elective / specialisation*
Teaching methods	*Lecture, Lesson, Discussion, case study, lab works, project, seminar*
Workload (incl. contact hours, self-study hours)	*(Estimated) Total workload: 90.7 work hours per-semester* *Contact hours:* *a. Lecture, exercise: 28 work hours per-semester (2 hours per week × 14 weeks)* *Private study including examination preparation: 62.7 work hours per-semester (private study ± 51.7 hours; examination preparation ± 11 hours)*
Credit points	3.18 ECTS
Required and recommended prerequisites for joining the module	-
Module objectives/intended learning outcomes	*Key question: what learning outcomes should students attain in the module?* *E.g. in terms of:* • *Attitude:* *a. Demonstrate good scientific manners, critical thinking, and innovation skills in educational, research, and professional fields (PLO-11/SOC-1).* • *Competences:* *a. Make a decision based on the data information and evaluation in order to fulfil the responsibility of the task (PLO-9/COM-2).* *b. Work as an individual as well as a team effectively, have an entrepreneur skill, and awareness of environmental issues (PLO-10/COM-3).* • *Knowledge: -*

	• *Skills:* *a. Improve their knowledge and be able to continue their study in a higher degree program (PLO-7/SKI-3).*
Content	*This course equips students with entrepreneurial knowledge and skills. The topics cover: the basic concepts of entrepreneurship; entrepreneurial motivation; strategies for capturing business ideas and opportunities; business management and financial management; business production activities; business licensing; marketing strategies and market analysis; preparing a business plan; and running a business. Learning is conducted using project-based learning, in which students prepare a business plan and carry out a business project.*
Examination forms	*Participatory activities (50%), project/product assessment (50%)*
Study and examination requirements	***Requirements for successfully passing the module:*** *a. Minimum attendance of 75%* *b. Minimum score of 55 out of 100*
Reading list	*a. Blackwell, Edward. 2011. How to Prepare a Business Plan. London: Kogan Page. ISBN: 0-7494-41917.* *b. Buchori Alma. 2005. Kewirausahaan. Bandung: Alfabeta.* *c. Jeffry A. Timmons, dkk. 2007. New Venture Creation: Entrepreneurship for the 21st Century. McGraw Hill Irwin.* *d. Kasali, Rhenald, et al. 2010. Modul Kewirausahaan untuk Program Strata 1, 1st edition. Jakarta.* *e. Munandar, Utami SC. 1999. Kreativitas dan Keberbakatan. Jakarta: Gramedia Pustaka Utama.* *f. Paley, Norton. 2004. Successful Business Planning. Thorogood Publication. ISBN: 978-1854182777.* *g. Suharyadi, dkk. 2008. Kewirausahaan: Membangun Usaha Sukses Sejak Usia Muda. Jakarta: Salemba Empat.* *h. Suryana. 2008. Kewirausahaan: Pedoman Praktis, Kiat dan Proses Menuju Sukses. Jakarta: Salemba Empat.*

Module Descriptions

Module designation	*1000002046*
Semester(s) in which the module is taught	*1*
Person responsible for the module	*TIM MKWU*
Language	Indonesian
Relation to curriculum	*Compulsory*
Teaching methods	*Lecture, Lesson, Discussion, case study*
Workload (incl. contact hours, self-study hours)	*(Estimated) Total workload: 90 work hours per-semester* *Contact hours (please specify whether lecture, exercise): 63.4 work hours per-semester* *Private study including examination preparation, specified in hours: 26.6 work hours per-semester*
Credit points	3.18 ECTS
Required and recommended prerequisites for joining the module	-
Module objectives/intended learning outcomes	*Key question: what learning outcomes should students attain in the module?* *E.g. in terms of:* • *Attitude:* *a. Demonstrates religious, national and cultural values, as well as academic ethics in carrying out their duties.* *b. Demonstrates a resilient, collaborative, adaptive, innovative, inclusive, lifelong learning, and entrepreneurial character.* • *Competences -* • *Knowledge:* • *Skills:* *a. Develops logical, critical, systematic and creative thinking in carrying out specific work in the field of expertise and in accordance with the work competency standards in the relevant field.* *b. Develops self sustainably and collaborate.*

Content	*The Digital Literacy course is a general compulsory course (MKWU) for all students at Universitas Negeri Surabaya, offered in the first year of study. This course equips students with an understanding of the digital world, such as using the internet and social media wisely, understanding and critically evaluating information, and recognizing the use of technology in education, including various software and applications.* *It also covers the use of applications to support academic fields, technology-based learning content, basic programming, and the use of technology for project collaboration. Learning activities include practice sessions, discussions, presentations, individual assignments, and final project collaboration.*
Examination forms	*Essay*
Study and examination requirements	***Requirements for successfully passing the module:*** *a. Minimum attendance of 75%* *b. Minimum score of 55 out of 100*
Reading list	*a. Subuh Isnur, et.al., 2024. Literasi Digital. Penerbit Erlangga.* *b. Kathy A, et. al. 2022. Literacy for Digital: Futures Mind, Body, Text. New York: Routledge* *c. Joel Bloch. 2021. Creating Digital Literacy Spaces for Multilingual Writers. Multilingual Matters3.Lauren Hays; Jenna* *d. Kammer. 2021. Integrating Digital Literacy in the Disciplines. Bloomfield:* *e. Taylor & Francis Group.4.Nicole M. Fox. 2022. Digital Visual Literacy. ABC-CLIO.* *f. Bart Van de Wiele. 2022. Adobe Photoshop, Illustrator, and InDesign Collaboration and Workflow. Adobe Press6.David* *g. Alford. 2021. BGE S1-S3 computing science and digital literacy : third and fourth levels.*

UNESA

4th Semester



Module Descriptions

Module designation	*8420303076*
Semester(s) in which the module is taught	*4/ Fourth Yeaar*
Person responsible for the module	1. *Dra. Suliyanah, M.Si* 2. *Dr. Asnawi, M.Si* 3. *Lydia Rohmawati, M.Si* 4. *Utama Alan Deta, M.Pd., M.Si* 5. *Prof. Dr. Wasis, M.Si* 6. *Abu Zainuddin, M.Pd*
Language	*indonesia*
Relation to curriculum	*Compulsory*
Teaching methods	*lecture, lesson*
Workload (incl. contact hours, self-study hours)	*(Estimated) Total workload: 136 work hours per-semester* *Contact hours:* a) *Lecture, exercise: 26.7 work hours per-semester ,* b) *Laboratory session: 45.3 work hours per-semester* *Private study including examination preparation: 64 work hours per-semester*
Credit points	*4.77 ECTS*
Required and recommended prerequisites for joining the module	*Physics Modern*
Module objectives/intended learning outcomes	*Key question: what learning outcomes should students attain in the module?* *E.g. in terms of:* - *Knowledge: familiarity with information, theory and/or subject knowledge* *Skills: cognitive and practical abilities for which knowledge is used* - *Competences: integration of knowledge, skills and social and methodological capacities in working or learning situations* *E.g.: "Students know that/know how to/are able to…"*
Content	*The Modern Physics course discusses the concepts/ principles/theories / basic laws of Modern Physics (physics content knowledge) which underlies the study material in the Physics curriculum of SMA / SMK in depth which includes Relativity, Particle Properties of Waves, Wave Properties of Particles, Structure Atom, Quantum Mechanics, Hydrogen Atom Quantum Theory, Multiple Electron Atom, Core Structure, Nuclear Transformation, as well as being able to communicate scientifically and work effectively both individually and in groups.*

Examination forms	*Essay*
Study and examination requirements	***Requirements for successfully passing the module:*** *a) Minimum attendance of 75%* *b) Minimum score of 55 out of 100*
Reading list	*1. Beiser A, 2003, "Consepts of Modern Physics", Sixth Edition. McGraw Hill Inter. BookCompany* *2. Supangkat, Haryadi, 1990. "Fisika Modern", Jurusan Fisika ITB.* *3. Wehr,M R.1980," Physics of The Atom" , Addison Wesley Manila*

Module Descriptions

Module designation (kode MK)	8420303135
Semester(s) in which the module is taught	4
Person responsible for the module	*Dra. Suliyanah, M.Si.*
Language	Indonesian
Relation to curriculum	*Compulsory ~~/ elective / specialisation~~*
Teaching methods	*Lecture, Lesson, Discussion, case study ~~lab works~~, ~~project~~, ~~seminar~~*
Workload (incl. contact hours, self-study hours)	*(Estimated) Total workload: 181.3 work hours per-semester* *Contact hours (please specify whether lecture, exercise, ~~laboratory session, etc.~~): 53.3 work hours per-semester* *Private study including examination preparation, specified in hours: 128 work hours per-semester*
Credit points	4.77 ECTS
Required and recommended prerequisites for joining the module	-
Module objectives/intended learning outcomes	*Key question: what learning outcomes should students attain in the module?* *E.g. in terms of:* - *Attitude:* - *Competences* - *Knowledge:* a) *Masters the pedagogical knowledge in planning, teaching, and evaluating physics learning as well as resource management in organizing classes, physics laboratories and educational institutions* - *Skills:* a) *Develops logical, critical, systematic and creative thinking in carrying out specific work in the field of expertise and in accordance with the work competency standards in the relevant field.* b) *Conducts physics education research in the form of studies and evaluations of physics learning with a quantitative and/or qualitative approach in the form of oral and academic writing effectively.*

Content	*This course discusses the nature of research in Physics education; various research methods in Physics education: experimental research, CAR, and R&D; Physics education research design: design, research subjects/populations/samples, research instruments, data collection techniques, and data analysis techniques according to various experimental research methods, CAR, and R&D; issues and identification of problems in Physics education and learning; writing a Physics education research proposal according to the research design.*
Examination forms	*Product*
Study and examination requirements	***Requirements for successfully passing the module:*** *a) Minimum attendance of 75%* *b) Minimum score of 55 out of 100*
Reading list	*a) Nazir, Moh. , Metode Penelitian, Penerbit Ghalia Indonesia, Bogor, 2009.* *b) Prabowo, Metodologi Penelitian, Penerbit Unesa University Press, Surabaya, 2011.* *c) Punaji Setyosari, Metode Penelitian Pendidikan dan Pengembangan, Penerbit Kencana, Jakarta, 2010.* *d) Sugiyono, Metode Penelitian Kuantitatif, Kualitatif dan R & D, CV Penerbit Alfabeta, Bandung, 2010.* *e) Suharsimi Arikunto, Prosedur Penelitian Suatu Pendekatan Praktik, Penerbit Rineka Cipta, Jakarta, 2006.*

Module Descriptions

Module designation	8420303297 – Elektronika (Electronics)
Semester(s) in which the module is taught	4
Person responsible for the module	*Drs. Imam Sucahyo, M.Si.*
Language	Indonesian
Relation to curriculum	*Compulsory ~~/ elective / specialisation~~*
Teaching methods	*Lecture, Lesson, Discussion, ~~case study~~, lab works, project, ~~seminar~~*
Workload (incl. contact hours, self-study hours)	*(Estimated) Total workload: 136 work hours per-semester* *Contact hours:* *a) Lecture, exercise: 28 work hours per-semester (2 hours per week × 14 weeks),* *b) Laboratory session: 45.3 work hours per-semester (1 credit × 170 minutes × 16 weeks)* *Private study including examination preparation: 62.7 work hours per-semester (private study ± 51.7 hours; examination preparation ± 11 hours)*
Credit points	4.77 ECTS
Required and recommended prerequisites for joining the module	-

Module objectives/intended learning outcomes	*Key question: what learning outcomes should students attain in the module?* *E.g. in terms of:* - *Attitude:* *a) Demonstrate good scientific manners, critical thinking, and innovation skills in educational, research, and professional fields (PLO-11/SOC-1).* - *Competences:* *a) Make a decision based on the data information and evaluation in order to fulfil the responsibility of the task (PLO-9/COM-2).* - *Knowledge:* *a) Demonstrate their knowledge of classical physics and modern physics (PLO-1/KNO-1).* *b) Formulate a physical system as a physical model by using mathematics (PLO-2/KNO-2).* - *Skills:* *a) Design and conduct experiments in learning physics by applying the scientific method (PLO-6/SKI-2).*
Content	*This course covers the working principles and applications of Bipolar Junction Transistors (BJT) and amplifier circuits, power amplifiers, Junction Field Effect Transistors (JFET) and their characteristics, the characteristics and circuits of operational amplifiers (op-amps) including their use in a bio-impedance spectroscopy system, oscillators, and the basics of digital electronics (number conversion, logic gates and binary coded decimal). Learning is conducted using project-based learning supported by laboratory activities (circuit experiments, data collection and practicum reports).*
Examination forms	*Participatory activities (12.5%), project/product assessment (20%), practicum assessment (35%), practice/performance assessment (7.5%), written test (25%)*
Study and examination requirements	***Requirements for successfully passing the module:*** *a) Minimum attendance of 75%* *b) Minimum score of 55 out of 100*

Reading list	a) *Sutrisno. 1978. Elektronika 2: Teori dan Penerapannya. Bandung: Penerbit ITB.* b) *Rahmawati, E., Sucahyo, I., dan Kholiq, A. 2017. Hand Out Elektronika Dasar 2.* c) *Rahmawati, E., Sucahyo, I., dan Kholiq, A. 2017. Panduan Praktikum Elektronika Dasar 2.* d) *Tooley, M. 2006. Electronic Circuits: Fundamentals and Applications. Third Edition. Elsevier Ltd.* e) *Boylestad, R., and Nashelsky, L. Electronic Devices and Circuit Theory. Seventh Edition. Prentice Hall.* f) *Floyd, T. L. 2012. Electronic Devices. Prentice Hall.* g) *Rahmawati, E., Santoso, D. R., Noor, J. A. E., & Dharmawan, H. A. (2024, November). Portable and inexpensive electrochemical impedance spectroscopy system for characterization of saline solution impedance. In Journal of Physics: Conference Series (Vol. 2900, No. 1, p. 012041). IOP Publishing.*

Module Descriptions

Module designation (kode MK)	*8420303115*
Semester(s) in which the module is taught	*3*
Person responsible for the module	*Imam Sucahyo*
Language	Indonesian
Relation to curriculum	*Compulsory ~~/ elective / specialisation~~*
Teaching methods	*Lecture, Lesson, Discussion, case study ~~lab works~~, ~~project~~, ~~seminar~~*
Workload (incl. contact hours, self-study hours)	*(Estimated) Total workload: 136 work hours per-semester* *Contact hours:* *a) Lecture, exercise: 26.7 work hours per-semester ,* *b) Laboratory session: 45.3 work hours per-semester* *Private study including examination preparation: 64 work hours per-semester*
Credit points	4.77 ECTS
Required and recommended prerequisites for joining the module	-
Module objectives/intended learning outcomes	*Key question: what learning outcomes should students attain in the module?* *E.g. in terms of:* - *Attitude: -* - *Competences: -* - *Knowledge:* *a) Masters and demonstrates the principles of classical and modern physics theory.* *b) Formulates physical symptoms and problems based on the results of observations and experiments, and model them using mathematics and computing for appropriate decision making in both familiar and new problems.* - *Skills:* *a) Develops logical, critical, systematic and creative thinking in carrying out specific work in the field of expertise and in accordance with the work competency standards in the relevant field.*

Content	*Thus, this Electromagnetism course covers discussions on the following concepts: vector analysis, gradient, divergence, curl, Stokes' theorem, electric fields, Coulomb's law, electric fields, Gauss's law, electric potential, electric dipoles, electric multipole energy, field energy density, Laplace's equation and Poisson's equation, boundary conditions, the method of images, and the method of separation of variables.* *Dielectric materials: polarization vector, polarization charge, displacement vector **D**, Gauss's law for **D**.* *Electric current: electric charge flow, continuity equation.* *Magnetic field: Lorentz force, Biot–Savart law, vector potential, Ampère's law, magnetic dipole moment, scalar potential, magnetization, magnetic poles, Ampère's law for **H**, magnetic materials, hysteresis.* *Magnetic induction, displacement current, Maxwell's equations.* *Learning is carried out through case-study methods and laboratory activities (data collection processes, reporting, and presentation of laboratory results).*
Examination forms	*Essay*
Study and examination requirements	***Requirements for successfully passing the module:*** *c) Minimum attendance of 75%* *d) Minimum score of 55 out of 100*
Reading list	*f) David j Griffiths, 2013, Introduction to Electrodynamics, Fourth edition, Prentice Hall, International edition* *g) TIM. Buku Panduan Praktikum Lisrik Magnet. TIM Listrik Manget, 2018* *h) Mahmud Zaki, 2000. Medan Elektromagnetik (Bagian I). Jurusan Fisika FMIPA ITS.* *i) Reitz, JR. & Milford, FJ. 1990.*

Module Descriptions

Module designation	*8420302287*
Semester(s) in which the module is taught	*4*
Person responsible for the module	*Abdul Kholiq, M.Pd*
Language	Indonesian
Relation to curriculum	*Compulsory ~~/ elective / specialisation~~*
Teaching methods	*Lecture, Lesson, Discussion, case study ~~lab works~~, ~~project~~, ~~seminar~~*
Workload (incl. contact hours, self-study hours)	*(Estimated) Total workload: 136 work hours per-semester* *Contact hours (please specify whether lecture, exercise, ~~laboratory session, etc.~~): 40 work hours per-semester* *Private study including examination preparation, specified in hours: 94 work hours per-semester*
Credit points	3.18 ECTS
Required and recommended prerequisites for joining the module	-
Module objectives/intended learning outcomes	*Key question: what learning outcomes should students attain in the module?* *E.g. in terms of:* - *Attitude: -* - *Competences -* - *Knowledge:* a) *Masters the pedagogical knowledge in planning, teaching, and evaluating physics learning as well as resource management in organizing classes, physics laboratories and educational institutions.* - *Skills:* a) *Develops logical, critical, systematic and creative thinking in carrying out specific work in the field of expertise and in accordance with the work competency standards in the relevant field.* b) *Masters the principles of developing physics learning media based on science, contextual technology, especially ICT (information and communication technology), and the surrounding environment.*
Content	*This course examines the definition, function, role, and types of learning media; selecting relevant learning media; as well as the basic concepts of development.*
Examination forms	*project*

Study and examination requirements	***Requirements for successfully passing the module:*** *e) Minimum attendance of 75%* *f) Minimum score of 55 out of 100*
Reading list	*j) Fenrich, P. 1997. Practical Guidelines For Creating Instructional Multimedia Application . USA: Harcourt Brace College Publisher* *k) Heinich, R., Molenda. 1999. Instructional Media and Technologies forLearning . USA: Prentice Hall* *l) Reynolds, Karen E. 1996. Technology for the teaching and learning science . Boston: Allyn and Bacon* *m) Arsyad, Azhar, 2009. Media pembelajaran . Jakarta: Raja Grafindo Persada* *n) Munadi, Yudhi. 2008. Media pembelajaran: sebuah pendekatan baru . Jakarta: Gaung Persada, 2008* *o) Isnawati. 2015. Media Pembelajaran Berbasis Bahan Sederhana . Surabaya: Jaudar Press* *p) Rusli M, Hermawan D dan Supuwiningsih N N. 2017. Multimedia Pembelajaran Yang Inovatif. Yogyakarta: Andi Offset.* *q) Surjono, H. D. 2019. Multimedia pembelajaran interaktif konsep dan pengembangan. Yogyakarta: UNY Press* *r) Susanti, N., Yennita, Y., & Azhar, A. (2020). Development of contextual based electronic global warming modules using flipbook applications as physics learning media in high schools. Journal of Educational Sciences, 4(3), 541.* *s) Wati, M., Hartini, S., Hikmah, N., & Mahtari, S. (2018, March). Developing physics learning media using 3D cartoon. In Journal of Physics: Conference Series (Vol. 997, No. 1, p. 012044). IOP Publishing.* *t) Wijaya, R. E., Mustaji, M., & Sugiharto, H. (2021). Development of Mobile Learning in Learning Media to Improve Digital Literacy and Student Learning Outcomes in Physics Subjects: Systematic Literature Review. Budapest International Research and Critics Institute (BIRCI-Journal): Humanities and Social Sciences, 4(2), 3087-3098.* *u) Wahyuni, H. S., & Rosana, D. (2019, June). Physics Props Development based on Personal Desk Laboratory System to Improve Creative Thinking Ability and Students' Scientific Attitude. In Journal of Physics: Conference Series (Vol. 1233, No. 1, p. 012032). IOP Publishing.*

Module designation	*8420302283*
Semester(s) in which the module is taught	*4*
Person responsible for the module	*Dr. Muhammad Satriawan, M.Pd*
Language	Indonesian
Relation to curriculum	*Compulsory ~~/ elective / specialisation~~*
Teaching methods	*Lecture, Lesson, Discussion, case study ~~lab works~~, ~~project~~, ~~seminar~~*
Workload (incl. contact hours, self-study hours)	*(Estimated) Total workload: 136 work hours per-semester* *Contact hours (please specify whether lecture, exercise, ~~laboratory session, etc.~~): 40 work hours per-semester* *Private study including examination preparation, specified in hours: 94 work hours per-semester*
Credit points	3.18 ECTS
Required and recommended prerequisites for joining the module	-
Module objectives/intended learning outcomes	*Key question: what learning outcomes should students attain in the module?* *E.g. in terms of:* - *Attitude: -* - *Competences -* - *Knowledge:* *b) Masters the pedagogical knowledge in planning, teaching, and evaluating physics learning as well as resource management in organizing classes, physics laboratories and educational institutions.* - *Skills:* *c) Develops logical, critical, systematic and creative thinking in carrying out specific work in the field of expertise and in accordance with the work competency standards in the relevant field.* *d) Masters the principles of developing physics learning media based on science, contextual technology, especially ICT (information and communication technology), and the surrounding environment.* *e) Conducting physics education research through the study and evaluation of physics learning using quantitative and/or qualitative approaches, effectively communicated in oral and academic written forms*
Content	*This core professional course covers learning systems and instructional planning, including instructional planning models, competency design, indicator development, syllabus design, and the development of lesson plans based on the current secondary school curriculum.*

Examination forms	*project*
Study and examination requirements	***Requirements for successfully passing the module:*** *g) Minimum attendance of 75%* *h) Minimum score of 55 out of 100*
Reading list	*1. Haynes, A. 2010. The complete guide to lesson planning and preparation. Bloomsbury Publishing.* *2. Rosenberg, Joshua M., and Matthew J. Koehler.* *3. Keputusan Kepala Badan Standar, Kurikulum, dan Asesmen Pendidikan Kementerian Pendidikan, Kebudayaan, Riset, dan Teknologi Nomor 008/H/Kr/2022 Tentang Capaian Pembelajaran Pada Pendidikan Anak Usia Dini, Jenjang Pendidikan Dasar, Dan Jenjang Pendidikan Menengah Pada Kurikulum Merdeka.* *4. Kwangmuang, P., Jarutkamolpong, S., Sangboonraung, W., & Daungtod, S. (2021). The development of learning innovation to enhance higher order thinking skills for students in Thailand junior high schools. Heliyon, 7(6), e07309.* *5. Peraturan Menteri Pendidikan Dan Kebudayaan Republik Indonesia Nomor 37 Tahun 2018... Tentang Perubahan Atas Peraturan Menteri Pendidikan Dan Kebudayaan Nomor 24 Tahun 2016 Tentang Kompetensi Inti Dan Kompetensi Dasar Pelajaran Pada Kurikulum 2013 Pada Pendidikan Dasar Dan Pendidikan Menengah.* *6. RI, K. (2022). Buku Saku Tanya Jawab Kurikulum Merdeka. Jakarta: BADAN STANDAR, KURIKULUM, DAN ASESMEN PENDIDIKAN KEMENTERIAN PENDIDIKAN, KEBUDAYAAN, RISET, DAN TEKNOLOGI REPUBLIK INDONESIA.* *7. Anggaryani, M., Satriawan, M., Saputra, O., & Habibbulloh, M. (2023). Dasar-Dasar Pengembangan Bahan Ajar: Berorientasi pada Pembelajaran Berbasis Proyek. Mitra Edukasi dan Publikasi.*

Module Descriptions

Module designation	8420302288 – (Teaching Skills and Microteaching)
Semester(s) in which the module is taught	5
Person responsible for the module	*Mita Anggaryani, M.Pd., Ph.D. (Study Program Coordinator)*
Language	Indonesian
Relation to curriculum	*Compulsory / elective / specialisation*
Teaching methods	*Lecture, Lesson, Discussion, case study, lab works, project, seminar, microteaching and peer teaching*
Workload (incl. contact hours, self-study hours)	*(Estimated) Total workload: 136 work hours per-semester* *Contact hours:* *a. Lecture, exercise, microteaching: 42 work hours per-semester (3 hours per week × 14 weeks)* *Private study including examination preparation: 94 work hours per-semester (private study ± 77.5 hours; examination preparation ± 16.5 hours)*
Credit points	4.77 ECTS
Required and recommended prerequisites for joining the module	-
Module objectives/intended learning outcomes	*Key question: what learning outcomes should students attain in the module?* *E.g. in terms of:* • *Attitude:* *a. Demonstrate good scientific manners, critical thinking, and innovation skills in educational, research, and professional fields (PLO-11/SOC-1).* • *Competences:* *a. Make a decision based on the data information and evaluation in order to fulfil the responsibility of the task (PLO-9/COM-2).* *b. Work as an individual as well as a team effectively, have an entrepreneur skill, and awareness of environmental issues (PLO-10/COM-3).*

	• *Knowledge:* *a. Demonstrate pedagogical knowledge in planning, teaching, and evaluating a physics learning (PLO-3/KNO-3).* • *Skills:* *a. Plan, do, and evaluate of physics learning by using information and communication technology (PLO-5/SKI-1).* *b. Improve their knowledge and be able to continue their study in a higher degree program (PLO-7/SKI-3).*
Content	*This course examines school-based management and clinical supervision through presentations and discussions, and facilitates students in developing learning tools based on the applicable curriculum and the needs and diversity of learners, including learners with special needs, in accordance with the National Education Standards through workshops and discussions. The topics cover: school-based management; clinical supervision; the concept of microteaching; basic teaching skills; teacher competencies; development of learning tools and assessment; model-based learning simulations; and recording model-based microteaching sessions. Students are required to use ICT and research results to produce learning tools for primary and secondary education, and are equipped with teaching skills through microteaching and peer teaching. Learning is conducted using project-based learning.*
Examination forms	*Participatory activities (2.5%), project/product assessment (56%), portfolio assessment (1.5%), practice/performance assessment (40%)*
Study and examination requirements	***Requirements for successfully passing the module:*** *a. Minimum attendance of 75%* *b. Minimum score of 55 out of 100*
Reading list	*a. Nurkolis. 2003. Manajemen Berbasis Sekolah: Teori, Model, dan Aplikasi. Jakarta: Grasindo.* *b. Mulyasa, E. 2004. Manajemen Berbasis Sekolah: Konsep, Strategi, dan Implementasi. Bandung: PT Remaja Rosdakarya.* *c. Makawimbang, J.E. 2013. Supervisi Klinis: Teori dan Pengukurannya (Analisis di Bidang Pendidikan). Bandung: Alfabeta.* *d. UPT-P4 Unesa. 2014. Pedoman Pengalaman Lapangan. Surabaya: University Press.* *e. Arends, R.I. 2012. Learning to Teach. New York: McGraw-Hill International Edition.* *f. Slavin, R.E. 2011. Psikologi Pendidikan (Teori dan Praktik) (Terjemahan). Jakarta: PT Indeks.*

	g. Baroncelli, Stefania., Farneti, Roberto., Horga, Ioan., Vanhoonacker, Sophie (eds). 2014. Teaching and Learning the European Union: Traditional and Innovative Methods. Dordrecht: Springer. *h. Susantini, E., dkk. 2014. Panduan Microteaching untuk Dosen, Mahasiswa, dan Crew. Surabaya: University Press.* *i. Habibi, Admoko, S., Herayanti, L., Almaida, N. N., & Anugrah, S. (2021). Model Multicultural-Techno Contextual Learning (M-TECH): Diperuntukkan bagi Mahasiswa Calon Guru. Mataram: Pusat Pengembangan Pendidikan dan Penelitian Indonesia (P4I).*

Module Descriptions

Module designation	8420302240
Semester(s) in which the module is taught	*4/ second year*
Person responsible for the module	Mukhayyarotin Niswati Rodliyatul Jauhariyah, S.Pd., M.Pd
Language	*indonesia*
Relation to curriculum	*Compulsory*
Teaching methods	*e.g. lecture, lesson, lab works, project, seminar etc.*
Workload (incl. contact hours, self-study hours)	*(Estimated) Total workload: 90.7 work hours per-semester* *Contact hours (please specify whether lecture, exercise: 26.7 work hours per-semester* *Private study including examination preparation, specified in hours: 64 work hours per-semester*
Credit points	3.18 ECTS
Required and recommended prerequisites for joining the module	Learning Evaluation
Module objectives/intended learning outcomes	*Key question: what learning outcomes should students attain in the module?* *E.g. in terms of:* • *Knowledge:* *a. Demonstrates a resilient, collaborative, adaptive, innovative, inclusive, lifelong learning, and entrepreneurial character.* *b. Develops logical, critical, systematic and creative thinking in carrying out specific work in the field of expertise and in accordance with the work competency standards in the relevant field.* • *Skills:* *Develops self sustainably and collaborate.* • *Competences:* *Masters the pedagogical knowledge in planning, teaching, and evaluating physics learning as well as resource management in organizing classes, physics laboratories and educational institutions.*
Content	Study of the meaning, purpose, function, and assessment principles, taxonomy of cognitive, affective, and psychomotor learning

	outcomes, including scientific literacy and HOTs, various approaches, methods, and assessment strategies / techniques, instrument forms, rubrics / assessment guidelines , analysis and interpretation of assessment results, and their use. Online learning is carried out through discussions, assignments, and project assignments related to assessments at school.
Examination forms	*Essay*
Study and examination requirements	***Requirements for successfully passing the module:*** *a. Minimum attendance of 75%* *b. Minimum score of 55 out of 100*
Reading list	1. Anderson, Lorin W. Dan David R. Krathwohl, 2001. A Taxonomy for Learning, Teaching, and Assessing. A Revision of Bloom's Taxonomy of Educational Objectives. New York: Longman. 2. Arifin, Zaenal, 2013. Evaluasi Pembelajaran . Bandung: Remaja Rosdakarya Offset. 3. Arikunto, Suharsimi, 2014. Dasar-Dasar Evaluasi Pendidikan. Jakarta: Bumi Aksara. 4. Azwar, Saifuddin. 2012. Reliabilitas dan Validitas . Yogyakarta: Pustaka Pelajar. 5. Purwanto, 2014. Evaluasi Hasil Belajar . Jakarta: Pustaka Pelajar

Module Descriptions

Module designation	*8420302197*
Semester(s) in which the module is taught	*3*
Person responsible for the module	*Tim Matakuliah Statistika*
Language	Indonesian
Relation to curriculum	*Compulsory / elective / specialisation*
Teaching methods	*Lecture, Lesson, Discussion, case study lab works, project, seminar*
Workload (incl. contact hours, self-study hours)	*(Estimated) Total workload: 136 work hours per-semester* *Contact hours (please specify whether lecture, exercise, laboratory session, etc.): 40 work hours per-semester* *Private study including examination preparation, specified in hours: 94 work hours per-semester*
Credit points	3.18 ECTS
Required and recommended prerequisites for joining the module	-
Module objectives/intended learning outcomes	*Key question: what learning outcomes should students attain in the module?* *E.g. in terms of:* • *Attitude: -* • *Competences -* • *Knowledge:* *a. Masters and demonstrates the principles of classical and modern physics theory.* • *Skills:* *a. Develops logical, critical, systematic and creative thinking in carrying out specific work in the field of expertise and in accordance with the work competency standards in the relevant field.* *b. Develops self sustainably and collaborate.*

Content	*The Statistics course provides discussions on descriptive statistics, data distribution, central measures, probability distributions and their properties, binomial distribution, Poisson distribution, hypergeometric distribution, normal distribution, sampling distribution, statistical inference, interval estimation, and hypothesis testing for one and two populations. Learning is conducted through project-based methods combined with discussion and Q&A methods, assignments, matrix note strategies, summarizing, and drills.*
Examination forms	*essay*
Study and examination requirements	***Requirements for successfully passing the module:*** *a. Minimum attendance of 75%* *b. Minimum score of 55 out of 100*
Reading list	*a) Gilford, J.P Frucher, Fundamental statistics In physicology and Education, New york: Mc Graw Hill* *b) Sudjana. 1996. Metode Statistik. Bandung: Penerbit Tarsito* *c) Sudjana. 1983. Teknik Analisis Regresi dan Kolerasi. Bandung: penerbit Tarsito* *d) Peter Bruce and Andrew Bruce, 2017, Practical Statistios for Data Scientists, USA; O Reilly Media, inc.* *e) Weis, Neil A 2012. Elementary Statistics. United State of America Addison-Wesley* *f) Bluman, Allan G. 2011, Elementary statistics: a step by step approach 8th ed, Mc. Graww Hill.* *g) https://www.kdnuggets.com/2020/06/8-basic-statistics-concepts.html*

UNESA

5th Semester



Module Descriptions

Module designation	*8420302144*
Semester(s) in which the module is taught	*5/third year*
Person responsible for the module	1. Dr. Titin Sunarti., M.Si. 2. Dr. Rohim aminullah
Language	*Indonesian*
Relation to curriculum	*Compulsory*
Teaching methods	*Lecture, lesson*
Workload (incl. contact hours, self-study hours)	*(Estimated) Total workload: 90.7 work hours per-semester* *Contact hours (please specify whether lecture, exercisE) : 26.7 work hours per-semester* *Private study including examination preparation, specified in hours: 64 work hours per-semester*
Credit points	*3.18 ETCS*
Required and recommended prerequisites for joining the module	*Optics*
Module objectives/intended learning outcomes	*Key question: what learning outcomes should students attain in the module?* *E.g. in terms of:* • *Knowledge: Masters and demonstrates the principles of classical and modern physics theory.* • *Skills: Develops logical, critical, systematic and creative thinking in carrying out specific work in the field of expertise and in accordance with the work competency standards in the relevant field.* • *Competences: Formulates physical symptoms and problems based on the results of observations and experiments, and model them using mathematics and computing for appropriate decision making in both familiar and new problems.*
Content	In this courses, various optical systems are discussed fissionally and geometrically, where physical optics will discuss: Huygens principle, interference (wavefront splitting interferometer, amplitude splitter), diffraction (Fresnell, Frounthoufer, single slit and diffraction lattice), polarization and geometric optics discusses Fermat's principle of

	reflection and refraction, optical tools and the propagation of light in the medium and between mediums.
Examination forms	*Essay*
Study and examination requirements	***Requirements for successfully passing the module:*** *a. Minimum attendance of 75%* *b. Minimum score of 55 out of 100*
Reading list	*Names of textbooks, articles, etc.*

Module Descriptions

Module designation	*8420302099*
Semester(s) in which the module is taught	*6*
Person responsible for the module	*Mita Anggaryani, M.Pd., Ph.D.*
Language	Indonesian
Relation to curriculum	*Compulsory / elective / specialisation*
Teaching methods	*Lecture, Lesson, Discussion, case study lab works, project, seminar*
Workload (incl. contact hours, self-study hours)	*(Estimated) Total workload: 136 work hours per-semester* *Contact hours (please specify whether lecture, exercise, laboratory session, etc.): 40 work hours per-semester* *Private study including examination preparation, specified in hours: 94 work hours per-semester*
Credit points	3.18 ECTS
Required and recommended prerequisites for joining the module	-
Module objectives/intended learning outcomes	*Key question: what learning outcomes should students attain in the module?* *E.g. in terms of:* • *Attitude:* *a. Demonstrates a resilient, collaborative, adaptive, innovative, inclusive, lifelong learning, and entrepreneurial character.* *b. Demonstrates religious, national and cultural values, as well as academic ethics in carrying out their duties.* • *Competences -* • *Knowledge:* *a. Masters and demonstrates the principles of classical and modern physics theory.* *b. Formulates physical symptoms and problems based on the results of observations and experiments, and model them using mathematics and computing for appropriate decision making in both familiar and new problems.*

	c. Masters the pedagogical knowledge in planning, teaching, and evaluating physics learning as well as resource management in organizing classes, physics laboratories and educational institutions. • *Skills:* *a. Develops logical, critical, systematic and creative thinking in carrying out specific work in the field of expertise and in accordance with the work competency standards in the relevant field.* *b. Develops self sustainably and collaborate.* *c. Masters the principles of developing physics learning media based on science, contextual technology, especially ICT (information and communication technology), and the surrounding environment.*
Content	*This course covers: the history of planet Earth, Earth's system and structure, large-scale system interactions and plate tectonics, natural disasters, disaster mitigation, volcanology, the origin of the universe, the Solar System, Earth within the Solar System, Earth's atmosphere, solar radiation, planetary threats, and efforts to protect the planet. This course is intended for students who have completed Basic Physics I. Learning activities are conducted using a project-based learning model with an exploratory case study approach, implemented both in the classroom and through fieldwork. The learning process is supported by the VLP volcano simulation software that has been developed, along with other relevant software tools.*
Examination forms	*Project*
Study and examination requirements	***Requirements for successfully passing the module:*** *a. Minimum attendance of 75%* *b. Minimum score of 55 out of 100*
Reading list	*a. McConnelll David and Steer David (2013), 1CThe Good Earth 1D , Introductory to Earth Science, Third Edition, Pergamon Press.* *b. Madlazim, Supriyono dan MNR Jauhariyah (2014). 1C Ilmu Pengetahuan Bumi dan Antariksa 1D. Diktat Kuliah IPBA.* *c. Farndon, J. et al. 2003. Planet Earth. London, UK: Lorenz Books. http://www. fisikaunesa. net/vi-learninghttp://ocw. mit. edu/courses/#earth-atmospheric-and-planetary-sciences* *d. Tjasyono, B. 2017. Sains Kebumian dan Antariksa Pendekatan Multidisipliner. Surabaya: Unesa Press.*

Module Descriptions

Module designation (kode MK)	8420303069
Semester(s) in which the module is taught	7
Person responsible for the module	*Utama Alan Deta, S.Pd., M.Pd., M.Si.*
Language	Indonesian
Relation to curriculum	*Compulsory / elective / specialisation*
Teaching methods	*Lecture, Lesson, Discussion, case study lab works, project, seminar*
Workload (incl. contact hours, self-study hours)	*(Estimated) Total workload: 136 work hours per-semester* *Contact hours (please specify whether lecture, exercise, laboratory session, etc.): 40 work hours per-semester* *Private study including examination preparation, specified in hours: 94 work hours per-semester*
Credit points	4.77 ECTS
Required and recommended prerequisites for joining the module	-
Module objectives/intended learning outcomes	*Key question: what learning outcomes should students attain in the module?* *E.g. in terms of:* • *Attitude: -* • *Competences* *a. Develops logical, critical, systematic and creative thinking in carrying out specific work in the field of expertise and in accordance with the work competency standards in the relevant field.* • *Knowledge:* *a. Masters and demonstrates the principles of classical and modern physics theory.* *b. Formulates physical symptoms and problems based on the results of observations and experiments, and model them using mathematics and computing for appropriate decision making in both familiar and new problems.*

	• *Skills:* *a. Develops logical, critical, systematic and creative thinking in carrying out specific work in the field of expertise and in accordance with the work competency standards in the relevant field.*
Content	*The Quantum Physics course is designed to equip students with a conceptual understanding and analytical skills to explain and solve microscopic physical phenomena based on the principles of quantum mechanics. The material includes the theoretical transition from classical to quantum physics through the study of blackbody radiation, quantum phenomena, and the formulation of the basic principles of quantum mechanics. Using a case study approach, students are trained to formulate and solve the Schrödinger equation for various simple potential systems, such as the harmonic oscillator and hydrogen atom, as well as to analyze the behavior of particles in an external magnetic field. In addition, perturbation theory for complex systems and an introduction to quantum computing as a foundation for future technology are also discussed.*
Examination forms	*Essay*
Study and examination requirements	***Requirements for successfully passing the module:*** *a. Minimum attendance of 75%* *b. Minimum score of 55 out of 100*
Reading list	*a. Prastowo, T. and Rahmawati, E. 2014. Lecture Notes on Quantum Physics. Unpublished work.* *b. 2. Zettili, N. 2009. Quantum Mechanics. West Sussex, UK: John Wiley and Sons.* *c. 3. Griffiths & Schroeter, D.J.Griffiths & D.F.Schroeter. 2018. Introduction to Quantum Mechanics, 3rded. Cambridge, UK:* *d. Cambridge University Press.* *e. 4. Gasiorowicz, S. 1996. Quantum Physics. New York, US: John Wiley and Sons.* *f. 5. Liboff, R. 1980. Introductory Quantum Mechanics. Reading, US: Addison-Wesley.* *g. 6. McMahon, D. 2005. Quantum Mechanics demystified. New York, US: McGraw-Hill.* *h. 7. Greiner, W. 2001. Quantum Mechanics: An Introduction (4th ed.). Berlin, Germany: Springer-Verlag.* *i. 8. Sakurai, J.J. & Napolitano, Jim. 2020. Modern Quantum Mechanics, 3rd ed. Cambridge, UK: Cambridge University Press.*

	j. 9. Nielsen, M.A. & Chuang, I.L. 2010. Quantum Computation and Quantum Information, 2nded. Cambridge, UK: Cambridge *k. University Press.*

Module Descriptions

Module designation	*8420303301*
Semester(s) in which the module is taught	*5*
Person responsible for the module	*Abu Zainuddin, S.Pd, M.Pd.*
Language	Indonesian
Relation to curriculum	*Compulsory / elective / specialisation*
Teaching methods	*Lecture, Lesson, Discussion, case study lab works, project, seminar*
Workload (incl. contact hours, self-study hours)	*(Estimated) Total workload: 136 work hours per-semester* *Contact hours (please specify whether lecture, exercise, laboratory session, etc.): 40 work hours per-semester* *Private study including examination preparation, specified in hours: 94 work hours per-semester*
Credit points	3,18 ECTS
Required and recommended prerequisites for joining the module	-
Module objectives/intended learning outcomes	*Key question: what learning outcomes should students attain in the module?* *E.g. in terms of:* • *Attitude: -* • *Competences:* *a. Conducting physics education research in the form of studies and evaluations of physics learning with a quantitative and/or qualitative approach in the form of oral and academic writing effectively.* • *Knowledge:* *a. Develop logical, critical, systematic and creative thinking in carrying out specific work in the field of expertise and in accordance with the work competency standards in the relevant field.* *b. Develop yourself sustainably and collaborate.* • *Skills: -*

Content	*In this lecture, the depth, breadth, sequence of delivery, and examples of application as well as learning plans and simulations of Physics learning materials for Senior High School/Vocational High School classes X, XI, and XII are discussed..*
Examination forms	*Project.*
Study and examination requirements	***Requirements for successfully passing the module:*** *a. Minimum attendance of 75%* *b. Minimum score of 55 out of 100*
Reading list	*a. SILABUS MATA PELAJARANSEKOLAH MENENGAH ATAS/ MADRASAH ALIYAH (SMA/MA), Mata Pelajaran Fisika.* *b. Hewitt, P. G. (2002). Practicing Physics Conceptual Physics (6 ed). San Fransisco: Addison Wesley* *c. Ong, L K. (2009). Longman Matriculation Study Guide. Pearson-Longman* *d. Buku Guru dan Buku Siswa SMA dan yang sederajat* *e. Buku-buku Fisika untuk SMA/MA dan yang sederajat*

Module Descriptions

Module designation	*8420304307*
Semester(s) in which the module is taught	*5*
Person responsible for the module	*Tim Matakuliah Statistika*
Language	Indonesian
Relation to curriculum	*Compulsory / elective / specialisation*
Teaching methods	*Lecture, Lesson, Discussion, case study lab works, project, seminar*
Workload (incl. contact hours, self-study hours)	*(Estimated) Total workload: 136 work hours per-semester* *Contact hours (please specify whether lecture, exercise, laboratory session, etc.): 40 work hours per-semester* *Private study including examination preparation, specified in hours: 94 work hours per-semester*
Credit points	3,18 ECTS
Required and recommended prerequisites for joining the module	-
Module objectives/intended learning outcomes	*Key question: what learning outcomes should students attain in the module?* *E.g. in terms of:* • *Attitude: -* • *Competences:* *a. Conducting physics education research in the form of assessments and evaluations of physics learning using quantitative and/or qualitative approaches, both orally and in academic writing, effectively.* • *Knowledge:* *a. Demonstrate a resilient, collaborative, adaptive, innovative, inclusive, lifelong learning, and entrepreneurial character.* *b. Develop logical, critical, systematic, and creative thinking in carrying out specific work in their field of expertise and in accordance with the relevant field's work competency standards.* *c. Develop yourself sustainably and collaborate.*

	• *Skills: -*
Content	*The Applications of Statistics in Physics Education course discusses descriptive statistics, data distribution, median, probability distributions and their properties, the binomial distribution, the Poisson distribution, the hypergonic distribution, the normal distribution, sampling distributions, statistical inference, interval estimation, and hypothesis testing for one and two populations. Learning is project-based, interspersed with discussion and Q&A methods, assignments, matrix note-taking strategies, summarizing, and drills.*
Examination forms	*Project.*
Study and examination requirements	***Requirements for successfully passing the module:*** *a. Minimum attendance of 75%* *b. Minimum score of 55 out of 100*
Reading list	*a. Gilford, J.P Frucher, Fundamental statistics In physicology and Education, New york: Mc Graw Hill* *b. Sudjana. 1996. Metode Statistik. Bandung: Penerbit Tarsito* *c. Sudjana. 1983. Teknik Analisis Regresi dan Kolerasi. Bandung: penerbit Tarsito.*

Module Descriptions

Module designation	*1000020158*
Semester(s) in which the module is taught	*5*
Person responsible for the module	*TIM MBKM*
Language	Indonesian
Relation to curriculum	*Compulsory / elective / specialisation*
Teaching methods	*Lecture, Lesson, Discussion, case study lab works, project, seminar*
Workload (incl. contact hours, self-study hours)	*(Estimated) Total workload: 136 work hours per-semester* *Contact hours (please specify whether lecture, exercise, laboratory session, etc.): 40 work hours per-semester* *Private study including examination preparation, specified in hours: 94 work hours per-semester*
Credit points	3.18 ECTS
Required and recommended prerequisites for joining the module	-
Module objectives/intended learning outcomes	*Key question: what learning outcomes should students attain in the module?* *E.g. in terms of:* • *Attitude: -* • *Competences: -* • *Knowledge:* *a. Demonstrate a resilient, collaborative, adaptive, innovative, inclusive, lifelong learning, and entrepreneurial character* *b. Develop logical, critical, systematic and creative thinking in carrying out specific work in the field of expertise and in accordance with the work competency standards in the relevant field.* • *Skills: -*
Content	*The Creative and Critical Thinking course is designed to develop students' ability to think creatively and critically. In this course, students are taught various techniques and strategies to generate innovative ideas and evaluate arguments objectively. Learning*

	involves group discussions, case studies, and challenging problemsolving exercises, which allow students to practice and apply thinking skills in various contexts. In addition, students are also introduced to various theories and concepts that underlie the creative and critical thinking process, which are useful for improving analytical and decision making skills. In this course, students are encouraged to explore different ways of thinking, identify assumptions, and question commonly accepted viewpoints. Through projects and presentations, students can demonstrate their ability to apply critical thinking in real situations, while developing confidence in conveying their ideas. With mastery of these skills, students are expected to be able to adapt quickly in a dynamic and complex environment, and become more independent and innovative thinkers in facing challenges in the professional world.
Examination forms	*project.*
Study and examination requirements	***Requirements for successfully passing the module:*** *a. Minimum attendance of 75%* *b. Minimum score of 55 out of 100*
Reading list	*a. Baer, J. (2021). Creativity and divergent thinking: A task-specific approach. Routledge.* *b. Cropley, D. H. (2021). Creativity in engineering: Novel solutions to complex problems. Academic Press.* *c. Runco, M. A. (2020). Theories of creativity. Sage Publications.* *d. Nickerson, R. S. (2021). Enhancing creativity: A guide to cognitive approaches. Taylor & Francis.* *e. Robinson, K. (2022). Out of our minds: The power of being creative. Capstone.* *f. Beghetto, R. A. (2021). Teaching for creativity: Ideas in action. Routledge.* *g. Kaufman, J. C. (2020). Creativity 101 (2nd ed.). Springer Publishing.* *h. Glăveanu, V. P. (2020). The possible: A sociocultural theory of creativity. Oxford University Press.* *i. Sternberg, R. J., & Halpern, D. F. (2022). Critical thinking in psychology and everyday life. Cambridge University Press.* *j. Levitin, D. J. (2020). A field guide to lies: Critical thinking in the information age. Penguin Books.* *k. Paul, R., & Elder, L. (2020). Critical Thinking: Tools for Taking Charge of Your Learning and Your Life (3rd ed.). Pearson.*

	l. Facione, P. A. (2020). Critical Thinking: A Statement of Expert Consensus for Purposes of Educational Assessment and Instruction. The Critical Thinking Community. *m. Gelder, T. (2021). Creative and Critical Thinking: Skills for the 21st Century. Wiley.* *n. Ennis, R. H. (2021). Critical Thinking: A Streamlined Introduction. Cambridge University Press.* *o. Lipman, M. (2020). Thinking in Education (2nd ed.). Cambridge University Press.* *p. Sternberg, R. J. (2020). Thinking Styles (2nd ed.). Cambridge University Press.* *q. Paul, R., & Elder, L. (2021). The Miniature Guide to Critical Thinking Concepts and Tools. Foundation for Critical Thinking.* *r. Csikszentmihalyi, M. (2020). Creativity: The Psychology of Discovery and Invention (Revised ed.). HarperCollins.* *s. Cropley, A. (2022). Creativity in Education & Learning: A Guide for Teachers and Educators. Routledge.* *t. Runco, M. A., & Acar, S. (2021). Divergent Thinking as an Indicator of Creativity. Oxford University Press.* *u. Norris, S. P., & Ennis, R. H. (2020). Evaluating Critical Thinking. Teaching Philosophy, 43(3), 1-15.* *v. Johnson, D. W., & Johnson, F. P. (2020). Joining Together: Group Theory and Group Skills (13th ed.). Pearson.* *w. De Bono, E. (2021). Six Thinking Hats (Rev. ed.). Back Bay Books.* *x. Bailin, S., & Siegel, H. (2021). Critical Thinking and Education: A Scholarly Review. Cambridge University Press.* *y. Root-Bernstein, R., & Root-Bernstein, M. (2022). Sparks of Genius: The 13 Thinking Tools of the World's Most Creative People (2nd ed.). Houghton Mifflin Harcourt.*

Module Descriptions

Module designation	*1000020163*
Semester(s) in which the module is taught	*5*
Person responsible for the module	*Mita Anggaryani, M.Pd., Ph.D.*
Language	Indonesian
Relation to curriculum	*Compulsory / elective / specialisation*
Teaching methods	*Lecture, Lesson, Discussion, Project, Seminar, lab works, case study*
Workload (incl. contact hours, self-study hours)	*(Estimated) Total workload: 136 work hours per-semester* *Contact hours (please specify whether lecture, exercise, laboratory session, etc.): 40 work hours per-semester* *Private study including examination preparation, specified in hours: 94 work hours per-semester*
Credit points	3.18 ECTS
Required and recommended prerequisites for joining the module	-
Module objectives/intended learning outcomes	*Key question: what learning outcomes should students attain in the module?* *E.g. in terms of:* • *Attitude: -* • *Competences:* *a. Mastering the principles of developing physics learning media based on science, contextually relevant technology specifically ICT (information and communication technology) and the surrounding environment..* • *Knowledge:* *a. Engaging in continuous self-development and collaborating.* • *Skills:* *a. Mastering pedagogical knowledge in the planning, instruction, and evaluation of physics learning, as well as the management of resources for conducting classes, operating physics laboratories, and managing educational institutions..*

Content	*The Communication Skills course is a project-based course. Students develop Physics-related communication projects aimed at the school community and/or the general public, based on literature research. These Physics communication projects provide students with opportunities to develop real-world skills, fostering the emergence of creative ideas that can be realized and implemented..*
Examination forms	*Presented Project*
Study and examination requirements	***Requirements for successfully passing the module:*** *a. Minimum attendance of 75%* *b. Minimum score of 55 out of 100*
Reading list	*a. Schulz, P., & Cobley, P. (Eds.). (2012). Handbooks of communication science. De Gruyter Mouton..* *b. Leßmöllmann, A., Dascal, M., & Gloning, T. (Eds.). (2019). Science communication (Vol. 17). Walter de Gruyter GmbH & Co KG.* *c. Nelson, L. K., & Gilbert, J. L. (2024). Research in Communication Sciences and Disorders: Methods for Scientific Inquiry. Plural publishing.*

Module Descriptions

Module designation	*8420304309*
Semester(s) in which the module is taught	*5*
Person responsible for the module	*Setyo Admoko, S.Pd., M.Pd.*
Language	Indonesian
Relation to curriculum	*Compulsory / elective / specialisation*
Teaching methods	*Lecture, Lesson, Discussion, case study lab works, project, seminar*
Workload (incl. contact hours, self-study hours)	*(Estimated) Total workload: 136 work hours per-semester* *Contact hours (please specify whether lecture, exercise, laboratory session, etc.): 40 work hours per-semester* *Private study including examination preparation, specified in hours: 94 work hours per-semester*
Credit points	0 ECTS
Required and recommended prerequisites for joining the module	-
Module objectives/intended learning outcomes	*Key question: what learning outcomes should students attain in the module?* *E.g. in terms of:* • *Attitude: -* • *Competences:* *a. Conducting physics education research management in the form of assessments and evaluations of physics learning using quantitative and/or qualitative approaches in both oral and written academic forms effectively.* • *Knowledge:* *a. Able to demonstrate religious, national and cultural values, as well as academic ethics in carrying out their duties.* *b. Develop logical, critical, systematic, and creative thinking in performing specific work in their field of expertise and in accordance with the relevant field's work competency standards.* • *Skills:*

	a. Mastering pedagogical knowledge in planning, teaching, and evaluating physics learning, as well as resource management in classrooms, physics laboratories, and educational institutions.
Content	*The Community Physics course is designed to provide students with an understanding of emerging socio-scientific issues in society, such as climate change, renewable energy, technology, health, and their impacts on the environment and social life. Students are encouraged to critically analyze these issues by integrating physics concepts, ethical values, and social perspectives through discussions, case studies, and a problem-based learning approach. Learning focuses on developing critical thinking skills, scientific argumentation, and responsible decision-making, while linking these issues to physics lessons in schools to make them more contextual and meaningful. As a final assignment, students are required to submit a paper or portfolio that in-depth analyzes one of the SSIs in society, demonstrating their ability to connect physics theory with social reality and its implications for physics education.*
Examination forms	*Essay.*
Study and examination requirements	***Requirements for successfully passing the module:*** *a. Minimum attendance of 75%* *b. Minimum score of 55 out of 100*
Reading list	*a. Zeidler, D. L. (2003). The Role of Moral Reasoning on Socio-scientific Issues and Discourse in Science Education. Springer Science & Business Media.* *b. Sadler, T. D. (2011). Socio-scientific Isssues in the Classroom: Teaching, learning and Research. Springer Science & Business Media.*

Module Descriptions

Module designation	*8420302308*
Semester(s) in which the module is taught	*5*
Person responsible for the module	*Setyo Admoko, S.Pd., M.Pd.*
Language	Indonesian
Relation to curriculum	*Compulsory / elective / specialisation*
Teaching methods	*Lecture, Lesson, Discussion, case study, Project, Seminar, lab works*
Workload (incl. contact hours, self-study hours)	*(Estimated) Total workload: 136 work hours per-semester* *Contact hours (please specify whether lecture, exercise, laboratory session, etc.): 40 work hours per-semester* *Private study including examination preparation, specified in hours: 94 work hours per-semester*
Credit points	3.18 ECTS
Required and recommended prerequisites for joining the module	-
Module objectives/intended learning outcomes	*Key question: what learning outcomes should students attain in the module?* *E.g. in terms of:* • *Attitude: -* • *Competences:* *a. Conducting physics education research—involving the examination and evaluation of physics instruction—using quantitative and/or qualitative approaches, and communicating findings effectively through both oral and academic written formats.* • *Knowledge:* *a. Able to demonstrate religious, national and cultural values, as well as academic ethics in carrying out their duties.* *b. Developing logical, critical, systematic, and creative thinking in carrying out specific tasks within one's field of expertise, in accordance with the relevant professional competency standards.* • *Skills:*

	a. Mastering pedagogical knowledge in the planning, instruction, and evaluation of physics learning, as well as the management of resources for conducting classes, operating physics laboratories, and managing educational institutions..
Content	*The course "Socio-Scientific Issues (SSI) in Society" is designed to provide students with an understanding of socio-scientific issues emerging within society such as climate change, renewable energy, technology, and health along with their impacts on the environment and social life. Students are encouraged to critically analyze these issues by integrating physics concepts, ethical values, and social perspectives through discussions, case studies, and a problem-based learning approach. The curriculum focuses on developing critical thinking skills, scientific argumentation, and responsible decision-making, while connecting these issues to physics education in schools to make learning more contextual and meaningful. As a final requirement, students must compile a paper or portfolio that provides an in-depth analysis of a specific socio-scientific issue, serving as evidence of their ability to bridge physics theory with social reality and its implications for physics education.*
Examination forms	*Essay*
Study and examination requirements	***Requirements for successfully passing the module:*** *a. Minimum attendance of 75%* *b. Minimum score of 55 out of 100*
Reading list	*a. Gary Holden, Gary Rosenberg, & Kathleen Barker. 2005. Bibliometrics in Social Work. New York: Routledge.* *b. RONALD ROUSSEAU, LEO EGGHE, & RAF GUNS. 2018. BECOMING METRIC-WISE: A Bibliometric Guide for Researchers.* *Chandos Publishing- Elsevier.* *c. Roberto Todeschini and Alberto Baccini. 2016. Handbook of Bibliometric Indicators Quantitative Tools for Studying and Evaluating Research. Wiley VCH Verlagh GMBH.* *c. Nees Jan van Eck and Ludo Waltman. 2018. VOSViewer Manual Version 168. Universiteit Leiden, The Netherlands.* *c. Wasis, dkk. 2018. HoTs dan Literasi Sains (Konsep, Pembelajaran, dan Penilaiannya). Jombang: Kun Fayakun* *c. Jurnal nasional dan internasional yang relevan dengan pendidikan fisika 5 tahun terakhir.*

Module Descriptions

Module designation	*8420302311*
Semester(s) in which the module is taught	*5*
Person responsible for the module	*Nurita Apridiana Lestari, S.Pd., M.Pd.*
Language	Indonesian
Relation to curriculum	*Compulsory / elective / specialisation*
Teaching methods	*Lecture, Lesson, Discussion, case study lab works, project, seminar*
Workload (incl. contact hours, self-study hours)	*(Estimated) Total workload: 136 work hours per-semester* *Contact hours (please specify whether lecture, exercise, laboratory session, etc.): 40 work hours per-semester* *Private study including examination preparation, specified in hours: 94 work hours per-semester*
Credit points	3.18 ECTS
Required and recommended prerequisites for joining the module	-
Module objectives/intended learning outcomes	*Key question: what learning outcomes should students attain in the module?* *E.g. in terms of:* • *Attitude: -* • *Competences: -* • *Knowledge:* *a. Demonstrate a resilient, collaborative, adaptive, innovative, inclusive, lifelong learning, and entrepreneurial character .* *b. Develop logical, critical, systematic, and creative thinking in performing specific work in their field of expertise and in accordance with the relevant field's work competency standards.* *c. Develop yourself sustainably and collaborate* • *Skills: -*
Content	*The Entrepreneurship Practice course is designed to provide students with practical entrepreneurial experience through research-based project activities and the implementation of MBKM (Business-Based*

	Business Entrepreneurship) programs. The outcome is an Entrepreneurship Bazaar (KWU) project report. Students are trained to identify business opportunities, design business models, validate them, run bazaar activities, and prepare reflective reports based on market research data.
Examination forms	*project.*
Study and examination requirements	***Requirements for successfully passing the module:*** *a. Minimum attendance of 75%* *b. Minimum score of 55 out of 100*
Reading list	*a. Osterwalder, A., & Pigneur, Y. (2010). Business Model Generation: A Handbook for Visionaries, Game Changers, and Challengers. John Wiley and Sons.* *b. Ries, E. (2011). The Lean Startup: how Today's Entrepreneurs Use Continuous Innovation to Create Radically Successful Businesses. Crown Business.*

Module Descriptions

Module designation	*8420304310*
Semester(s) in which the module is taught	*5*
Person responsible for the module	*Setyo Admoko, S.Pd., M.Pd.*
Language	Indonesian
Relation to curriculum	*Compulsory / elective / specialisation*
Teaching methods	*Lecture, Lesson, Discussion, case study lab works, project, seminar*
Workload (incl. contact hours, self-study hours)	*(Estimated) Total workload: 136 work hours per-semester* *Contact hours (please specify whether lecture, exercise, laboratory session, etc.): 40 work hours per-semester* *Private study including examination preparation, specified in hours: 94 work hours per-semester*
Credit points	3.18 ECTS
Required and recommended prerequisites for joining the module	-
Module objectives/intended learning outcomes	*Key question: what learning outcomes should students attain in the module?* *E.g. in terms of:* • *Attitude: -* • *Competences: -* • *Knowledge:* *a. Develop logical, critical, systematic, and creative thinking in carrying out specific work in their field of expertise and in accordance with the work competency standards in the relevant field.* • *Skills:* *a. Master and demonstrate the principles of classical and modern physics theory.* *b. Formulate physical phenomena and problems based on observations and experiments, and model them using mathematics and computation to make informed decisions in both familiar and new problems.*

Content	*The Physics Reasoning course is designed to equip students with logical, analytical, critical, and reflective thinking skills to understand and explain physical phenomena, both conceptually and in everyday applications. Through this course, students are encouraged to develop scientific reasoning skills, connect physics concepts with socio-cultural realities, and foster awareness of the importance of science in supporting social life.*
Examination forms	*Essay.*
Study and examination requirements	***Requirements for successfully passing the module:*** *a. Minimum attendance of 75%* *b. Minimum score of 55 out of 100*
Reading list	*a. Lawson, A. E. (20220). Science Teaching and the Development of Thinking. Wadsworth/Thomson Learning.* *b. Giere, R. N., Bickle, J., & Mauldin, R. F. (2006). Understanding Scientific Reasoning. Wadsworth.* *c. Sudarmin. (2014). Pendidikan Karakter, Etnosains, dan Kearifan Lokal. Unnes Press.*

Module Descriptions

Module designation	*8420303306*
Semester(s) in which the module is taught	*5*
Person responsible for the module	*Nurita Apridiana Lestari, S.Pd., M.Pd.*
Language	Indonesian
Relation to curriculum	*Compulsory / elective / specialisation*
Teaching methods	*Lecture, Lesson, Discussion, case study, Project, Seminar, lab works*
Workload (incl. contact hours, self-study hours)	*(Estimated) Total workload: 136 work hours per-semester* *Contact hours (please specify whether lecture, exercise, laboratory session, etc.): 40 work hours per-semester* *Private study including examination preparation, specified in hours: 94 work hours per-semester*
Credit points	3.18 ECTS
Required and recommended prerequisites for joining the module	-
Module objectives/intended learning outcomes	*Key question: what learning outcomes should students attain in the module?* *E.g. in terms of:* • *Attitude: -* • *Competences:* *a. Mastering the principles of developing physics learning media based on science, contextually relevant technology specifically ICT (information and communication technology) and the surrounding environment..* • *Knowledge:* *a. Developing logical, critical, systematic, and creative thinking in carrying out specific tasks within one's field of expertise, in accordance with the relevant professional competency standards.* *b. Engaging in continuous self-development and collaborating.* • *Skills: -*

Content	*The course on Sustainable Physics Education examines the connections between physics concepts and issues related to sustainable development, including energy, the environment, and eco-friendly technologies. Students gain an understanding of Education for Sustainable Development (ESD), contextual teaching strategies, and the integration of sustainability values into the physics curriculum. Through discussions, case studies, and literature analysis, students are encouraged to develop critical thinking skills and devise innovative solutions. As a final assignment, students are required to produce a literature review article that explores the contribution of physics education toward the achievement of the Sustainable Development Goals (SDGs)..*
Examination forms	*Presented Project*
Study and examination requirements	***Requirements for successfully passing the module:*** *a. Minimum attendance of 75%* *b. Minimum score of 55 out of 100*
Reading list	*a. Tilbury, D. (2011). Education for Sustainable Development: An Expert Review of Processes and Learning. UNESCO..* *Filho, W. L. (Ed.). (2019). Handbook of Sustainability and Education. Springer..* *b. UNESCO (2017). Education for Sustainable Development Goals: Learning Objectives. UNESCO Publishing* *b. Artikel-artikel terkini dari jurnal International Journal of Sustainability in Higher Education, Journal of Physics Education, dll.*

UNESA

6th Semester



Module Descriptions

Module designation	Pengenalan Lapangan Persekolahan (PLP) – School Field Experience Programme (MBKM Teaching in Schools)
Semester(s) in which the module is taught	5/6
Person responsible for the module	*Academic Mobility Sub-Directorate Team (Tim Sub Direktorat Mobilitas Akademik)*
Language	Indonesian
Relation to curriculum	*Compulsory / elective / specialisation*
Teaching methods	*Lecture, Lesson, Discussion, case study, lab works, project, seminar, school-based field practice*
Workload (incl. contact hours, self-study hours)	*(Estimated) Total workload: 906.7 work hours per-semester* *Contact hours:* *a. Scheduled field activities at partner schools (observation, teaching practice, supervision): 604.4 work hours per-semester (scheduled activities, 2/3 of the total workload)* *Private study including unscheduled assignments and report preparation: 302.2 work hours per-semester (1/3 of the total workload)*
Credit points	31.8 ECTS
Required and recommended prerequisites for joining the module	*Completed the compulsory courses of the study programme (minimum of 80 credits)*
Module objectives/intended learning outcomes	*Key question: what learning outcomes should students attain in the module?* *E.g. in terms of:* • *Attitude:* *a. Demonstrate good scientific manners, critical thinking, and innovation skills in educational, research, and professional fields (PLO-11/SOC-1).* *b. Demonstrate the appreciation of religious and cultural values in conducting their tasks as a professional (PLO-12/SOC-2).* • *Competences:* *a. Communicate the ideas and research results in verbal as well as written effectively (PLO-8/COM-1).*

	b. Make a decision based on the data information and evaluation in order to fulfil the responsibility of the task (PLO-9/COM-2). *c. Work as an individual as well as a team effectively, have an entrepreneur skill, and awareness of environmental issues (PLO-10/COM-3).* • *Knowledge:* *a. Demonstrate pedagogical knowledge in planning, teaching, and evaluating a physics learning (PLO-3/KNO-3).* • *Skills:* *a. Plan, do, and evaluate of physics learning by using information and communication technology (PLO-5/SKI-1).* *b. Improve their knowledge and be able to continue their study in a higher degree program (PLO-7/SKI-3).*
Content	*The School Field Experience Programme (PLP) facilitates observation and internship activities of education undergraduates to study the aspects of learning and educational management in schools, so that prospective teachers can integrate the theories, methods and learning strategies learned in lectures with the practice of learning in schools within their social and cultural context. The scope includes observation, analysis and direct experience of school culture, school management and school dynamics, as well as all academic and administrative tasks of teachers. PLP is carried out for one semester at partner schools and is converted into the courses PLP-School Management, PLP-School Programme Development, PLP-Curriculum Analysis, PLP-Lesson Plan Development, PLP-Teaching Material Development, PLP-Learning Media Development, PLP-Learning Assessment and PLP-Teaching Practice. The programme starts with programme planning (identifying the profile of the partner institution, analysing the urgency and needs of the programme, determining the objectives, scope, method and stages of the activities, and preparing a proposal of an impactful mini project) and ends with programme evaluation and reporting (developing the opening, main and closing parts of the report, editing the report and presenting the evaluation and report of the programme). Learning is conducted using project-based learning, field practice under the guidance of supervising lecturers and mentor teachers, discussion, question and answer, assignments, daily logbooks and reflection on field experience.*
Examination forms	*Mentor teacher assessment (40%), PLP implementation report assessed by the supervising lecturer (20%), individual performance assessment by the supervising lecturer (40%); supported by daily logbooks, the mini project proposal and the final report presentation*

Study and examination requirements	***Requirements for successfully passing the module:*** *a. Minimum attendance of 75%* *b. Minimum score of 55 out of 100*
Reading list	*a. Direktorat Jenderal Pendidikan Tinggi. 2020. Panduan Penyelenggaraan Merdeka Belajar-Kampus Merdeka. Jakarta: Kemendikbud.* *b. Tim Mobilitas Akademik. 2025. Pedoman Mobilitas Akademik UNESA.* *c. Peraturan Menteri Pendidikan Tinggi, Sains, dan Teknologi Nomor 39 Tahun 2025 tentang Penjaminan Mutu Pendidikan Tinggi.* *d. Tim Kurikulum UNESA. 2024. Pedoman Pengembangan, Implementasi dan Evaluasi Kurikulum UNESA.* *e. Seksi Pengenalan Lapangan Persekolahan MBKM Unesa. 2024. Buku Pedoman Mengajar di Sekolah Tahun 2024. Surabaya: Direktorat Akademik Universitas Negeri Surabaya.*

Module Descriptions

Module designation	1000004056 – PLP-Praktik Mengajar (School Field Experience – Teaching Practice)
Semester(s) in which the module is taught	6
Person responsible for the module	*MBKM Team (Tim MBKM)*
Language	Indonesian
Relation to curriculum	*Compulsory / elective / specialisation*
Teaching methods	*Lecture, Lesson, Discussion, case study, lab works, project, seminar, teaching practice in schools*
Workload (incl. contact hours, self-study hours)	*(Estimated) Total workload: 181.3 work hours per-semester* *Contact hours:* *a. Lecture, exercise, teaching practice: 56 work hours per-semester (4 hours per week × 14 weeks)* *Private study including examination preparation: 125.3 work hours per-semester (private study ± 103.3 hours; examination preparation ± 22 hours)*
Credit points	6.36 ECTS
Required and recommended prerequisites for joining the module	-
Module objectives/intended learning outcomes	*Key question: what learning outcomes should students attain in the module?* *E.g. in terms of:* • *Attitude:* *a. Demonstrate the appreciation of religious and cultural values in conducting their tasks as a professional (PLO-12/SOC-2).* • *Competences:* *a. Communicate the ideas and research results in verbal as well as written effectively (PLO-8/COM-1).* *b. Work as an individual as well as a team effectively, have an entrepreneur skill, and awareness of environmental issues (PLO-10/COM-3).* • *Knowledge:*

	a. Demonstrate pedagogical knowledge in planning, teaching, and evaluating a physics learning (PLO-3/KNO-3). • *Skills:* *a. Plan, do, and evaluate of physics learning by using information and communication technology (PLO-5/SKI-1).*
Content	*This course applies students' ability in good teaching practice (real teaching) according to the school subjects, which consists of the skills of opening a lesson, mastering the material, using teaching materials and media as well as ICT, using language, giving assignments and feedback, reinforcing and closing the lesson in real teaching in actual classes, and producing a scientific paper that can be published in a national journal. The topics cover: the skills of opening a lesson; teaching and classroom mastery skills; carrying out learning steps according to the selected approach, model, strategy or technique; the steps of classroom management; using teaching materials and media in learning; using ICT in learning, including online learning; managing the class effectively and efficiently; carrying out learning evaluation appropriately; practising teaching skills in front of the class; and the final PLP report. Students carry out teaching practice in educational institutions, and their performance is assessed by the mentors at the institutions where they practise. Learning is conducted using project-based learning and performance-based assignments.*
Examination forms	*Participatory activities (50%), practice/performance assessment (50%)*
Study and examination requirements	***Requirements for successfully passing the module:*** *a. Minimum attendance of 75%* *b. Minimum score of 55 out of 100*
Reading list	*a. Direktorat Pembelajaran Direktorat Jenderal Pembelajaran dan Kemahasiswaan Kementerian Riset Teknologi dan Pendidikan Tinggi. 2017. Panduan Program Pengenalan Lapangan Persekolahan Program Sarjana Pendidikan. Jakarta: Direktorat Pembelajaran Direktorat Jenderal Pembelajaran dan Kemahasiswaan Kementerian Riset Teknologi dan Pendidikan Tinggi.* *b. Divisi Praktik Kegiatan Lapangan Satuan Merdeka Belajar Kampus Merdeka Universitas Negeri Surabaya. 2021. Buku Pedoman Pengenalan Lapangan Persekolahan Tahun 2021. Surabaya: Unesa.* *c. Tim Unesa. 2020. Pedoman dan Implementasi Kurikulum Merdeka Belajar Kampus Merdeka (MBKM). Surabaya: Universitas Negeri Surabaya.*

Module Descriptions

Module designation	*8420303077*
Semester(s) in which the module is taught	*6*
Person responsible for the module	*Abu Zainuddin, S.Pd, M.Pd.*
Language	Indonesian
Relation to curriculum	*Compulsory / elective / specialisation*
Teaching methods	*Lecture, Lesson, Discussion, case study lab works, project, seminar*
Workload (incl. contact hours, self-study hours)	*(Estimated) Total workload: 136 work hours per-semester* *Contact hours (please specify whether lecture, exercise, laboratory session, etc.): 96 work hours per-semester* *Private study including examination preparation, specified in hours: 40 work hours per-semester*
Credit points	4.77 ECTS
Required and recommended prerequisites for joining the module	-
Module objectives/intended learning outcomes	*Key question: what learning outcomes should students attain in the module?* *E.g. in terms of:* • *Attitude: -* • *Competences -* • *Knowledge: -* • *Skills:* *a. Develops logical, critical, systematic and creative thinking in carrying out specific work in the field of expertise and in accordance with the work competency standards in the relevant field.* *b. Develops self sustainably and collaborate.* *c. Conducts physics education research in the form of studies and evaluations of physics learning with a quantitative and/or qualitative approach in the form of oral and academic writing effectively.*

Content	*This lecture discusses depth, breadth, order of delivery, and examples of application as well as lesson plans and simulations of learning from the Physics materials for high school/MA grades 10, 11, and 12.*
Examination forms	*Essay*
Study and examination requirements	***Requirements for successfully passing the module:*** *a. Minimum attendance of 75%* *b. Minimum score of 55 out of 100*
Reading list	*a. SILABUS MATA PELAJARANSEKOLAH MENENGAH ATAS/ MADRASAH ALIYAH (SMA/MA), Mata Pelajaran Fisika.* *b. Hewitt, P. G. (2002). Practicing Physics Conceptual Physics (6 ed). San Fransisco: Addison Wesley* *c. Ong, L K. (2009). Longman Matriculation Study Guide. Pearson-Longman* *d. Buku Guru dan Buku Siswa SMA dan yang sederajat* *e. Buku-buku Fisika untuk SMA/MA dan yang sederajat* *f. Buku lain, jurnal, dan sebagainya yang relevan*

Module Descriptions

Module designation	MFB/FM-18324412
Semester(s) in which the module is taught	5/Third year
Person responsible for the module	Dr Eko Hariyono, M.Pd. Mita Anggaryani, M.Pd., Ph.D. Nurita Apridiana Lestari, S.Pd., M.Pd.
Language	Indonesia
Relation to curriculum	*Compulsory / elective / specialisation*
Teaching methods	*lecture, lesson, lab works, project, seminar etc.*
Workload (incl. contact hours, self-study hours)	*(Estimated) Total workload: 136 work hours per-semester* *Contact hours:* *a. Lecture, exercise: 68 work hours per-semester,* *Private study including examination preparation: 68 work hours per-semester*
Credit points	4.77 ECTS
Required and recommended prerequisites for joining the module	*Innovative Learning*
Module objectives/intended learning outcomes	*Key question: what learning outcomes should students attain in the module?* • *Attitude:* *Demonstrates a resilient, collaborative, adaptive, innovative, inclusive, lifelong learning, and entrepreneurial character.* • *Knowledge:* *Masters the pedagogical knowledge in planning, teaching, and evaluating physics learning as well as resource management in organizing classes, physics laboratories and educational institutions.* • *Skills:* *Develops logical, critical, systematic and creative thinking in carrying out specific work in the field of expertise and in accordance with the work competency standards in the relevant field.*

Content	*The description of the contents should clearly indicate the weighting of the content and the level.*
Examination forms	*Essay*
Study and examination requirements	***Requirements for successfully passing the module:*** *a. Minimum attendance of 75%* *b. Minimum score of 55 out of 100*
Reading list	1. Granger, Colin. 1993. Play Games with English. 2. Hadfield, Jill. 1998 Elementary Vocabulary Games. Essex: Addison Wesley Longman, Ltd 3. Hadfield, Jill. 1990. Intermediate Communication Games. Essex: Addison Wesley Longman, Ltd 4. Watcyn-Jones, Peter. 2001. Vocabulary Games and Activities. Essex: Pearson Education Limited. 5. Celce-Murcia, Marianne. 2001. Teaching English as a Second or Foreign Language. Boston: Heinle & Heinle, Thomson Learning. Inc 6. Harmer, Jeremy. 2007. The Practice of English Language Teaching. Essex: Pearson Education Limited.

Module Descriptions

Module designation	*8420303313*
Semester(s) in which the module is taught	*6*
Person responsible for the module	*Abdul Kholiq, M.Pd.*
Language	Indonesian
Relation to curriculum	*Compulsory / elective / specialisation*
Teaching methods	*Lecture, Lesson, Discussion, case study, project, lab works, seminar*
Workload (incl. contact hours, self-study hours)	*(Estimated) Total workload: 136 work hours per-semester* *Contact hours (please specify whether lecture, exercise, laboratory session, etc.): 40 work hours per-semester* *Private study including examination preparation, specified in hours: 94 work hours per-semester*
Credit points	3.18 ECTS
Required and recommended prerequisites for joining the module	-
Module objectives/intended learning outcomes	*Key question: what learning outcomes should students attain in the module?* *E.g. in terms of:* • *Attitude: -* • *Competences:* *a. Mastering the principles of developing physics learning media based on science, contextually relevant technology specifically ICT (information and communication technology) and the surrounding environment..* • *Knowledge:* *a. Developing logical, critical, systematic, and creative thinking in carrying out specific tasks within one's field of expertise, in accordance with the relevant professional competency standards..* • *Skills:*

	a. Mastering pedagogical knowledge in the planning, instruction, and evaluation of physics learning, as well as the management of resources for conducting classes, operating physics laboratories, and managing educational institutions..
Content	*This course examines the definition, functions, roles, and types of instructional media; the selection of relevant instructional media; and the fundamental concepts of media development—encompassing planning through needs analysis, design via prototyping, and development..*
Examination forms	*Present Project*
Study and examination requirements	***Requirements for successfully passing the module:*** *a. Minimum attendance of 75%* *b. Minimum score of 55 out of 100*
Reading list	*a. Fenrich, P. 1997. Practical Guidelines For Creating Instructional Multimedia Application . USA: Harcourt Brace College Publisher* *b. Heinich, R., Molenda. 1999. Instructional Media and Technologies forLearning . USA: Prentice Hall* *c. Reynolds, Karen E. 1996. Technology for the teaching and learning science . Boston: Allyn and Bacon* *d. Arsyad, Azhar, 2009. Media pembelajaran . Jakarta: Raja Grafindo Persada* *e. Munadi, Yudhi. 2008. Media pembelajaran: sebuah pendekatan baru . Jakarta: Gaung Persada, 2008* *f. Isnawati. 2015. Media Pembelajaran Berbasis Bahan Sederhana . Surabaya: Jaudar Press.*

Module Descriptions

Module designation	8420302286
Semester(s) in which the module is taught	4
Person responsible for the module	*Dr. Oka Saputra, M.Pd*
Language	Indonesian
Relation to curriculum	*Compulsory ~~/ elective / specialisation~~*
Teaching methods	*Lecture, Lesson, Discussion, case study ~~lab works~~, ~~project~~, ~~seminar~~*
Workload (incl. contact hours, self-study hours)	*(Estimated) Total workload: 90.7 work hours per-semester* *Contact hours (please specify whether lecture, exercise, ~~laboratory session, etc.~~): 26.7 work hours per-semester* *Private study including examination preparation, specified in hours: 64 work hours per-semester*
Credit points	3.18 ECTS
Required and recommended prerequisites for joining the module	-
Module objectives/intended learning outcomes	*Key question: what learning outcomes should students attain in the module?* *E.g. in terms of:* - *Attitude: -* - *Competences : -* - *Knowledge:* *a) Masters the pedagogical knowledge in planning, teaching, and evaluating physics learning as well as resource management in organizing classes, physics laboratories and educational institutions.* - *Skills:* *a) Develops logical, critical, systematic and creative thinking in carrying out specific work in the field of expertise and in accordance with the work competency standards in the relevant field.* *b) Conducts physics education research in the form of studies and evaluations of physics learning with a quantitative and/or qualitative approach in the form of oral and academic writing effectively*

Content	*In the "Learning Materials Development" course, students are able to design, plan, and compile innovative high school physics teaching materials based on data, information, and pedagogical knowledge in line with 21st-century learning, utilizing science and technology-based learning resources, demonstrating independent performance and a strong scientific attitude.*
Examination forms	*Product*
Study and examination requirements	***Requirements for successfully passing the module:*** *a) Minimum attendance of 75%* *b) Minimum score of 55 out of 100*
Reading list	*a) Krathwohl, David R. 2002. A Revision of Bloom's Taxonomy: An Overview. Theory into Practice, (41) 4:212-26* *b) Ernawulan Syaodih. 2007. Elementary Education Assessment: Elementary Education Lecture Handbook, SPs UPI Bandung: Indonesian University of Education.* *c) Department of National Education. 2003. Standards for Assessing Elementary and Middle School Social Studies Textbooks. Ministry of National Education Book Center.* *d) Department of National Education. (2006). Guidelines for Selecting and Compiling Teaching Materials. Jakarta: Directorate General of Elementary and Secondary Education.* *e) Campbell-Smith, Shandy, et al. 1994. Writing Teaching Materials. Jakarta: Ministry of Education and Culture.* *f) Wahyudin, Dinn & Kartawinata, Handy. 1998. Writing Teaching Materials. Jakarta: Ministry of Education and Culture.* *g) Wijaya, Cece; Djadjuri, Djadja & Rusyan, Tabrani. 1990. Reform Efforts in Education and Teaching. Bandung: Rosdakarya*

Module Descriptions

Module designation	*8420303302*
Semester(s) in which the module is taught	*5*
Person responsible for the module	*Setyo Admoko, S.Pd., M.Pd.*
Language	Indonesian
Relation to curriculum	*Compulsory / elective / specialisation*
Teaching methods	*Lecture, Lesson, Discussion, Project, Seminar, lab works, case study*
Workload (incl. contact hours, self-study hours)	*(Estimated) Total workload: 136 work hours per-semester* *Contact hours (please specify whether lecture, exercise, laboratory session, etc.): 40 work hours per-semester* *Private study including examination preparation, specified in hours: 94 work hours per-semester*
Credit points	3.18 ECTS
Required and recommended prerequisites for joining the module	-
Module objectives/intended learning outcomes	*Key question: what learning outcomes should students attain in the module?* *E.g. in terms of:* • *Attitude: -* • *Competences:* *a. Conducting physics education research involving the examination and evaluation of physics instruction using quantitative and/or qualitative approaches, and communicating findings effectively through both oral and academic written formats..* • *Knowledge:* *a. Able to demonstrate religious, national and cultural values, as well as academic ethics in carrying out their duties.* *b. Developing logical, critical, systematic, and creative thinking in carrying out specific tasks within one's field of expertise, in accordance with the relevant professional competency standards.* • *Skills:*

	a. Mastering pedagogical knowledge in the planning, instruction, and evaluation of physics learning, as well as the management of resources for conducting classes, operating physics laboratories, and managing educational institutions..
Content	*The course "Observation and Assessment in School Physics" equips students with the understanding and experience to analyze physics learning assessment systems in secondary schools through theoretical study, discussions, and field observations. Students are guided to identify the types of assessments implemented by teachers, evaluate their alignment with the curriculum and learning objectives, and assess their respective strengths and weaknesses. As a final requirement, students must compile a report on the physics assessment system at their assigned school, which includes a description of the assessments, an analysis of the system, identified challenges, and recommendations for developing more effective and authentic assessment practices..*
Examination forms	*Presented Project*
Study and examination requirements	***Requirements for successfully passing the module:*** *a. Minimum attendance of 75%* *b. Minimum score of 55 out of 100*
Reading list	*a. Anderson, L. W., & Krathwohl, D. R. (2001). A Taxonomy for Learning, Teaching, and Assesing: A Revision of Bloom's Taxonomy of Educational Objectives. New York: Longman.* *b. .Brookharts, S. M., (Nitko, A. J. (2018). Educational Assesment of Students. Pearson.* *c. Arifin, Zainal. (2012). Evaluasi Pembelajaran: Prinsip, Teknik, Prosedur. Bandung: Remaja Rosdakarya.*

Module Descriptions

Module designation	*8420303304*
Semester(s) in which the module is taught	*5*
Person responsible for the module	*Nurita Apridiana Lestari, S.Pd., M.Pd.*
Language	Indonesian
Relation to curriculum	*Compulsory / elective / specialisation*
Teaching methods	*Lecture, Lesson, Discussion, case study lab works, project, seminar*
Workload (incl. contact hours, self-study hours)	*(Estimated) Total workload: 136 work hours per-semester* *Contact hours (please specify whether lecture, exercise, laboratory session, etc.): 40 work hours per-semester* *Private study including examination preparation, specified in hours: 94 work hours per-semester*
Credit points	3.18 ECTS
Required and recommended prerequisites for joining the module	-
Module objectives/intended learning outcomes	*Key question: what learning outcomes should students attain in the module?* *E.g. in terms of:* • *Attitude: -* • *Competences:* *a. Mastering the principles of developing physics learning media based on science, technology, and contextual contexts, especially ICT (information and communication technology), and the surrounding environment.* • *Knowledge:* *a. Develop logical, critical, systematic, and creative thinking in performing specific work in their field of expertise and in accordance with the relevant field's work competency standards.* • *Skills:*

	a. Mastering pedagogical knowledge in planning, teaching, and evaluating physics learning, as well as resource management in classrooms, physics laboratories, and educational institutions.
Content	*The Observation of School Physics Learning Media course equips students with the skills to observe, analyze, and evaluate the use of physics learning media in schools. Students are expected to connect pedagogical theory, principles of technology-based media development, and real-world conditions in schools through direct observation activities and analytical reports.*
Examination forms	*Essay.*
Study and examination requirements	***Requirements for successfully passing the module:*** *a. Minimum attendance of 75%* *b. Minimum score of 55 out of 100*
Reading list	*a. Mayer, R. E. (2021). Multimedia learning (3rd ed.). Cambridge: Cambridge University Press.* *b. O'Leary, M. (2020). Classroom observation: A guide to the effective observation of teaching and learning (2nd ed.). London: Routledge.* *c. Arsyad, A. (2019). Media pembelajaran (Revisi). Jakarta: Rajawali Pers.*

Module Descriptions

Module designation	*8420303303*
Semester(s) in which the module is taught	*5*
Person responsible for the module	*Nurita Apridiana Lestari, S.Pd., M.Pd.*
Language	Indonesian
Relation to curriculum	*Compulsory / elective / specialisation*
Teaching methods	*Lecture, Lesson, Discussion, Project, Seminar, lab works, case study*
Workload (incl. contact hours, self-study hours)	*(Estimated) Total workload: 136 work hours per-semester* *Contact hours (please specify whether lecture, exercise, laboratory session, etc.): 40 work hours per-semester* *Private study including examination preparation, specified in hours: 94 work hours per-semester*
Credit points	3.18 ECTS
Required and recommended prerequisites for joining the module	-
Module objectives/intended learning outcomes	*Key question: what learning outcomes should students attain in the module?* *E.g. in terms of:* • *Attitude: -* • *Competences:* *a. Conducting physics education research—involving the examination and evaluation of physics instruction—using quantitative and/or qualitative approaches, and communicating findings effectively through both oral and academic written formats.* • *Knowledge:* *a. Developing logical, critical, systematic, and creative thinking in carrying out specific tasks within one's field of expertise, in accordance with the relevant professional competency standards.* • *Skills:* *a. Mastering pedagogical knowledge in the planning, instruction, and evaluation of physics learning, as well as the*

	management of resources for conducting classes, operating physics laboratories, and managing educational institutions.
Content	*The course "Observation of Innovative Physics Instruction in Schools" provides students with the opportunity to observe innovative physics teaching practices within a school setting. The focus lies in identifying innovative instructional strategies, the use of media and technology, classroom management, assessment, and critical reflection on teaching practices. Students are expected to connect theoretical concepts with field-based practice and develop evaluative skills to enhance the quality of physics instruction.*
Examination forms	*Presented Project*
Study and examination requirements	***Requirements for successfully passing the module:*** *a. Minimum attendance of 75%* *b. Minimum score of 55 out of 100*
Reading list	*a. Joyce, B., Weil, M., & Calhoun, E. (2015). Models of Teaching (9th Edition). Pearson Education..* *b. Eggen, P., & Kauchak, D. (2016). Educational Psychology: Windows on Classrooms (10th Edition). Pearson.* *c. Arends, R. I. (2012). Learning to Teach (9th Edition). McGraw-Hill.* *d. Widoyoko, E. P. (2014). Teknik Penyusunan Instrumen Penelitian. Pustaka Belajar.*

UNESA

7th Semester



Module Descriptions

Module designation	*8420303068*
Semester(s) in which the module is taught	*7*
Person responsible for the module	*Utama Alan Deta, S.Pd., M.Pd., M.Si.*
Language	Indonesian
Relation to curriculum	*Compulsory / elective / specialisation*
Teaching methods	*Lecture, Lesson, Discussion, case study lab works, project, seminar*
Workload (incl. contact hours, self-study hours)	*(Estimated) Total workload: 136 work hours per-semester* *Contact hours (please specify whether lecture, exercise, laboratory session, etc.): 96 work hours per-semester* *Private study including examination preparation, specified in hours: 40 work hours per-semester*
Credit points	4.77 ECTS
Required and recommended prerequisites for joining the module	-
Module objectives/intended learning outcomes	*Key question: what learning outcomes should students attain in the module?* *E.g. in terms of:* • *Attitude: -* • *Competences -* • *Knowledge:* *a. Masters and demonstrates the principles of classical and modern physics theory.* *b. Formulates physical symptoms and problems based on the results of observations and experiments, and model them using mathematics and computing for appropriate decision making in both familiar and new problems.* • *Skills:* *a. Develops self sustainably and collaborate.*
Content	*Nuclear Physics studies the history of discoveries and the fundamental concepts of atomic nuclei, the properties and behavior*

	of atomic nuclei, nuclear stability and binding energy, the deuteron as the simplest nucleus, nuclear energy levels, various nuclear models, nuclear radioactivity, the mechanisms of radioactive decay, Q-value calculations for different types and conditions of nuclear reactions, the building blocks of matter, the "family" of elementary particles, fundamental conservation principles in the world of elementary particles, the discovery of mesons, fission and fusion reactions, alternative energy sources based on fusion reactions, nuclear technology and nuclear waste management, and the applications of radioisotopes in various fields of life.
Examination forms	*Essay*
Study and examination requirements	***Requirements for successfully passing the module:*** *a. Minimum attendance of 75%* *b. Minimum score of 55 out of 100*
Reading list	*a. Krane, K.S. 1988. Introductory Nuclear Physics. New York, US : John wiley & Sons Inc.* *b. P Arya, Atam. 1966. Fundamentals of Nuclear Physics . Allyn and Bacon, Inc. Boston.* *c. Das and Ferbel. 2003. Introduction to Nuclear and Particle Physics (2 nd Edition). World Scientific Publishing Co, Pte, Ltd. Singapore.* *d. E. Meyerhoff, Walter. 1967. Elements of Nuclear Physics. McGraw-Hill, Inc. USA.* *e. Cottingham and Greenwood. 2004. An Introduction to Nuclear Physics (2 nd Edition). Cambridge University Press, UK*

Module Descriptions

Module designation (kode MK)	8420303080
Semester(s) in which the module is taught	7
Person responsible for the module	*Dr. Fitriana, S.Si*
Language	Indonesian
Relation to curriculum	*Compulsory / elective / specialisation*
Teaching methods	*Lecture, Lesson, Discussion, case study lab works, project, seminar*
Workload (incl. contact hours, self-study hours)	*(Estimated) Total workload: 181.3 work hours per-semester* *Contact hours (please specify whether lecture, exercise, laboratory session, etc.): 53.3 work hours per-semester* *Private study including examination preparation, specified in hours: 128 work hours per-semester*
Credit points	4.77 ECTS
Required and recommended prerequisites for joining the module	-
Module objectives/intended learning outcomes	*Key question: what learning outcomes should students attain in the module?* *E.g. in terms of:* • *Attitude:* • *Competences* • *Knowledge:* *a. Masters the pedagogical knowledge in planning, teaching, and evaluating physics learning as well as resource management in organizing classes, physics laboratories and educational institutions* *b. Masters and demonstrates the principles of classical and modern physics theory.* • *Skills:* *a. Develops logical, critical, systematic and creative thinking in carrying out specific work in the field of expertise and in accordance with the work competency standards in the relevant field.*

Content	*Studying Solid State Physics, including: Crystal Structure; X-ray Diffraction, Neutron Diffraction, Electron Diffraction (XRF, SEM, TEM, AFM); Crystal Bonding; Lattice Vibrations; Einstein Model; Debye Model; Band Structure and Electrical Properties of Materials: Semiconductors, Insulators, and Metals; The Concept of Effective Mass; Pure Semiconductors and Impurities: Donors and Acceptors; Fermi Level, Ef, Carrier Concentration Equations; Donors and Acceptors Both Present; P-N Junctions; P-N Diodes; Electrical Conduction; Hall Effect; Light-Emitting Diodes; Paramagnetism, Diamagnetism, Ferromagnetism; Superconductors, Dielectrics, Supercapacitors*
Examination forms	*Product*
Study and examination requirements	***Requirements for successfully passing the module:*** *a. Minimum attendance of 75%* *b. Minimum score of 55 out of 100*
Reading list	*a. Kittel, Charles . 1996 . Introduction to Solid State Physics 7th. John Wiley & Sons, New York.* *b. Ashcroft and Mermin . 1976. Solid State Physics . Sauders College, Philadelphia.* *c. Ali Omar, M . 1975. Elementary Solid State Physics: Principle and Applications . Addison Wesley Publication. Comp. USA.* *d. Ali Omar, M . 1977. Fundamental of Solid State Physics . Addison Wesley Publication. Comp.USA.* *e. Christman . 1989. Introduction to Solid State Physics . John Wiley & Sons, USA.* *f. H.M. Rosenberg . 1987. The Solid State Physics Third Edition . Oxford Science Publication, USA.* *g. M. S. Dresselhaus, 2001, Solid state Physics, MIT, USA.*

Module Handbook

Courses	Statistical Physics
Programme	S1 Physics Education
Code	
Semester	5
Group of Course Coordinator	Tjipto Prastowo, Ph.D.
Lecturers	1. Dr. Z.A. Imam Supardi, M.Si 2. Tjipto Prastowo, Ph.D. 3. Drs. Supardiyono, M. 4. Utama Alan Deta, S.Pd., M.Pd., M.Si
The language used	Indonesian
Classification in the curriculum	Compulsory Courses
Learning format / number of class hours per week	Per-week consists of: 3 hours face to face (1 hour face to face = 50 minutes)
Load	3 hours face to face, 3 hours structured assignments, 3 learn to be independent per-week, for 15 weeks = a total of 135 hours face-to-face / semester
Credit Unit	3 CU = 4.77 ECTS
Precondition	Basic Physics 1 and 2, Mathematical Physics 1 and 2, Modern Physics
Course Learning Outcome	1. Mastering the theoretical concepts of Statistical Physics in general and the theoretical concepts of Classical Statistical distribution (Maxwell Boltzmann) and quantum statistical distributions (Bose Einstein and Fermi Dirac) in depth. 2. Able to formulate solutions to procedural problems related to the application of the theoretical concepts of Classical Statistics and Quantum Statistics distribution to several phenomena of microscopic physical systems.
Courses content	Statistical Physics studies the behavior of microscopic systems with a large number of forming particles through two approaches, namely the laws of classical statistical distribution (Maxwell-Boltzmann statistics) and quantum statistical distributions (Bose-Einstein statistics and Fermi-Dirac statistics). In the lecture, we will explain the differences between the three laws of statistical distribution and the application of the three types of distribution in

<table>
<tr><td></td><td>some cases of physics, for example ideal gases and true gases, bosons and fermion gases, classical and semi-classical gases, Gibbs paradox, classical and semi-classical gas entropy -classic, monatomic and diatomic gases, specific heat of monatomic and diatomic gases, specific heat of solids according to classical and quantum statistics, and the total partition function in the presence of molecular interactions, as well as introduction to the concept of ensemble (micro-canonical, canonical and large canonical).</td></tr>
<tr><td>Attributed soft skill</td><td>scientific report

public speaking

team work</td></tr>
<tr><td>Learning achievement (assesment)</td><td>Students are considered competent and pass if they get at least a minimum test score of 68 for mid test (SS) and final exam (S), assignments (A), and participation (P), where the final grade (FG) is calculated following the formula:

Final Grade of the course (FG) = 20% P + 30% A + 20% SS + 30%S

Convert the 0-100 scale value to a 0-4 scale and the letters are arranged as follows:

<table>
<tr><th>Letter</th><th>Number</th><th>Interval</th></tr>
<tr><td>A</td><td>4,00</td><td>85 ≤ A < 100</td></tr>
<tr><td>A-</td><td>3,75</td><td>80 ≤ A- < 85</td></tr>
<tr><td>B+</td><td>3,50</td><td>75 ≤ B+ < 80</td></tr>
<tr><td>B</td><td>3,00</td><td>70 ≤ B < 75</td></tr>
<tr><td>B-</td><td>2,75</td><td>65 ≤ B- < 70</td></tr>
<tr><td>C+</td><td>2,50</td><td>60 ≤ C+ < 65</td></tr>
<tr><td>C</td><td>2,00</td><td>55 ≤ C < 60</td></tr>
<tr><td>D</td><td>1,00</td><td>40 ≤ D < 55</td></tr>
<tr><td>E</td><td>0,00</td><td>0 ≤ E < 40</td></tr>
</table></td></tr>
<tr><td>Media form</td><td>1. Power point file
2. e-book file</td></tr>
<tr><td>References</td><td>1. Prastowo, T. 2014. Lecture Notes on Statistical Physics. Unpublished work
2. Pointon, A. J. 1978. An Introduction to Statistical Physics. London, UK: Longmann</td></tr>
</table>

	3. Beiser, A. 1988. *Perspective of Modern Physics*. London, UK: McGraw-Hill 4. Serway, R. A. et al. 2005. *Modern Physics*. California, US: Thomson Learning Inc 5. Kittel, C. and H. Kroemer. 1980. *Thermal Physics*. New York, US: W 6. Tipler, P. A. 1990. *Physics for Scientists and Engineers*. New York, US: W
Note	

Module Descriptions

Module designation	*8420302108*
Semester(s) in which the module is taught	*6*
Person responsible for the module	*Prof. Dr. Eko Hariyono, M.Pd.*
Language	Indonesian
Relation to curriculum	*Compulsory / elective / specialisation*
Teaching methods	*Lecture, Lesson, Discussion, case study lab works, project, seminar*
Workload (incl. contact hours, self-study hours)	*(Estimated) Total workload: 136 work hours per-semester* *Contact hours (please specify whether lecture, exercise, laboratory session, etc.): 40 work hours per-semester* *Private study including examination preparation, specified in hours: 94 work hours per-semester*
Credit points	3.18 ECTS
Required and recommended prerequisites for joining the module	-
Module objectives/intended learning outcomes	*Key question: what learning outcomes should students attain in the module?* *E.g. in terms of:* • *Attitude: -* • *Competences -* • *Knowledge:* *a. Masters and demonstrates the principles of classical and modern physics theory.* *b. Masters the pedagogical knowledge in planning, teaching, and evaluating physics learning as well as resource management in organizing classes, physics laboratories and educational institutions.* • *Skills:* *a. Demonstrates a resilient, collaborative, adaptive, innovative, inclusive, lifelong learning, and entrepreneurial character.*
Content	*This course is a compulsory subject designed to equip students with the knowledge and skills needed for managing physics laboratories*

	and developing experimental instruments. Students will learn the fundamental principles of laboratory management, including equipment administration, workplace safety, and standard operating procedures. In addition, this course covers the design of laboratory instruments, in which students will develop competencies in designing, constructing, and analyzing experimental tools based on physics concepts. These activities involve material selection, fabrication techniques, and instrument testing to ensure suitability for experimental needs. As a major output, students will produce laboratory-standard instruments that can be utilized in physics teaching and research. This project aims to enhance students' competencies in applying physics principles to create functional and innovative experimental devices. Through this course, students are expected to gain comprehensive insight into laboratory management and to develop and optimize experimental tools that effectively support physics learning.
Examination forms	*Essay*
Study and examination requirements	***Requirements for successfully passing the module:*** *a. Minimum attendance of 75%* *b. Minimum score of 55 out of 100*
Reading list	*a. Gary Holden, Gary Rosenberg, & Kathleen Barker. 2005. Bibliometrics in Social Work. New York: Routledge.* *b. RONALD ROUSSEAU, LEO EGGHE, & RAF GUNS. 2018. BECOMING METRIC-WISE: A Bibliometric Guide for Researchers.* *Chandos Publishing- Elsevier.* *c. Roberto Todeschini and Alberto Baccini. 2016. Handbook of Bibliometric Indicators Quantitative Tools for Studying and Evaluating Research. Wiley VCH Verlagh GMBH.* *c. Nees Jan van Eck and Ludo Waltman. 2018. VOSViewer Manual Version 168. Universiteit Leiden, The Netherlands.* *c. Wasis, dkk. 2018. HoTs dan Literasi Sains (Konsep, Pembelajaran, dan Penilaiannya). Jombang: Kun Fayakun* *c. Jurnal nasional dan internasional yang relevan dengan pendidikan fisika 5 tahun terakhir.*

Module Descriptions

Module designation	8420302300 – Filsafat Pendidikan IPA (Philosophy of Science Education)
Semester(s) in which the module is taught	7
Person responsible for the module	*Dra. Suliyanah, M.Si.*
Language	Indonesian
Relation to curriculum	*Compulsory / elective / specialisation*
Teaching methods	*Lecture, Lesson, Discussion, case study, lab works, project, seminar*
Workload (incl. contact hours, self-study hours)	*(Estimated) Total workload: 90.7 work hours per-semester* *Contact hours:* *a. Lecture, exercise: 28 work hours per-semester (2 hours per week × 14 weeks)* *Private study including examination preparation: 62.7 work hours per-semester (private study ± 51.7 hours; examination preparation ± 11 hours)*
Credit points	3.18 ECTS
Required and recommended prerequisites for joining the module	-
Module objectives/intended learning outcomes	*Key question: what learning outcomes should students attain in the module?* *E.g. in terms of:* • *Attitude:* *a. Demonstrate good scientific manners, critical thinking, and innovation skills in educational, research, and professional fields (PLO-11/SOC-1).* *b. Demonstrate the appreciation of religious and cultural values in conducting their tasks as a professional (PLO-12/SOC-2).* • *Competences:* *a. Make a decision based on the data information and evaluation in order to fulfil the responsibility of the task (PLO-9/COM-2).*

	b. Work as an individual as well as a team effectively, have an entrepreneur skill, and awareness of environmental issues (PLO-10/COM-3). • *Knowledge:* *a. Demonstrate pedagogical knowledge in planning, teaching, and evaluating a physics learning (PLO-3/KNO-3).* • *Skills:* *a. Improve their knowledge and be able to continue their study in a higher degree program (PLO-7/SKI-3).*
Content	*This course discusses the relationship between humans, knowledge, science, philosophy, technology and religion; the nature of humans as thinking beings; the differences between facts, concepts and principles in science, especially physics; and science as an object of philosophical study together with the history of its development (prehistoric, Greek and Islamic eras, the Renaissance and modern era, and the contemporary era). It also describes the foundations of knowledge (reasoning, logic, sources of knowledge and criteria of truth), the foundations of science (ontology, epistemology and axiology), the scientific method and scientific explanation, the thoughts of philosophers in science education and the philosophy of science, sustainable education, and a critical review of the role and use of artificial intelligence (AI) in science education. Learning is conducted using case studies, presentations and discussions.*
Examination forms	*Participatory activities (55%), project/product assessment (25%), written test (20%)*
Study and examination requirements	***Requirements for successfully passing the module:*** *a. Minimum attendance of 75%* *b. Minimum score of 55 out of 100*
Reading list	*a. Bakhtiar, A. 2006. Filsafat Ilmu. Jakarta: Raja Grafindo Persada.* *b. Campbell, N. 1953. What is Science? New York: Dover Publications.* *c. Kuhn, T. S. 2000. The Structure of Scientific Revolutions: Peran Paradigma dalam Revolusi Sains. Bandung: Remaja Rosdakarya.* *d. Roberts, R. M. 2004. Serendipity: Penemuan-penemuan Bidang Sains yang Tidak Disengaja. Bandung: Pakar Raya.* *e. Kant, Immanuel. 2004. Metaphysical Foundations of Natural Science. Cambridge: Cambridge University Press.*

	f. Hegel, G. W. F. 2004. Philosophy of Nature. Oxford: Oxford University Press. *g. Russell, B. 2009. A History of Western Philosophy. New York: Simon & Schuster, Inc.* *h. McComas, W. F. (2002). The Nature of Science in Science Education: Rationales and Strategies. Kluwer Academic Publishers.* *i. Tiedemann, M. (Ed.). (2024). Philosophical Education beyond the Classroom. Springer Stuttgart.* *j. Nola, R., & Irzik, G. (2006). Philosophy, Science, Education and Culture (Vol. 28, Contemporary Trends and Issues in Science Education). Springer Science & Business Media.* *k. Utami, P. L., Suprapto, N., & Hidaayatullaah, H. N. (2025, November). Empowering students' energy literacy through STEAM-ESD projects in place-based education. In Journal of Physics: Conference Series (Vol. 3132, No. 1, p. 012010). IOP Publishing.* *l. Other relevant books, scientific articles and sources.*

Module Descriptions

Module designation	*8420302254*
Semester(s) in which the module is taught	*6*
Person responsible for the module	*Utama Alan Deta, M.Pd., M.Si*
Language	Indonesian
Relation to curriculum	*Compulsory / elective / specialisation*
Teaching methods	*Lecture, Lesson, Discussion, case study lab works, project, seminar*
Workload (incl. contact hours, self-study hours)	*(Estimated) Total workload: 136 work hours per-semester* *Contact hours (please specify whether lecture, exercise, laboratory session, etc.): 40 work hours per-semester* *Private study including examination preparation, specified in hours: 94 work hours per-semester*
Credit points	3.18 ECTS
Required and recommended prerequisites for joining the module	-
Module objectives/intended learning outcomes	*Key question: what learning outcomes should students attain in the module?* *E.g. in terms of:* • *Attitude:* *a. Demonstrates religious, national and cultural values, as well as academic ethics in carrying out their duties.* • *Competences -* • *Knowledge: -* • *Skills:* *a. Develops logical, critical, systematic and creative thinking in carrying out specific work in the field of expertise and in accordance with the work competency standards in the relevant field.* *b. Conducts physics education research in the form of studies and evaluations of physics learning with a quantitative and/or qualitative approach in the form of oral and academic writing effectively.*

Content	*This Local Wisdom in Physics course has four main parts, namely the essence of local wisdom in physics and its scope; reconstructing scientific knowledge based on local wisdom; Science Education as a means of the acculturation process; and scientific-physics research in the context of culture and customs. The teaching strategies used in this course are lectures, Q&A sessions, discussions, assignments, presentations, and mini projects.*
Examination forms	*Essay*
Study and examination requirements	***Requirements for successfully passing the module:*** *a. Minimum attendance of 75%* *b. Minimum score of 55 out of 100*
Reading list	*a. Sudarmin. 2013. Pendidikan Karakter: Etnosains dan Kearifan Lokal (Konsep dan Penerapannya dalam Penelitian dan* *Pembelajaran Sains) . Semarang: Swadaya Manunggal* *b. Winarti A, Almubarak, Muna K. 2018. Inovasi Pembelajaran Kimia Berbasis ETNOSAINS. Banjarmasin: Program Studi Pendidikan Kimia FKIP ULM* *b. Hewson MG. 2015. Embracing Indigenous Knowledge in Science and Medical Teaching. New York: Springer* *b. Hendry J. 2014. Science and Sustainability Learning from Indigenous Wisdom. New York: Palgrave and Macmillan* *b. Simonyi K. 2012. A Cultural History of Physics (Translated by David Kramer). Florida: CRC Press* *b. Franklin S. 1995. Science as Culture, Cultures of Science. Annual Review of Anthropology 24: 163-184.* *https://www.jstor.org/stable/2155934?origin=JSTOR-pdf* *g. Suprapto dkk. 2021. Kearifan lokal kerapan sapi dari tinjauan etnosains dan etnofisika. Surabaya: Kunfayakun* *g. O Saputra, et al. 2024. Development of multimedia oriented to local wisdom to improve students' understanding of physics concepts. J. Phys.: Conf. Ser. 2900 012046*

Module Descriptions

Module designation (kode MK)	8420302268
Semester(s) in which the module is taught	4
Person responsible for the module	*Dr. Setyo Admoko, S.Pd., M.Pd.*
Language	Indonesian
Relation to curriculum	*Compulsory / elective / specialisation*
Teaching methods	*Lecture, Lesson, Discussion, case study lab works, project, seminar*
Workload (incl. contact hours, self-study hours)	*(Estimated) Total workload: 90.6 work hours per-semester* *Contact hours (please specify whether lecture, exercise, laboratory session, etc.): 53.3 work hours per-semester* *Private study including examination preparation, specified in hours: 37.3 work hours per-semester*
Credit points	3.18 ECTS
Required and recommended prerequisites for joining the module	-
Module objectives/intended learning outcomes	*Key question: what learning outcomes should students attain in the module?* *E.g. in terms of:* • *Attitude:* *a. Demonstrates religious, national and cultural values, as well as academic ethics in carrying out their duties.* *b. Demonstrates a resilient, collaborative, adaptive, innovative, inclusive, lifelong learning, and entrepreneurial character.* • *Competences -* • *Knowledge:* *a. Masters and demonstrates the principles of classical and modern physics theory.* • *Skills:*

	a. Develops logical, critical, systematic and creative thinking in carrying out specific work in the field of expertise and in accordance with the work competency standards in the relevant field. *b. Develops self sustainably and collaborate.*
Content	*This Physics Argumentation course has eight main sections of material discussion, namely: (1) The definition of argumentation and its development in physics learning; (2) Argumentation as part of the physics learning design process; (3) The role of teachers in encouraging argumentation in physics learning; (4) Teaching strategies that have the potential to teach and train argumentation skills; (5) Implementing argument-based teaching in physics learning; (6) Evaluating the quality of arguments in physics learning; (7) Some practical implications for argumentation-based physics teaching; and (8) Research on argumentation in physics science education. The lecture strategies used in this course include lectures, Q&A sessions, discussions, assignments, presentations, and mini projects.*
Examination forms	*Essay*
Study and examination requirements	***Requirements for successfully passing the module:*** *a. Minimum attendance of 75%* *b. Minimum score of 55 out of 100*
Reading list	*a. S. Erduran and M. P. Jiménez-Aleixandre, Argumentation in science education. Springer, 2008.* *b. 2. C. Rapanta, Argumentation strategies in the classroom. Vernon Press, 2019.* *c. 3. D. Llewellyn, Teaching high school science through inquiry and argumentation. Corwin Press, 2013.* *d. 4. N. Pinkwart and B. M. McLaren, Educational technologies for teaching argumentation skills. Bentham Science Publishers,* *e. 2012.* *f. 5. P. Besnard and A. Hunter, Elements of argumentation, vol. 47. MIT press Cambridge, 2008* *g. 6. S. E. Toulmin, "The uses of argument (Updated edition, first published in 1958)," 2003.* *h. 7. D. Hitchcock and B. Verheij, Arguing on The Toulmin Model. Dordrecht, The Netherlands.: Springer, 2006.*

Module Descriptions

Module designation	*8420302265*
Semester(s) in which the module is taught	*4*
Person responsible for the module	*Binar Kurnia Prahani*
Language	Indonesian
Relation to curriculum	*Compulsory / elective / specialisation*
Teaching methods	*Lecture, Lesson, Discussion, case study lab works, project, seminar*
Workload (incl. contact hours, self-study hours)	*(Estimated) Total workload: 136 work hours per-semester* *Contact hours (please specify whether lecture, exercise, laboratory session, etc.): 40 work hours per-semester* *Private study including examination preparation, specified in hours: 94 work hours per-semester*
Credit points	3.18 ECTS
Required and recommended prerequisites for joining the module	-
Module objectives/intended learning outcomes	*Key question: what learning outcomes should students attain in the module?* *E.g. in terms of:* • *Attitude: -* • *Competences -* • *Knowledge:* *a. Masters the pedagogical knowledge in planning, teaching, and evaluating physics learning as well as resource management in organizing classes, physics laboratories and educational institutions.* • *Skills:* *a. Develops logical, critical, systematic and creative thinking in carrying out specific work in the field of expertise and in accordance with the work competency standards in the relevant field.* *b. Masters the principles of developing physics learning media based on science, contextual technology, especially ICT (information and communication technology), and the surrounding environment.*

Content	*This course focuses on enhancing students' understanding and knowledge of science, technology, engineering, art, and mathematics, so that this understanding can be used to solve problems and make decisions for human progress..*
Examination forms	*essay*
Study and examination requirements	***Requirements for successfully passing the module:*** *a. Minimum attendance of 75%* *b. Minimum score of 55 out of 100*
Reading list	*a. Bybee, R. W. (2013). The case for STEM education: Challenges and opportunities. Arlington, VA: National Science Teachers Association (NSTA) Press.* *b. Cunningham, C. M., & Kelly, G. J. (2017). Epistemic practices of engineering for education. Science Education, 101(3), 486–505. https://doi.org/10.1002/sce.21271* *c. Wiggins, G., & McTighe, J. (2005). Understanding by design. Alexandria, VA: Association for Supervision and Curriculum Development (ASCD).* *d. Quigley, C. F., Herro, D., & Jamil, F. M. (2017). Developing a conceptual model of STEAM teaching and learning. School* *d. Science and Mathematics, 117(1–2), 1–12. https://doi.org/10.1111/ssm.12201.*

Module Descriptions

Module designation	8420302253 – E-Learning Fisika (Physics E-Learning)
Semester(s) in which the module is taught	5
Person responsible for the module	*Prof. Dr. Eko Hariyono, S.Pd., M.Pd.*
Language	Indonesian
Relation to curriculum	*Compulsory / elective / specialisation*
Teaching methods	*Lecture, Lesson, Discussion, case study, lab works, project, seminar*
Workload (incl. contact hours, self-study hours)	*(Estimated) Total workload: 90.7 work hours per-semester* *Contact hours:* *a. Lecture, exercise: 28 work hours per-semester (2 hours per week × 14 weeks)* *Private study including examination preparation: 62.7 work hours per-semester (private study ± 51.7 hours; examination preparation ± 11 hours)*
Credit points	3.18 ECTS
Required and recommended prerequisites for joining the module	-
Module objectives/intended learning outcomes	*Key question: what learning outcomes should students attain in the module?* *E.g. in terms of:* • *Attitude:* *a. Demonstrate good scientific manners, critical thinking, and innovation skills in educational, research, and professional fields (PLO-11/SOC-1).* • *Competences:* *a. Make a decision based on the data information and evaluation in order to fulfil the responsibility of the task (PLO-9/COM-2).* *b. Work as an individual as well as a team effectively, have an entrepreneur skill, and awareness of environmental issues (PLO-10/COM-3).* • *Knowledge:*

	a. Demonstrate pedagogical knowledge in planning, teaching, and evaluating a physics learning (PLO-3/KNO-3). • *Skills:* *a. Plan, do, and evaluate of physics learning by using information and communication technology (PLO-5/SKI-1).* *b. Improve their knowledge and be able to continue their study in a higher degree program (PLO-7/SKI-3).*
Content	*This course equips prospective physics education graduates to analyse, evaluate and create interactive simulation-based physics learning, mobile-based physics learning, web-based physics learning and distance learning of physics in order to compete and excel in the 4.0 era and towards Society 5.0, and to communicate scientifically and work effectively both individually and in groups. The topics cover: the basic concepts and principles of instructional design and e-learning (multimedia, contiguity, modality, personalisation); learner needs and characteristics; pedagogical and technical standards for evaluating e-learning media; instructional design models (ADDIE, SAM) and current development tools (e.g., H5P, Unity, Adobe Captivate, Canva, PhET); gamification and interactivity; prototyping and storyboarding; collaboration strategies and project management in e-learning development; e-learning platforms and tools (Moodle, Google Classroom, Edmodo, PhET, Khan Academy, GeoGebra, Padlet) and their effectiveness; evaluation of e-learning content; continuous professional development in educational technology; e-learning-based assessment (quizzes, assignments, discussions, projects and portfolios); and learning analytics to identify patterns of physics learning difficulties. Learning is conducted using project-based learning.*
Examination forms	*Participatory activities (9.5%), project/product assessment (49.5%), portfolio assessment (33.5%), written test (7.5%)*
Study and examination requirements	***Requirements for successfully passing the module:*** *a. Minimum attendance of 75%* *b. Minimum score of 55 out of 100*
Reading list	*a. Griffin, P. & Care, E. (2015). Assessment and Teaching of 21st Century Skills: Methods and Approach. New York: Springer.* *b. Nichols, J. R. (2015). 4 Essential Rules of 21st Century Learning. Teach Thought.* *c. Benade, L. (2017). Being a Teacher in the 21st Century: A Critical New Zealand Research Study. New York: Springer.* *d. Watson, J. (2008). Blended Learning: The Convergence of Online and Face-to-Face Education. Florida: NACOL.*

	e. Jatmiko, B., Prahani, B. K., Siswanto, J., Susantini, E., & Habibbulloh, M. (2023). Model Pembelajaran Investigation-Based Multiple Representation Online (IBMRO). Mitra Edukasi dan Publikasi.

Module Descriptions

Module designation	*8420302269*
Semester(s) in which the module is taught	*6*
Person responsible for the module	*Binar Kurnia Prahani*
Language	Indonesian
Relation to curriculum	*Compulsory / elective / specialisation*
Teaching methods	*Lecture, Lesson, Discussion, case study lab works, project, seminar*
Workload (incl. contact hours, self-study hours)	*(Estimated) Total workload: 136 work hours per-semester* *Contact hours (please specify whether lecture, exercise, laboratory session, etc.): 40 work hours per-semester* *Private study including examination preparation, specified in hours: 94 work hours per-semester*
Credit points	3.18 ECTS
Required and recommended prerequisites for joining the module	-
Module objectives/intended learning outcomes	*Key question: what learning outcomes should students attain in the module?* *E.g. in terms of:* • *Attitude: -* • *Competences -* • *Knowledge:* *a. Masters the pedagogical knowledge in planning, teaching, and evaluating physics learning as well as resource management in organizing classes, physics laboratories and educational institutions.* • *Skills:* *a. Develops logical, critical, systematic and creative thinking in carrying out specific work in the field of expertise and in accordance with the work competency standards in the relevant field.* *b. Develops self sustainably and collaborate.*

	c. Masters the principles of developing physics learning media based on science, contextual technology, especially ICT (information and communication technology), and the surrounding environment.
Content	*This course optimizes the use of all digital or real game tools to teach physics knowledge.*
Examination forms	*essay*
Study and examination requirements	***Requirements for successfully passing the module:*** *a. Minimum attendance of 75%* *b. Minimum score of 55 out of 100*
Reading list	*a. Perelman 1988 Fun With Maths and Physics: Brain Teasers Trick and Illusion Moscow: MIR Plubishers.* *b. Fadlilah M, 2014, Edutainment Pendidikan Anak Usia Dini: Mencipkana Pembelajaran Menarik Kreatif, dan Menyenamhkan. Jakartaa: Kencana Prenadamedia Grup.* *c. Astra, I., Henukh, A., & Uskenat, K. (2024, May). Physics edutainment: Improving conceptual understanding of students. In AIP Conference Proceedings (Vol. 3116, No. 1). AIP Publishing.*

Module Descriptions

Module designation	8420302264 – Pengukuran dan Instrumen Pendidikan Fisika (Physics Education Measurement and Instruments)
Semester(s) in which the module is taught	6
Person responsible for the module	*Prof. Dr. Wasis, M.Si.*
Language	Indonesian
Relation to curriculum	*Compulsory / elective / specialisation*
Teaching methods	*Lecture, Lesson, Discussion, case study, lab works, project, seminar*
Workload (incl. contact hours, self-study hours)	*(Estimated) Total workload: 90.7 work hours per-semester* *Contact hours:* *a. Lecture, exercise: 28 work hours per-semester (2 hours per week × 14 weeks)* *Private study including examination preparation: 62.7 work hours per-semester (private study ± 51.7 hours; examination preparation ± 11 hours)*
Credit points	3.18 ECTS
Required and recommended prerequisites for joining the module	-
Module objectives/intended learning outcomes	*Key question: what learning outcomes should students attain in the module?* *E.g. in terms of:* • *Attitude:* *a. Demonstrate good scientific manners, critical thinking, and innovation skills in educational, research, and professional fields (PLO-11/SOC-1).* • *Competences:* *a. Communicate the ideas and research results in verbal as well as written effectively (PLO-8/COM-1).* *b. Work as an individual as well as a team effectively, have an entrepreneur skill, and awareness of environmental issues (PLO-10/COM-3).* • *Knowledge:*

	a. Demonstrate pedagogical knowledge in planning, teaching, and evaluating a physics learning (PLO-3/KNO-3). *b. Demonstrate knowledge related to physics education research (PLO-4/KNO-4).* • *Skills:* *a. Improve their knowledge and be able to continue their study in a higher degree program (PLO-7/SKI-3).*
Content	*This course studies the process of developing physics education instruments, both test and non-test, up to the stage of testing the quality of the instruments. The topics cover: developing test-based assessment instruments and trialling them; item analysis of test instruments; developing non-test assessment instruments; testing the quality of non-test instruments using Exploratory Factor Analysis (EFA), Rasch analysis and Confirmatory Factor Analysis (CFA); strategies for testing instrument quality in physics education research; and software tutorials and workshops for validating physics education assessment instruments, such as ANATES, SPSS, AMOS and Winsteps. Students design test and non-test instruments up to the quality-testing stage and write an article on instrument development and quality testing. Learning is conducted using project-based learning through repository discussions, workshops, collaborative learning, classroom discussions and software tutorials.*
Examination forms	*Participatory activities (32.5%), project/product assessment (38.5%), practice/performance assessment (19%), written test (10%)*
Study and examination requirements	***Requirements for successfully passing the module:*** *a. Minimum attendance of 75%* *b. Minimum score of 55 out of 100*
Reading list	*a. Panduan Asesmen dan Pembelajaran Kurikulum Merdeka.* *b. Books on item analysis (analisis butir soal).* *c. George, David. 2005. Examination and Evaluation in Education. New Delhi: Commonwealth.* *d. Sunarti, T., Wasis, W., Setyarsih, W., Zainuddin, A., Jauhariyah, M. N. R., Zakaria, A., & Rizki, I. A. (2024). Analysis of Students' Physics Numeracy Literacy Ability and Its Learning Implementation: Case Study in Nganjuk City. Studies in Learning and Teaching, 5(3), 770-790.* *e. Software ANATES.* *f. Software SPSS.*

Module Descriptions

Module designation	8420302260 – Teori Respon Butir (Item Response Theory)
Semester(s) in which the module is taught	7
Person responsible for the module	*Prof. Dr. Wasis, M.Si.*
Language	Indonesian
Relation to curriculum	*Compulsory / elective / specialisation*
Teaching methods	*Lecture, Lesson, Discussion, case study, lab works, project, seminar*
Workload (incl. contact hours, self-study hours)	*(Estimated) Total workload: 90.7 work hours per-semester* *Contact hours:* *a. Lecture, exercise: 28 work hours per-semester (2 hours per week × 14 weeks)* *Private study including examination preparation: 62.7 work hours per-semester (private study ± 51.7 hours; examination preparation ± 11 hours)*
Credit points	3.18 ECTS
Required and recommended prerequisites for joining the module	-
Module objectives/intended learning outcomes	*Key question: what learning outcomes should students attain in the module?* *E.g. in terms of:* • *Attitude:* *a. Demonstrate good scientific manners, critical thinking, and innovation skills in educational, research, and professional fields (PLO-11/SOC-1).* • *Competences:* *a. Communicate the ideas and research results in verbal as well as written effectively (PLO-8/COM-1).* *b. Make a decision based on the data information and evaluation in order to fulfil the responsibility of the task (PLO-9/COM-2).* • *Knowledge:*

	a. Demonstrate pedagogical knowledge in planning, teaching, and evaluating a physics learning (PLO-3/KNO-3). *b. Demonstrate knowledge related to physics education research (PLO-4/KNO-4).* • *Skills: -*
Content	*This course discusses the basic concepts, models and applications of item response theory (IRT) in the development and analysis of educational assessment instruments, especially in physics education, with the aim of providing an understanding of the principles of psychometric measurement, the estimation of item parameters and examinee ability, and the interpretation of analysis results to improve the quality of test items and learning evaluation. The topics cover: an introduction to IRT and its differences from classical test theory; item parameters (discrimination, difficulty and pseudo-guessing) and item characteristic curves (ICC); logistic models (1PL, 2PL and 3PL), item calibration and model fit; ability estimation (e.g., maximum likelihood estimation); item and test information functions and standard error for optimising physics test items; the advantages and limitations of IRT models; equating and linking for large-scale physics tests; and differential item functioning (DIF) analysis. Emphasis is given to the use of analysis software and the practical implications for developing valid and reliable evaluation instruments. Learning is conducted using case studies.*
Examination forms	*Participatory activities (50%), project/product assessment (15%), practice/performance assessment (2%), written test (33%)*
Study and examination requirements	***Requirements for successfully passing the module:*** *a. Minimum attendance of 75%* *b. Minimum score of 55 out of 100*
Reading list	*a. George, David. 2005. Examination and Evaluation in Education. New Delhi: Commonwealth.* *b. Sumaryanta. 2021. Teori Tes Klasik & Teori Respon Butir: Konsep & Contoh Penerapannya. Cirebon: Confident.*

Module Descriptions

Module designation	8420302270 – Asesmen Berbasis Digital (Digital-Based Assessment)
Semester(s) in which the module is taught	Even semester
Person responsible for the module	*Prof. Dr. Wasis, M.Si.*
Language	Indonesian
Relation to curriculum	*Compulsory / elective / specialisation*
Teaching methods	*Lecture, Lesson, Discussion, case study, lab works, project, seminar*
Workload (incl. contact hours, self-study hours)	*(Estimated) Total workload: 90.7 work hours per-semester* *Contact hours:* *a. Lecture, exercise: 28 work hours per-semester (2 hours per week × 14 weeks)* *Private study including examination preparation: 62.7 work hours per-semester (private study ± 51.7 hours; examination preparation ± 11 hours)*
Credit points	3.18 ECTS
Required and recommended prerequisites for joining the module	-
Module objectives/intended learning outcomes	*Key question: what learning outcomes should students attain in the module?* *E.g. in terms of:* • *Attitude:* *a. Demonstrate good scientific manners, critical thinking, and innovation skills in educational, research, and professional fields (PLO-11/SOC-1).* • *Competences:* *a. Communicate the ideas and research results in verbal as well as written effectively (PLO-8/COM-1).* *b. Make a decision based on the data information and evaluation in order to fulfil the responsibility of the task (PLO-9/COM-2).*

	c. Work as an individual as well as a team effectively, have an entrepreneur skill, and awareness of environmental issues (PLO-10/COM-3). • *Knowledge:* *a. Demonstrate pedagogical knowledge in planning, teaching, and evaluating a physics learning (PLO-3/KNO-3).* *b. Demonstrate knowledge related to physics education research (PLO-4/KNO-4).* • *Skills:* *a. Plan, do, and evaluate of physics learning by using information and communication technology (PLO-5/SKI-1).*
Content	*This course discusses the concepts, principles and practice of developing digital assessment in physics learning, focusing on the paradigm shift of assessment towards authentic, formative and performance-based technology-supported approaches. The topics cover: curriculum analysis; types and approaches of digital assessment; designing digital assessment instruments to measure cognitive, affective and psychomotor aspects of physics learning, including performance-based, HOTS and scientific literacy instruments; the use of Learning Management Systems (LMS), mobile applications and other digital platforms; and digital evaluation models and tools such as Google Form, Moodle Quiz, PhET simulations and AI-based applications for diagnosing misconceptions and tracking learning progress, in the context of TPACK, hybrid learning or STEM. Students develop and implement valid and reliable digital assessment instruments that suit the characteristics of physics content and the needs of 21st century learners, and critically reflect on their effectiveness through limited trials and analysis of assessment data. Learning is conducted using case-based learning and project-based learning.*
Examination forms	*Participatory activities (40%), project/product assessment (60%)*
Study and examination requirements	***Requirements for successfully passing the module:*** *a. Minimum attendance of 75%* *b. Minimum score of 55 out of 100*
Reading list	*a. Wasis, Y. S. R., Sunarti, T., & Indiana, S. (2020). HOTS dan Literasi Sains: Konsep, Pembelajaran, dan Penilaiannya. Surabaya: Kun Fayakun Corp.* *b. Wasis, W., Sunarti, T., & Jauhariyah, M. N. R. (2023). Implementation of Continuous-Assessment on Postgraduate Program. IJORER: International Journal of Recent Educational Research, 4(3), 254-270.*

Module Descriptions

Module designation	*8420302252*
Semester(s) in which the module is taught	*6*
Person responsible for the module	*Abd. Kholiq, S.Pd., M.T.*
Language	Indonesian
Relation to curriculum	*Compulsory / elective / specialisation*
Teaching methods	*Lecture, Lesson, Discussion, case study lab works, project, seminar*
Workload (incl. contact hours, self-study hours)	*(Estimated) Total workload: 90.6 work hours per-semester* *Contact hours (please specify whether lecture, exercise, laboratory session, etc.): 64 work hours per-semester* *Private study including examination preparation, specified in hours: 26.6 work hours per-semester*
Credit points	3.18 ECTS
Required and recommended prerequisites for joining the module	-
Module objectives/intended learning outcomes	*Key question: what learning outcomes should students attain in the module?* *E.g. in terms of:* • *Attitude:* *a. Demonstrates a resilient, collaborative, adaptive, innovative, inclusive, lifelong learning, and entrepreneurial character.* • *Competences -* • *Knowledge: -* • *Skills:* *a. Develops logical, critical, systematic and creative thinking in carrying out specific work in the field of expertise and in accordance with the work competency standards in the relevant field.* *b. Develops self sustainably and collaborate.*

	c. Masters the principles of developing physics learning media based on science, contextual technology, especially ICT (information and communication technology), and the surrounding environment.
Content	*This course is a subject that develops knowledge and skills related to the development of Physics learning videos, including the development of audiovisual media, shooting and editing techniques, and cinematography theory. This course serves as a means for students to develop themselves by creatively combining knowledge of Physics and communication skills in the form of audiovisual media. Students are expected to be critical, creative, and active during this course.*
Examination forms	*Project*
Study and examination requirements	***Requirements for successfully passing the module:*** *a. Minimum attendance of 75%* *b. Minimum score of 55 out of 100*
Reading list	*a. Bucchi, M. and Trench, B. eds., 2021. Routledge handbook of public communication of science and technology. Routledge.* *b. Dale, E., 1969. Audiovisual methods in teaching.* *c. Cruse, E., 2006. Using educational video in the classroom: Theory, research and practice. Library Video Company, 12(4), pp.56-80* *d. Fischhoff, B. and Scheufele, D.A., 2013. The science of science communication. Proceedings of the National Academy of Sciences, 110(Supplement 3), pp.14031 14032.* *e. Kubovy, M. and Schutz, M., 2010. Audio-visual objects. Review of Philosophy and Psychology, 1(1), pp.41-61.* *f. Welbourne, D.J. and Grant, W.J., 2016. Science communication on YouTube: Factors that affect channel and video popularity. Public understanding of science, 25(6), pp.706-718*

Module Descriptions

Module designation	*8420302143*
Semester(s) in which the module is taught	*6*
Person responsible for the module	*Abdul Kholiq, M.Si.*
Language	Indonesian
Relation to curriculum	*Compulsory / elective / specialisation*
Teaching methods	*Lecture, Lesson, Discussion, case study lab works, project, seminar*
Workload (incl. contact hours, self-study hours)	*(Estimated) Total workload: 136 work hours per-semester* *Contact hours (please specify whether lecture, exercise, laboratory session, etc.): 40 work hours per-semester* *Private study including examination preparation, specified in hours: 94 work hours per-semester*
Credit points	3.18 ECTS
Required and recommended prerequisites for joining the module	-
Module objectives/intended learning outcomes	*Key question: what learning outcomes should students attain in the module?* *E.g. in terms of:* • *Attitude: -* • *Competences -* • *Knowledge:* *a. Masters the pedagogical knowledge in planning, teaching, and evaluating physics learning as well as resource management in organizing classes, physics laboratories and educational institutions.* • *Skills:* *a. Develops logical, critical, systematic and creative thinking in carrying out specific work in the field of expertise and in accordance with the work competency standards in the relevant field.* *b. Conducts physics education research in the form of studies and evaluations of physics learning with a quantitative and/or*

	qualitative approach in the form of oral and academic writing effectively. *c. Masters the principles of developing physics learning media based on science, contextual technology, especially ICT (information and communication technology), and the surrounding environment.*
Content	*This course is a course that designs and develops the use of computers to present and integrate text, sound, images, animation, audio, and video with tools and links so that users can navigate, interact, create, and communicate, which is often used in the field of informatics..*
Examination forms	*project*
Study and examination requirements	***Requirements for successfully passing the module:*** *a. Minimum attendance of 75%* *b. Minimum score of 55 out of 100*
Reading list	*a. Mulyana I, Prajuhana A P, Iqbal M S, 2019, desain Grafis dan Multimedia: Teori dan Implementasi, Bogor: LPPM* *Universitas Pakuan.* *b. Suyanto M, 2005, Multimedia: Alat untuk Meningkatkan Keunggulan Bersaing, Yogyakarta: Andi Offset* *b. Munir, M. (2012). Multimedia konsep & aplikasi dalam pendidikan. Bandung: Alfabeta.* *b. Hasanah, A. R., Salam, M. A., & Mahtari, S. (2019, February). Developing the interactive multimedia in physics learning. In* *b. Journal of Physics: Conference Series (Vol. 1171, No. 1, p. 012019). IOP Publishing.* *b. Muller, D. A. (2008). Designing effective multimedia for physics education. Sydney: University of Sydney.* *b. Shermuhammedov, A. A., Mustafakulov, A. A., & Mamatkulov, B. H. (2021). Multimedia In The Teaching Of Physics Use.* *Conferencea, 105-108.* *h. Girwidz, R., & Kohnle, A. (2022). Multimedia and Digital Media in Physics Instruction. In Physics Education (pp. 297-336). Cham: Springer International Publishing.* *h. Qi, D., Zhang, S., Yang, C., He, Y., Cao, F., Yao, J., ... & Wang, L. V. (2020). Single-shot compressed ultrafast photography: a review. Advanced Photonics, 2(1), 014003-014003.*

	h. *Abdulloh, R. (2016). Easy & Simple-Web Programming. Elex Media Komputindo.*

Module Descriptions

Module designation	*8420302259*
Semester(s) in which the module is taught	7
Person responsible for the module	*Mita Anggaryani, M.Pd., Ph.D.*
Language	Indonesian
Relation to curriculum	*Compulsory / elective / specialisation*
Teaching methods	*project*
Workload (incl. contact hours, self-study hours)	*(Estimated) Total workload: 136 work hours per-semester* *Contact hours (please specify whether lecture, exercise, laboratory session, etc.): 40 work hours per-semester* *Private study including examination preparation, specified in hours: 94 work hours per-semester*
Credit points	3.18 ECTS
Required and recommended prerequisites for joining the module	-
Module objectives/intended learning outcomes	*Key question: what learning outcomes should students attain in the module?* *E.g. in terms of:* • *Attitude: -* • *Competences -* • *Knowledge:* *a. Engaging in continuous professional development and collaboration.* *b. Mastering pedagogical knowledge in the planning, instruction, and evaluation of physics learning, as well as resource management in classrooms, physics laboratories, and educational institutions* *c. Mastering the principles of developing physics instructional media based on science, contextual technology—particularly ICT (Information and Communication Technology)—and the surrounding environment* • *Skills:*

	a. Explain the definition, objectives, and benefits of physics communication. *b. Explain communication theories and prominent figures in physics, both in Indonesia and internationally* *c. Analyze the role of physics communication and its challenges in the development of physics in Indonesia* *d. Explain the fundamentals of visual communication design and computer graphics in physics communication* *e. Analyze scientific data related to public interest and decision-making*
Content	*The Physics Communication and Media Analysis course is a project-based course. Students develop physics communication and media analysis projects targeting school communities and/or the general public based on literature reviews. These physics communication and media analysis projects provide opportunities for students to develop real-world skills that foster creative, actionable, and applicable ideas*
Examination forms	*project*
Study and examination requirements	***Requirements for successfully passing the module:*** *c. Minimum attendance of 75%* *d. Minimum score of 55 out of 100*
Reading list	*1. Schulz, P., & Cobley, P. (Eds.). (2012). Handbooks of communication science. De Gruyter Mouton.* *2. Leßmöllmann, A., Dascal, M., & Gloning, T. (Eds.). (2019). Science communication (Vol. 17). Walter de Gruyter GmbH & Co KG.* *3. Nelson, L. K., & Gilbert, J. L. (2024). Research in Communication Sciences and Disorders: Methods for Scientific Inquiry. Plural publishing.* *4. Baron, N. (2010). Escape from the ivory tower: a guide to making your science matter. Island Press.* *5. Illingworth, S., & Allen, G. (2016). Effective Science Communication: A practical guide to surviving as a scientist. IOP Publishing.* *6. Osborne, J. (2023). Science, scientific literacy, and science education. In Handbook of research on science education (pp. 785-816). Routledge.*

UNESA

8th Semester



Module Descriptions

Module designation	1000002104 – Proposal Tugas Akhir (Final Project Proposal)
Semester(s) in which the module is taught	7
Person responsible for the module	*MBKM Team (Tim MBKM)*
Language	Indonesian
Relation to curriculum	*Compulsory / elective / specialisation*
Teaching methods	*Lecture, Lesson, Discussion, case study, lab works, project, seminar*
Workload (incl. contact hours, self-study hours)	*(Estimated) Total workload: 90.7 work hours per-semester* *Contact hours:* *a. Lecture, exercise: 28 work hours per-semester (2 hours per week × 14 weeks)* *Private study including examination preparation: 62.7 work hours per-semester (private study ± 51.7 hours; examination preparation ± 11 hours)*
Credit points	3.18 ECTS
Required and recommended prerequisites for joining the module	-
Module objectives/intended learning outcomes	*Key question: what learning outcomes should students attain in the module?* *E.g. in terms of:* • *Attitude:* *a. Demonstrate good scientific manners, critical thinking, and innovation skills in educational, research, and professional fields (PLO-11/SOC-1).* *b. Demonstrate the appreciation of religious and cultural values in conducting their tasks as a professional (PLO-12/SOC-2).* • *Competences:* *a. Communicate the ideas and research results in verbal as well as written effectively (PLO-8/COM-1).* *b. Make a decision based on the data information and evaluation in order to fulfil the responsibility of the task (PLO-9/COM-2).*

	c. Work as an individual as well as a team effectively, have an entrepreneur skill, and awareness of environmental issues (PLO-10/COM-3). • *Knowledge:* *a. Demonstrate knowledge related to physics education research (PLO-4/KNO-4).* • *Skills: -*
Content	*This course develops students' insight into real problems, improves their ability to organise and present problems, and prepares them to be active participants in and organisers of seminars. Its scope covers actual problems in physics education described in a complete paper, including problem identification and formulation, development of a framework of thinking, discussion, conclusions and recommendations. The topics cover: identifying relevant and actual educational problems; formulating focused research problems, objectives and benefits; reviewing journals, books and other credible sources; formulating the theoretical basis; designing the research method (type, approach and design); developing valid and reliable research instruments; determining data collection and data analysis techniques; organising the proposal according to scientific writing rules using appropriate academic language and reference managers (e.g., Mendeley, Zotero); presenting the proposal; and revising it based on input from supervisors and examiners so that it is ready for the proposal seminar as the first step of the undergraduate thesis. Learning is conducted using project-based learning, guidance, presentation and seminar.*
Examination forms	*Participatory activities (50%), project/product assessment (50%) – the final project proposal and its seminar presentation*
Study and examination requirements	***Requirements for successfully passing the module:*** *a. Minimum attendance of 75%* *b. Minimum score of 55 out of 100*
Reading list	*a. Azahari, A. 1995. Materi Pokok Teknik Penulisan Ilmiah. Jakarta: Universitas Terbuka.* *b. Lindsay, D. 1998. Penuntun Penulisan Ilmiah. Alih Bahasa oleh S.S. Achmadi. Jakarta: Universitas Indonesia Press.* *c. Yuzal, dkk. 2001. Panduan Praktis Seminar. Jakarta: PT RajaGrafindo Persada.* *d. Tim Penyusun Buku Pedoman Penulisan Skripsi Program Sarjana Strata Satu (S-1). 2014. Pedoman Penulisan Skripsi. Surabaya: Unesa University Press.*

	e. *Jones, T., & Roberts, M. (2021). Developing Effective Final Project Proposals: A Guide for Graduate Students. Journal of Academic Writing and Research, 15(3), 212-225.* f. *Smith, A., & Wilson, P. (2022). Crafting Research Proposals: Best Practices for Final Project Seminars. Educational Research Review, 48(2), 98-110.* g. *Anderson, K., & Martin, L. (2021). Strategies for Effective Proposal Presentations in Final Project Seminars. Journal of Higher Education Pedagogy, 29(4), 142-155.* h. *Clark, J., & Thompson, M. (2022). Final Project Proposal Seminars: Structuring and Presenting Research Ideas. International Journal of Academic Excellence, 33(5), 187-202.* i. *Miller, H., & Green, B. (2021). Peer Review in Final Project Proposal Seminars: Enhancing Feedback and Collaboration. Journal of Educational Collaboration, 27(3), 115-130.* j. *Carter, R., & Hayes, S. (2021). Improving Research Proposal Skills: A Practical Guide for Students in Final Project Seminars. Journal of Graduate Education, 30(2), 72-85.* k. *Nelson, K., & Fisher, L. (2022). Developing Critical Thinking in Final Project Proposal Seminars. Journal of Critical Pedagogy, 31(2), 50-63.* l. *Ferguson, G., & Peterson, R. (2021). Designing Effective Final Project Proposals for Graduate Students: A Seminar Based Approach. Journal of Research Methodology, 40(5), 185-198.* m. *Wright, S., & Lee, H. (2021). Final Project Proposal Seminars: Bridging Theory and Practice. Journal of Academic Seminar Studies, 22(7), 98-110.* n. *Roberts, M., & Gray, T. (2022). Enhancing Final Project Proposal Seminars Through Interactive Feedback. Journal of Higher Learning, 28(8), 130-142.* o. *Purnomo, A., Rahmasari, D., & Riyanto, Y. (2024). Implementasi Penelitian Multiple Intelligences (MIR) untuk Meningkatkan Mutu Pembelajaran. Jurnal Penelitian Pendidikan, 5(3), 2660-2670.* p. *Scholar, SINTA and SCOPUS databases.*

Module Descriptions

Module designation	1000002105 – Tugas Akhir (Final Project / Undergraduate Thesis)
Semester(s) in which the module is taught	7
Person responsible for the module	*MBKM Team (Tim MBKM)*
Language	Indonesian
Relation to curriculum	*Compulsory / elective / specialisation*
Teaching methods	*Lecture, Lesson, Discussion, case study, lab works, project, seminar, thesis supervision*
Workload (incl. contact hours, self-study hours)	*(Estimated) Total workload: 181.3 work hours per-semester* *Contact hours:* *a. Supervision, consultation and examination: 56 work hours per-semester (4 hours per week × 14 weeks)* *Private study including examination preparation: 125.3 work hours per-semester (private study ± 103.3 hours; examination preparation ± 22 hours)*
Credit points	6.36 ECTS
Required and recommended prerequisites for joining the module	-
Module objectives/intended learning outcomes	*Key question: what learning outcomes should students attain in the module?* *E.g. in terms of:* • *Attitude:* *a. Demonstrate good scientific manners, critical thinking, and innovation skills in educational, research, and professional fields (PLO-11/SOC-1).* • *Competences:* *a. Communicate the ideas and research results in verbal as well as written effectively (PLO-8/COM-1).* *b. Make a decision based on the data information and evaluation in order to fulfil the responsibility of the task (PLO-9/COM-2).* • *Knowledge:*

	a. Demonstrate knowledge related to physics education research (PLO-4/KNO-4). • *Skills: -*
Content	*The final project (undergraduate thesis) course aims to make students understand and be able to apply basic research concepts. Students prepare a research proposal by examining a problem (background), identifying the problem, limiting the problem, formulating the problem and the research objectives, followed by a literature review, a conceptual framework and the formulation of temporary hypotheses. Data collection and data analysis are then carried out in line with the problem formulation, followed by the explanation of the results, conclusions and the preparation of a research report according to correct writing techniques and free from plagiarism, using various information technologies. After passing the plagiarism check, students take the thesis examination before the examining lecturers, answer questions and revise their thesis based on the examiners' input. By completing the thesis, students demonstrate their ability to conduct structured and scientific research and are ready to face professional challenges in their field. Learning is conducted using project-based learning through independent work, supervision and the thesis examination.*
Examination forms	*Project/product assessment (100%) – the thesis and the thesis examination*
Study and examination requirements	***Requirements for successfully passing the module:*** *a. Minimum attendance of 75%* *b. Minimum score of 55 out of 100*
Reading list	*a. Universitas Negeri Surabaya. 2014. Pedoman Penulisan Skripsi. Surabaya: Universitas Negeri Surabaya.* *b. Ho-Young Song, John A Walker & Jiaywei Tasuo. 2022. Writing Successful Scientific Papers: A User's Guide. Seoul: Panmun Education Co. Ltd.* *c. Gabor L. Lövei. 2021. Writing and Publishing Scientific Papers: A Primer for the Non-English Speaker. Cambridge, UK: Open Book Publishers.* *d. Wendy Laura Belcher. 2019. Writing Your Journal Article in Twelve Weeks, Second Edition: A Guide to Academic Publishing Success. Chicago: University of Chicago Press.* *e. C. George Thomas. 2021. Research Methodology and Scientific Writing. Springer.* *f. Reis, Simone & Reis, André. 2013. How to Write Your First Scientific Paper. 10.1109/IEDEC.2013.6526784.*

	g. *Khatri, Bishnu. 2022. Writing an Effective Abstract for a Scientific Paper. Nepalese Journal of Development and Rural Studies, 19, 1-7. 10.3126/njdrs.v19i01.51910.* h. *Ayu, Fitri, Anggriani, Devi & Nizamuddin. 2023. Improving Students' Ability in Writing Scientific Papers Through Process Approach. The International Conference on Education, Social Sciences and Technology (ICESST), 2, 77-86. 10.55606/icesst.v2i1.272.* i. *Wahyuddin, Wahyuddin, Syafaruddin & Maharida. 2022. Training on Using Mendeley for Citations in Writing Scientific Papers for Students. Jurnal Pengabdian Masyarakat Bestari, 1, 1063-1072. 10.55927/jpmb.v1i9.2064.* j. *Klahr, Saulo. 2007. Guidelines for writing a scientific paper: an address to beginners. Nephrology, 2, s230-s234. 10.1111/j.1440-1797.1996.tb00178.x.* k. *Léane, Jourdan, Boudin, Florian, Dufour, Richard & Hernandez, Nicolas. (2023). Text Revision in Scientific Writing Assistance: An Overview.* l. *Scholar, SINTA and SCOPUS databases.*

Module Descriptions

Module designation	*8420302052*
Semester(s) in which the module is taught	*5*
Person responsible for the module	*Dr. Muhammad Satriawan, M.Pd.*
Language	Indonesian
Relation to curriculum	*Compulsory / elective / specialisation*
Teaching methods	*Lecture, Lesson, Discussion, Project, Seminar, Case study, lab works,*
Workload (incl. contact hours, self-study hours)	*(Estimated) Total workload: 136 work hours per-semester* *Contact hours (please specify whether lecture, exercise, laboratory session, etc.): 40 work hours per-semester* *Private study including examination preparation, specified in hours: 94 work hours per-semester*
Credit points	3.18 ECTS
Required and recommended prerequisites for joining the module	-
Module objectives/intended learning outcomes	*Key question: what learning outcomes should students attain in the module?* *E.g. in terms of:* • *Attitude: -* • *Competences:-* • *Knowledge:* *a. Developing logical, critical, systematic, and creative thinking in carrying out specific tasks within one's field of expertise, in accordance with the relevant professional competency standards.* *b. Engaging in continuous self-development and collaborating.* • *Skills:* *a. Mastering and demonstrating the principles of classical and modern physics theories.* *b. Formulating physical phenomena and problems based on observations and experiments, and modeling them using*

	mathematics and computation to facilitate informed decision-making for both familiar and novel situations.
Content	*The renewable energy course is designed to prepare students to perform analysis, calculations, planning, evaluation, and optimization related to energy utilization, as well as to select and harness renewable energy sources available in their surroundings. This course covers conversion methods, the equipment used for such conversion, the advantages and disadvantages of various sources, and opportunities for the further development and application of renewable energy..*
Examination forms	*Project*
Study and examination requirements	***Requirements for successfully passing the module:*** *a. Minimum attendance of 75%* *b. Minimum score of 55 out of 100*
Reading list	*a. Apribowo, C. H. B. (2021). Buku Ajar Perancangan Pembangkit Energi Baru dan Terbarukan. Media Sains Indonesia.* *b. Silitonga, A. S., & Ibrahim, H. (2020). Buku Ajar Energi Baru dan Terbarukan. Deepublish.* *c. Sukandarrumidi. (2018). Energi Terbarukan: Konsep Dasar Menuju Kemandirian Energi. Yogyakarta: Gadjah Mada University Press.* *d. Boyle, Godfrey (Ed.). (2012). Renewable Energy: Power for a Sustainable Future (3rd Edition). Oxford: Oxford University Press.* *e. Twidell, John, & Weir, Tony. (2015). Renewable Energy Resources (3rd Edition). London: Routledge.*

Module Descriptions

Module designation	*8420302079*
Semester(s) in which the module is taught	*5*
Person responsible for the module	*Tim Pengembangan RPS*
Language	Indonesian
Relation to curriculum	*Compulsory / elective / specialisation*
Teaching methods	*Lecture, Lesson, Discussion, Project, Seminar, lab works, Case study*
Workload (incl. contact hours, self-study hours)	*(Estimated) Total workload: 136 work hours per-semester* *Contact hours (please specify whether lecture, exercise, laboratory session, etc.): 40 work hours per-semester* *Private study including examination preparation, specified in hours: 94 work hours per-semester*
Credit points	3.18 ECTS
Required and recommended prerequisites for joining the module	-
Module objectives/intended learning outcomes	*Key question: what learning outcomes should students attain in the module?* *E.g. in terms of:* • *Attitude: -* • *Competences:* *a. Conducting physics education research—involving the examination and evaluation of physics instruction—using quantitative and/or qualitative approaches, and communicating findings effectively through both oral and academic written formats.* • *Knowledge:* *a. Developing logical, critical, systematic, and creative thinking in carrying out specific tasks within one's field of expertise, in accordance with the relevant professional competency standards.* *b. Engaging in continuous self-development and collaborating.*

	• *Skills:-*
Content	*The Applied Physics course examines the concepts, principles, and laws that explain the behavior of physical objects, as well as their applications within the field of physics. The curriculum covers measurements and units, the fundamentals of dynamics and the physical properties of materials, temperature and heat, and electricity. The course is conducted through presentations, discussions, modeling, and guided exercises. Assessment is based on assignments and written tests.*
Examination forms	*Essay*
Study and examination requirements	***Requirements for successfully passing the module:*** *a. Minimum attendance of 75%* *b. Minimum score of 55 out of 100*
Reading list	*a. Giancoli. C Douglas. 2005. Fisika Jilid 1. Jakarta: Erlangga.* *b. Giancoli. C Douglas. 2005. Fisika Jilid 2. Jakarta: Erlangga.*

Module Descriptions

Module designation	*8420302063*
Semester(s) in which the module is taught	*6*
Person responsible for the module	*Mita Anggaryani, M.Pd.,Ph.D.*
Language	Indonesian
Relation to curriculum	*Compulsory / elective / specialisation*
Teaching methods	*Lecture, Lesson, Discussion, case study, Project, Seminar, lab works*
Workload (incl. contact hours, self-study hours)	*(Estimated) Total workload: 136 work hours per-semester* *Contact hours (please specify whether lecture, exercise, laboratory session, etc.): 40 work hours per-semester* *Private study including examination preparation, specified in hours: 94 work hours per-semester*
Credit points	3.18 ECTS
Required and recommended prerequisites for joining the module	-
Module objectives/intended learning outcomes	*Key question: what learning outcomes should students attain in the module?* *E.g. in terms of:* • *Attitude: -* • *Competences:* *a. Mastering the principles of developing physics learning media based on science, contextually relevant technology specifically ICT (information and communication technology) and the surrounding environment..* • *Knowledge:* *a. Developing logical, critical, systematic, and creative thinking in carrying out specific tasks within one's field of expertise, in accordance with the relevant professional competency standards.* *b. Engaging in continuous self-development and collaborating.*

	• *Skills:* *a. Mastering and demonstrating the principles of classical and modern physics theories.* *b. Formulating physical phenomena and problems based on observations and experiments, and modeling them using mathematics and computation to facilitate informed decision-making for both familiar and novel situations.* *c. Mastering pedagogical knowledge in the planning, instruction, and evaluation of physics learning, as well as the management of resources for conducting classes, operating physics laboratories, and managing educational institutions.*
Content	*This course covers the following topics: the history of planet Earth; Earth's systems and structure; large-scale system interactions and plate tectonics; natural disasters and their mitigation; volcanoes; the origin of the universe; the solar system; Earth's place within the solar system; Earth's atmosphere; solar radiation; and threats to planet Earth, along with efforts to protect it. The course is open to students who have already completed the Basic Physics I course. It employs a project-based learning model, incorporating an exploratory case study approach through both classroom activities and fieldwork. The learning process is supported by the VLP volcanic simulation software developed specifically for this purpose as well as other relevant software tools. The course aims to develop the skills of prospective physics teachers in making predictions and decisions, as well as their ability to address authentic, real-world problems.*
Examination forms	*Presented Project*
Study and examination requirements	***Requirements for successfully passing the module:*** *a. Minimum attendance of 75%* *b. Minimum score of 55 out of 100*
Reading list	*a. McConnelll David and Steer David (2013), 1CThe Good Earth 1D , Introductory to Earth Science, Third Edition, Pergamon Press..* *b. Madlazim, Supriyono dan MNR Jauhariyah (2014). 1C Ilmu Pengetahuan Bumi dan Antariksa 1D. Diktat Kuliah IPBA.* *c. Farndon, J. et al. 2003. Planet Earth. London, UK: Lorenz Books. http://www. fisikaunesa. net/vi-learninghttp://ocw. mit.edu/courses/#earth-atmospheric-and-planetary-sciences* *d. Tjasyono, B. 2017. Sains Kebumian dan Antariksa Pendekatan Multidisipliner . Surabaya: Unesa Press.*

Module Descriptions

Module designation	*8420302280*
Semester(s) in which the module is taught	*6*
Person responsible for the module	*Prof. Dr. Eko Hariyono, M.Pd.*
Language	Indonesian
Relation to curriculum	*Compulsory / elective / specialisation*
Teaching methods	*Lecture, Lesson, Discussion, case study, Project, Seminar, lab works*
Workload (incl. contact hours, self-study hours)	*(Estimated) Total workload: 136 work hours per-semester* *Contact hours (please specify whether lecture, exercise, laboratory session, etc.): 40 work hours per-semester* *Private study including examination preparation, specified in hours: 94 work hours per-semester*
Credit points	3.18 ECTS
Required and recommended prerequisites for joining the module	-
Module objectives/intended learning outcomes	*Key question: what learning outcomes should students attain in the module?* *E.g. in terms of:* • *Attitude: -* • *Competences:* *a. Mastering the principles of developing physics learning media based on science, contextually relevant technology specifically ICT (information and communication technology) and the surrounding environment.* • *Knowledge:* *a. Developing logical, critical, systematic, and creative thinking in carrying out specific tasks within one's field of expertise, in accordance with the relevant professional competency standards.* *b. Engaging in continuous self-development and collaborating.* • *Skills:*

	a. Mastering and demonstrating the principles of classical and modern physics theories. *b. Formulating physical phenomena and problems based on observations and experiments, and modeling them using mathematics and computation to facilitate sound decision-making for both familiar and novel situations.* *c. Mastering pedagogical knowledge in the planning, instruction, and evaluation of physics learning, as well as the management of resources for conducting classes, operating physics laboratories, and managing educational institutions.*
Content	*This course examines the concepts and classification of disasters, as well as the geological, geomorphological, and climatological aspects related to them. It covers natural and non-natural disasters, the analysis of disaster potential in Indonesia, and mitigation strategies for various types of disasters—including those related to climate, volcanic activity, technology, disease outbreaks, and social issues. The course is conducted through discussions, expository lectures, and assignments designed to foster a mastery of concepts, a sense of responsibility, and an awareness of the importance of disaster mitigation..*
Examination forms	*Presented Project*
Study and examination requirements	***Requirements for successfully passing the module:*** *a. Minimum attendance of 75%* *b. Minimum score of 55 out of 100*
Reading list	*a. Coburn and Spence. 1994. Disaster Mitigation . United Kingdom: Cambridge Arschitectural. Agung Mulyo. 2004. Pengantar Ilmu Kebumian . Bandung: Pustaka Setia. L Don and Leet. 1964. Gempa Bumi; Penyelidikan Ilmiah dan Sederhana . Yogjakarta: Kreasi Wacana. TIM. 2019. Panduan Pembelajaran Kebencanaan Untuk Mahasiswa di Perguruan Tinggi. Jakarta: Direktorat Jenderal Pembelajaran dan Kemahasiswaan Kementerian Riset Teknologi dan Pendidikan Tinggi.* *b. .Madlazim. (2015). Buku Fisika Bumi Seri Seismologi. Surabaya: Unipress UNESA.* *c. Don and Leet (1964), Gempa Bumi ; Penyelidikan Ilmiah dan Sederhana, Yogjakarta : Kreasi Wacana.* *d. Agung Mulyo (2004). Pengantar Ilmu Kebumian, Bandung : Pustaka Setia.*

Module Descriptions

Module designation	*8420302266*
Semester(s) in which the module is taught	*5*
Person responsible for the module	*Endah Rahmawati, S.T., M.Si.*
Language	Indonesian
Relation to curriculum	*Compulsory / elective / specialisation*
Teaching methods	*Lecture, Lesson, Discussion, Project, Seminar, lab works, case study*
Workload (incl. contact hours, self-study hours)	*(Estimated) Total workload: 136 work hours per-semester* *Contact hours (please specify whether lecture, exercise, laboratory session, etc.): 40 work hours per-semester* *Private study including examination preparation, specified in hours: 94 work hours per-semester*
Credit points	3.18 ECTS
Required and recommended prerequisites for joining the module	-
Module objectives/intended learning outcomes	*Key question: what learning outcomes should students attain in the module?* *E.g. in terms of:* • *Attitude:* *a. Demonstrating a sound scientific attitude, critical thinking, and innovation skills in the fields of education, research, and professional practice.* • *Competences:* *a. Working effectively both as an individual and as part of a team, possessing entrepreneurial skills, and having an awareness of environmental issues.* • *Knowledge:-* • *Skills:* *a. Enhancing knowledge and gaining the ability to pursue further studies at a higher level.*

Content	*Robotics is a course that explores the concepts, functions, and applications of robots. Students will learn about robotic components, including sensors, actuators, mechanical design, and algorithms. Through various assignments, students will be required to design and build different types of projects—such as mobile robots and robotic manipulator arms—using these components. Students will work both independently and in small groups, covering topics including: 1. Introduction to robotics (concepts, functions, and implementation) across various fields; 2. Sensors and actuators used in robotics; 3. Mechanical design of robots; 4. Inverse kinematics for robot control; 5. Design and control of mobile robots (wheeled and legged); and the design and control of robotic manipulator arms..*
Examination forms	*Presented Project*
Study and examination requirements	***Requirements for successfully passing the module:*** *a. Minimum attendance of 75%* *b. Minimum score of 55 out of 100*
Reading list	*a. M. Quigley, B. Gerkey and W.D Smart, Programing Robots with ROS, O'Reilly. 2015. 2. C.D.Simpson, ROS Robot Pragramming, Robotis, 2017. 3. S. Thrun. M. Burgard, D.Fox,Probabilistic Robotics, MIT Pres. 2006.* *b. Mihelj, M. et.al. 2019. Robotics. 2nd Edition. Switzerland: Springer, pp. 1-247. ISBN 978-3-319-72911-4.* *c. Margolis, M. 2012. Make An Arduino Controlled Robot. United State of America: O'Reilly Media Inc., pp. 1-235. ISBN: 978-1-449-34437-5.*

Module Descriptions

Module designation	*8420302061*
Semester(s) in which the module is taught	*5*
Person responsible for the module	*Mita Anggaryani, M.Pd., Ph.D..*
Language	Indonesian
Relation to curriculum	*Compulsory / elective / specialisation*
Teaching methods	*Lecture, Lesson, Discussion, case study, Project, Seminar, lab works*
Workload (incl. contact hours, self-study hours)	*(Estimated) Total workload: 136 work hours per-semester* *Contact hours (please specify whether lecture, exercise, laboratory session, etc.): 40 work hours per-semester* *Private study including examination preparation, specified in hours: 94 work hours per-semester*
Credit points	3.18 ECTS
Required and recommended prerequisites for joining the module	-
Module objectives/intended learning outcomes	*Key question: what learning outcomes should students attain in the module?* *E.g. in terms of:* • *Attitude: -* • *Competences:* *a. Mastering the principles of developing physics learning media based on science, contextually relevant technology specifically ICT (information and communication technology) and the surrounding environment..* • *Knowledge:* *a. Able to demonstrate religious, national and cultural values, as well as academic ethics in carrying out their duties.* *b. Developing logical, critical, systematic, and creative thinking in carrying out specific tasks within one's field of expertise, in accordance with the relevant professional competency standards.* • *Skills:*

	a. Mastering and demonstrating the principles of classical and modern physics theories.
Content	*Space Physics examines the universe and all its contents (astronomical objects) through the lens of a fundamental causal principle: that everything which exists must have originated from nothingness. The course employs a phenomenological approach, focusing on physical aspects grounded in relevant laws of physics and empirical observations—such as mechanics, thermodynamics, and electromagnetic radiation—to describe the universe. Topics covered include the history of astronomy, the Big Bang and the early universe, the solar system, stars and constellations, the Milky Way galaxy, and the measurement of physical activities and processes within the life cycle of stars..*
Examination forms	*Presented Poster*
Study and examination requirements	***Requirements for successfully passing the module:*** *a. Minimum attendance of 75%* *b. Minimum score of 55 out of 100*
Reading list	*a. Prastowo, T. 2012. Sains Kebumian. Unpublished work. pp.1-25. 2.* *b. Karttunen, H. et al. 2007. Fundamental Astronomy. Berlin, Germany: Springer-Verlag. pp.1-510. 3. Gibson, C..2005.* *c. The Astronomy Handbook. Devon, UK: D&S Books Ltd. pp.1-256.* *d. Gribbin, J. 1998. A Brief History of Science. Sussex, UK: The Ivy Press Limited. Pp.1-224.* *e. Anugraha, R. 2012. Mekanika Benda Langit. Jurusan Fisika, FMIPA UGM. E-book. pp.1-200.*

Module Descriptions

Module designation	8420302183
Semester(s) in which the module is taught	7
Person responsible for the module	*Muhammad Habibbulloh.S.Pd*
Language	Indonesian
Relation to curriculum	*Compulsory / elective / specialisation*
Teaching methods	*Lecture, Lesson, Discussion, case study lab works, project, seminar*
Workload (incl. contact hours, self-study hours)	*(Estimated) Total workload: 90.7 work hours per-semester* *Contact hours (please specify whether lecture, exercise, laboratory session, etc.): 26.7 work hours per-semester* *Private study including examination preparation, specified in hours: 64 work hours per-semester*
Credit points	3.18 ECTS
Required and recommended prerequisites for joining the module	-
Module objectives/intended learning outcomes	*Key question: what learning outcomes should students attain in the module?* *E.g. in terms of:* • *Attitude:* • *Competences* • *Knowledge:* *a. Masters and demonstrates the principles of classical and modern physics theory.* • *Skills:* *a. Develops logical, critical, systematic and creative thinking in carrying out specific work in the field of expertise and in accordance with the work competency standards in the relevant field.*
Content	*This course examines the development of physics as a scientific discipline and the problems and ideas underlying it. The scope of the course includes Physics in Ancient Babylon and Egypt, Physics in Ancient Greece, the Development of Classical and Modern Physics,*

	literature on topics related to the development of an aspect of physics or the contributions of a particular society to the development of physics, and writing about the results in written form. This course is presented through assignments, presentations, and discussions.
Examination forms	*Essay*
Study and examination requirements	***Requirements for successfully passing the module:*** *a. Minimum attendance of 75%* *b. Minimum score of 55 out of 100*
Reading list	*a. Suprapto Nadi.2010. Sejarah Fisika .Surabaya:UNESA University Press.* *b. 2. Florian Cajori.1962. A History of Physics .New York:Dover Publications.* *c. 3. Isaac Asimov.1984. The History of Physics .New York:Walker Publishing Inc.* *d. 4. Serway RA.1986. Physics for Scientist and Engineers with Modern Physics .Philadelphia: Saunders Golden Sunburst.* *e. 5. Kendall Haven. 2007. 100 Greatest Science Discoveries of All Time. London: Libraries Unlimited.*

Module Descriptions

Module designation	*8420302245*
Semester(s) in which the module is taught	*4*
Person responsible for the module	*Utama Alan Deta, S.Pd., M.Pd., M.Si.*
Language	Indonesian
Relation to curriculum	*Compulsory / elective / specialisation*
Teaching methods	*Lecture, Lesson, Discussion, case study lab works, project, seminar*
Workload (incl. contact hours, self-study hours)	*(Estimated) Total workload: 136 work hours per-semester* *Contact hours (please specify whether lecture, exercise, laboratory session, etc.): 40 work hours per-semester* *Private study including examination preparation, specified in hours: 94 work hours per-semester*
Credit points	3.18 ECTS
Required and recommended prerequisites for joining the module	-
Module objectives/intended learning outcomes	*Key question: what learning outcomes should students attain in the module?* *E.g. in terms of:* • *Attitude: -* • *Competences -* • *Knowledge:* *a. Masters the pedagogical knowledge in planning, teaching, and evaluating physics learning as well as resource management in organizing classes, physics laboratories and educational institutions.* • *Skills:* *a. Develops logical, critical, systematic and creative thinking in carrying out specific work in the field of expertise and in accordance with the work competency standards in the relevant field.* *b. Conducts physics education research in the form of studies and evaluations of physics learning with a quantitative and/or*

	qualitative approach in the form of oral and academic writing effectively.
Content	*This course is a course that develops knowledge and skills related to physics education literacy, examining national and international journals, special topics in physics education research, literature review, plagiarism, bibliometric analysis, library research, publication, and mini-projects related to library research.*
Examination forms	*Essay*
Study and examination requirements	***Requirements for successfully passing the module:*** *a. Minimum attendance of 75%* *b. Minimum score of 55 out of 100*
Reading list	*a. Gary Holden, Gary Rosenberg, & Kathleen Barker. 2005. Bibliometrics in Social Work. New York: Routledge.* *b. RONALD ROUSSEAU, LEO EGGHE, & RAF GUNS. 2018. BECOMING METRIC-WISE: A Bibliometric Guide for Researchers.* *Chandos Publishing- Elsevier.* *c. Roberto Todeschini and Alberto Baccini. 2016. Handbook of Bibliometric Indicators Quantitative Tools for Studying and Evaluating Research. Wiley VCH Verlagh GMBH.* *c. Nees Jan van Eck and Ludo Waltman. 2018. VOSViewer Manual Version 168. Universiteit Leiden, The Netherlands.* *c. Wasis, dkk. 2018. HoTs dan Literasi Sains (Konsep, Pembelajaran, dan Penilaiannya). Jombang: Kun Fayakun* *c. Jurnal nasional dan internasional yang relevan dengan pendidikan fisika 5 tahun terakhir.*

Module Descriptions

Module designation	8420302098 – IPA Terpadu (Integrated Science)
Semester(s) in which the module is taught	4
Person responsible for the module	*RMK Coordinator Team (Tim Koordinator RMK)*
Language	Indonesian
Relation to curriculum	*Compulsory / elective / specialisation*
Teaching methods	*Lecture, Lesson, Discussion, case study, lab works, project, seminar*
Workload (incl. contact hours, self-study hours)	*(Estimated) Total workload: 90.7 work hours per-semester* *Contact hours:* *a. Lecture, exercise: 28 work hours per-semester (2 hours per week × 14 weeks)* *Private study including examination preparation: 62.7 work hours per-semester (private study ± 51.7 hours; examination preparation ± 11 hours)*
Credit points	3.18 ECTS
Required and recommended prerequisites for joining the module	-
Module objectives/intended learning outcomes	*Key question: what learning outcomes should students attain in the module?* *E.g. in terms of:* • *Attitude:* *a. Demonstrate good scientific manners, critical thinking, and innovation skills in educational, research, and professional fields (PLO-11/SOC-1).* • *Competences:* *a. Communicate the ideas and research results in verbal as well as written effectively (PLO-8/COM-1).* *b. Make a decision based on the data information and evaluation in order to fulfil the responsibility of the task (PLO-9/COM-2).*

	c. Work as an individual as well as a team effectively, have an entrepreneur skill, and awareness of environmental issues (PLO-10/COM-3). • *Knowledge:* *a. Demonstrate knowledge related to physics education research (PLO-4/KNO-4).* • *Skills:* *a. Improve their knowledge and be able to continue their study in a higher degree program (PLO-7/SKI-3).*
Content	*This course broadens students' insight into science and its integration by examining materials and concepts from various fields of science and relating them to one another. The topics cover: the epistemology of science learning; science concepts; the integrated approach in junior high school science learning; and the interdisciplinary approach in junior high school science learning. Students analyse, design and communicate integrated science learning and science concepts based on social issues in everyday life. Learning is conducted using project-based learning.*
Examination forms	*Participatory activities (25%), project/product assessment (50%), written test (25%)*
Study and examination requirements	***Requirements for successfully passing the module:*** *a. Minimum attendance of 75%* *b. Minimum score of 55 out of 100*
Reading list	*a. Fogarty, R. 1991. How to Integrate the Curricula. United States of America: IRI/Skylight Publishing, Inc.* *b. Hewitt, Paul. 2006. Conceptual Integrated Science. USA: Pearson Addison Wesley.* *c. Tillery, Enger & Ross. 2007. Integrated Science. New York: McGraw-Hill.*

Module Descriptions

Module designation	8420302253 – Pembelajaran Abad 21 (21st Century Learning)
Semester(s) in which the module is taught	-
Person responsible for the module	*Prof. Dr. Eko Hariyono, S.Pd., M.Pd.*
Language	Indonesian
Relation to curriculum	*Compulsory / elective / specialisation*
Teaching methods	*Lecture, Lesson, Discussion, case study, lab works, project, seminar*
Workload (incl. contact hours, self-study hours)	*(Estimated) Total workload: 90.7 work hours per-semester* *Contact hours:* *a. Lecture, exercise: 28 work hours per-semester (2 hours per week × 14 weeks)* *Private study including examination preparation: 62.7 work hours per-semester (private study ± 51.7 hours; examination preparation ± 11 hours)*
Credit points	3.18 ECTS
Required and recommended prerequisites for joining the module	-
Module objectives/intended learning outcomes	*Key question: what learning outcomes should students attain in the module?* *E.g. in terms of:* • *Attitude:* *a. Demonstrate good scientific manners, critical thinking, and innovation skills in educational, research, and professional fields (PLO-11/SOC-1).* • *Competences:* *a. Make a decision based on the data information and evaluation in order to fulfil the responsibility of the task (PLO-9/COM-2).* *b. Work as an individual as well as a team effectively, have an entrepreneur skill, and awareness of environmental issues (PLO-10/COM-3).* • *Knowledge:*

	a. Demonstrate pedagogical knowledge in planning, teaching, and evaluating a physics learning (PLO-3/KNO-3). • *Skills:* *a. Plan, do, and evaluate of physics learning by using information and communication technology (PLO-5/SKI-1).* *b. Improve their knowledge and be able to continue their study in a higher degree program (PLO-7/SKI-3).*
Content	*This course studies student-centred innovative learning models, covering cooperative learning (STAD – Student Team Achievement Division, Jigsaw and TPS – Think Pair Share) and learning oriented to the scientific approach, namely problem-based learning (PBL), project-based learning (PjBL) and guided inquiry. For each model, students study the underlying theories, the characteristics and the phases/syntax, and design learning in the form of lesson plans together with the accompanying learning tools. The study is carried out through the presentation of concepts, operational examples of each model in the form of learning tools, and workshops on developing learning tools oriented to each model and learning strategy, and ends with the implementation of a selected learning model by each student in a peer-teaching forum followed by discussion and reflection. Learning is conducted using project-based learning.*
Examination forms	*Participatory activities (35%), project/product assessment (55%), written test (10%)*
Study and examination requirements	***Requirements for successfully passing the module:*** *a. Minimum attendance of 75%* *b. Minimum score of 55 out of 100*
Reading list	*a. Arends, Richard I. (2004). Learning to Teach, Sixth Edition. New York: McGraw-Hill Book Company.* *b. Ibrahim, Muslimin, Rachmadiarti, Fida, & Ismono. (2005). Pembelajaran Kooperatif. Surabaya: Pusat Sains dan Matematika Sekolah.* *c. Nur, Mohamad. (2000). Pembelajaran Kooperatif. Surabaya: Pusat Sains dan Matematika Sekolah.* *d. Ibrahim, Muslimin. (2012). Pembelajaran Berdasarkan Masalah Edisi II. Surabaya: University Press.* *e. Kuhlthau, Carol C., Maniotes, Leslie K., & Caspari, Ann K. (2007). Guided Inquiry. London: Libraries Unlimited.*

	f. Arends, Richard I. (2004). Guide to Field Experiences and Portfolio Development: to accompany Learning to Teach. New York: McGraw-Hill Book Company. *g. Lestari, N. A., Jatmiko, B., & Madlazim. (2023, November). Climate Change Literacy of Coastal Disaster-Prone Communities in Realizing Climate Action for Sustainable Physics Learning. In Journal of Physics: Conference Series (Vol. 2623, No. 1, p. 012029). IOP Publishing.*

Module Descriptions

Module designation	*8420302316*
Semester(s) in which the module is taught	*5*
Person responsible for the module	*Mukhayyarotin Niswati Rodliyatul Jauhariyah, S.Pd., M.Pd.*
Language	Indonesian
Relation to curriculum	*Compulsory / elective / specialisation*
Teaching methods	*Lecture, Lesson, Discussion, case study lab works, project, seminar*
Workload (incl. contact hours, self-study hours)	*(Estimated) Total workload: 136 work hours per-semester* *Contact hours (please specify whether lecture, exercise, laboratory session, etc.): 40 work hours per-semester* *Private study including examination preparation, specified in hours: 94 work hours per-semester*
Credit points	3,18 ECTS
Required and recommended prerequisites for joining the module	-
Module objectives/intended learning outcomes	*Key question: what learning outcomes should students attain in the module?* *E.g. in terms of:* • *Attitude: -* • *Competences: -* • *Knowledge:* *a. Demonstrate a resilient, collaborative, adaptive, innovative, inclusive, lifelong learning, and entrepreneurial character.* *b. Develop logical, critical, systematic, and creative thinking in performing specific work in their field of expertise and in accordance with the relevant field's work competency standards.* • *Skills:* *a. Mastering pedagogical knowledge in planning, teaching, and evaluating physics learning, as well as managing resources in classrooms, physics laboratories, and educational institutions.*

	b. Conducting physics education research in the form of studies and evaluations of physics learning using quantitative and/or qualitative approaches, both verbally and in academic writing, effectively.
Content	*This course examines 21st-Century Skills, the Educational Assessment System Framework in the 21st Century, assessment systems (UN, TIMSS, and PISA) and their development, the characteristics of assessment instruments (UN, TIMSS, and PISA), and the development of assessment instruments based on the characteristics of 21st-Century skills. Learning methods include repository discussions, assignments, and project assignments to develop assessment instruments for physics learning based on 21st-Century skills.*
Examination forms	*Project.*
Study and examination requirements	***Requirements for successfully passing the module:*** *a. Minimum attendance of 75%* *b. Minimum score of 55 out of 100*
Reading list	*a. Care, E., Griffin, P. and Wilson M. 2018. Assessment and Teaching of 21 Springer International Publishing. st Century Skills: Research and Applications. Switzerland:* *b. Griffin, P. and Care, E. 2015. Assessment and Teaching of 21 st Century Skills: Methods and Approach. Switzerland: Springer Int. Pub.* *c. Griffin, P., McGaw, B., and Care, E. 2012. Assessment and Teaching of 21 Century Skills. Switzerland: Springer International Publishing.*

Module Descriptions

Module designation	8420302263
Semester(s) in which the module is taught	4
Person responsible for the module	*Utama Alan Deta, S.Pd., M.Pd., M.Si*
Language	Indonesian
Relation to curriculum	*Compulsory / elective / specialisation*
Teaching methods	*Lecture, Lesson, Discussion, case study lab works, project, seminar*
Workload (incl. contact hours, self-study hours)	*(Estimated) Total workload: 90.7 work hours per-semester* *Contact hours (please specify whether lecture, exercise, laboratory session, etc.): 26.7 work hours per-semester* *Private study including examination preparation, specified in hours: 64 work hours per-semester*
Credit points	3.18 ECTS
Required and recommended prerequisites for joining the module	-
Module objectives/intended learning outcomes	*Key question: what learning outcomes should students attain in the module?* *E.g. in terms of:* • *Attitude:* • *Competences* • *Knowledge:* • *Skills:* *a. Develops logical, critical, systematic and creative thinking in carrying out specific work in the field of expertise and in accordance with the work competency standards in the relevant field.* *b. Develops self sustainably and collaborate.*
Content	*This course examines the philosophy of the Physics Olympiad and hones problem-solving skills in Physics Olympiad questions. This course also provides skills in analyzing existing Physics Olympiad questions (OSN Kemendikbud and KSM Kemenag) and provides experience in designing theoretical and experimental physics*

	questions. Lectures are conducted using repository discussions, skill-building, classroom discussions, workshops, and presentations.
Examination forms	*Product*
Study and examination requirements	***Requirements for successfully passing the module:*** *a. Minimum attendance of 75%* *b. Minimum score of 55 out of 100*
Reading list	*a. Buku Pedoman KSN SMP terbaru* *b. Buku Pedoman KSN SMA terbaru* *c. Buku Pedoman KSM MTs terbaru* *d. Buku Pedoman KSM MA terbaru* *e. APhO Syllabus terbaru* *f. IPhO Book terbaru* *g. Serway, RA dan Jewett , JW. 2013. Physics for Scientists and Engineers 9th Edition. Cengage Learning* *h. U.A. Deta, S Admiko, dan R. Rahmanisa. 2023. Olimpiade Fisika: Filsafat, Sejarah, Pelaksanaan, dan Bank Soal Kompetisi Fisika tingkat Nasional dan Internasional. Sidoarjo: PT Mitra Edukasi dan Publikasi* *i. Soal-Soal Olimpiade/Kompetisi Fisika, buku, artikel ilmiah, dan sumber lain yang relevan.*

Module Descriptions

Module designation	8420302246 – Fisika Fotografi (Physics of Photography)
Semester(s) in which the module is taught	4
Person responsible for the module	*Abd. Kholiq, S.Pd., M.T.*
Language	Indonesian
Relation to curriculum	*Compulsory / elective / specialisation*
Teaching methods	*Lecture, Lesson, Discussion, case study, lab works, project, seminar, photography practice*
Workload (incl. contact hours, self-study hours)	*(Estimated) Total workload: 90.7 work hours per-semester* *Contact hours:* *a. Lecture, exercise: 28 work hours per-semester (2 hours per week × 14 weeks)* *Private study including examination preparation: 62.7 work hours per-semester (private study ± 51.7 hours; examination preparation ± 11 hours)*
Credit points	3.18 ECTS
Required and recommended prerequisites for joining the module	-
Module objectives/intended learning outcomes	*Key question: what learning outcomes should students attain in the module?* *E.g. in terms of:* • *Attitude:* *a. Demonstrate good scientific manners, critical thinking, and innovation skills in educational, research, and professional fields (PLO-11/SOC-1).* • *Competences:* *a. Communicate the ideas and research results in verbal as well as written effectively (PLO-8/COM-1).* *b. Work as an individual as well as a team effectively, have an entrepreneur skill, and awareness of environmental issues (PLO-10/COM-3).* • *Knowledge:*

	a. Demonstrate their knowledge of classical physics and modern physics (PLO-1/KNO-1). *b. Demonstrate knowledge related to physics education research (PLO-4/KNO-4).* • *Skills:* *a. Plan, do, and evaluate of physics learning by using information and communication technology (PLO-5/SKI-1).*
Content	*This course develops knowledge and skills related to photography, covering: the development and theories of photography; reviewing digital cameras (DSLR and Android phone cameras); basic photographic techniques using DSLR and Android phone cameras; the language of photography; photovoice and photonovella as alternative visual communication methods; photovoice in physics as an instrument of analysis, science communication or alternative media; and a physics photography mini project carried out independently and collaboratively by integrating theory into practice. Learning is conducted using project-based learning.*
Examination forms	*Participatory activities (25%), project/product assessment (50%), practice/performance assessment (25%)*
Study and examination requirements	***Requirements for successfully passing the module:*** *a. Minimum attendance of 75%* *b. Minimum score of 55 out of 100*
Reading list	*a. Tom Ang. 2018. Digital Photography: An Introduction, 5th edition. DK, Dorling Kindersley.* *b. David Taylor, Tracy Hallett, Paul Sanders, & Paul Lowe. 2015. Digital Photography Complete Course. DK, Dorling Kindersley.* *c. A. O. Latz & Thalia M. Mulvihill. 2017. Photovoice Research in Education and Beyond: A Practical Guide from Theory to Exhibition. New York: Taylor & Francis.* *d. Michele Jarldorn. 2019. Photovoice Handbook for Social Workers. Palgrave Macmillan, Springer Nature.* *e. Nadi Suprapto, Titin Sunarti, & Suliyanah. 2020. Profil Laboratorium Fisika SMA di Jawa Timur melalui Photovoice. Penerbit Popes Jagad Alimussiry.* *f. Nadi Suprapto, Titin Sunarti, Suliyanah, Desi Wulandari, Hasan N. Hidaayatullaah, Alif S. Adam, Husni Mubarok. 2020. Systematic review of photovoice as participatory action research strategies. International Journal of Evaluation and Research in Education (IJERE).* *g. Ryan F. Reese, Christopher M. Seitz, Marjorie Gosling & Hannah Craig. 2019. Using photovoice to foster a student vision for natural*

	spaces on a college campus in the Pacific Northwest United States. International Journal of Environmental Health Research. DOI: 10.1080/09603123.2019.1593950. *h. Sheri M. Treadwell & Neva Taylor. 2017. PE in Pictures: Using Photovoice to Promote Middle School Students' Reflections on Physical Activity during Free Time. Journal of Physical Education, Recreation & Dance, 88:4, 26-33. DOI: 10.1080/07303084.2017.1280436.* *i. Camille A. Sutton-Brown. 2014. Photovoice: A Methodological Guide. Photography and Culture, 7:2, 169-185. DOI: 10.2752/175145214X13999922103165.* *j. Meagan Call-Cummings, Melissa Hauber-Özer, Christie Byers & Greer Peden Mancuso. 2018. The power of/in Photovoice. International Journal of Research & Method in Education. DOI: 10.1080/1743727X.2018.1492536.* *k. Katharine J. Herbert, Amy Baize-Ward & Amanda O. Latz. 2018. Transformative Pedagogy with Innovative Methodology: Using Photovoice to Understand Community College Students' Needs. Community College Journal of Research and Practice, 42:7-8, 536-549. DOI: 10.1080/10668926.2018.1431572.* *l. Lance Brendan Young. 2017. PhotoVoice participatory action research for the communication classroom. Communication Teacher, 31:4, 226-230. DOI: 10.1080/17404622.2017.1358381.* *m. Marc Behrendt & Krisanna Machtmes. 2016. Photovoice as an evaluation tool for student learning on a field trip. Research in Science & Technological Education. DOI: 10.1080/02635143.2015.1124410.* *n. Jody L. Langdon, Ashley Walker, Gavin Colquitt, & Tony Pritchard. 2014. Using Photovoice to Determine Preservice Teachers' Preparedness to Teach. Journal of Physical Education, Recreation & Dance, 85:1, 22-27. DOI: 10.1080/07303084.2014.855595.* *o. Claudia Baldwin & Lisa Chandler. 2010. "At the water's edge": community voices on climate change. Local Environment: The International Journal of Justice and Sustainability, 15:7, 637-649. DOI: 10.1080/13549839.2010.498810.* *p. Other relevant books, scientific articles and sources.*

