UNPAD
PHYSICS

MODULE HANDBOOK

YEARS 1

UNDERGRADUATE PROGRAM IN PHYSICS

FACULTY OF MATHEMATICS AND NATURAL SCIENCES

UNIVERSITAS PADJADJARAN

2023

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Fundamental Physics

Academic Year	2023/2024
Code/ Semester	D10C20.1001/ 1st Semester
Course/ Credit points	Fundamental Physics 1 / 4 SKS ~ 7.24 ECTS
Language	Indonesian
Responsible Person	Camellia Panatarani
Lecturer	Camellia Panatarani, Lusi Safriani, Togar Saragi
Workload	1. Lectures: 4 x 50 = 200 minutes per week. 2. Assignments: 4 x 60 = 240 minutes per week. Individual study: 4 x 60 = 240 minutes per week.
Contents	1. Introduction: Science and Creativity, Quantity and Unit 2. Kinematics in One Dimension 3. Kinematics in Two Dimensions: Vectors 4. Dynamics 5. Circular Motion; Gravity 6. Work and Energy 7. Linear Momentum 8. Rotational Motion 9. Objects in Equilibrium: Elasticity and Fracture 10. Fluids Heat and Thermodynamics
Learning Objectives	Learning Goals: 1. After taking Fundamental Physics I course, students are able to apply the basic principles and concepts of physics to find solutions to simple and practical physics problems in everyday life
Course Method	1. Lecture course: lecture presentation, interactive learning quizzes (discussion and sharing). 2. Interactive learning: presentation (Focus Group Discussion and Small Group Discussion), Case-based learning, and problem-based learning 3 homework/assignment: Problem set, Individual study
Form of Examination	To be defined by lecturer at the beginning of course
Prerequisites	-
Requirements according to the examination regulations	Registered in this course, Minimum 80% attendance
Reading list	1. Serway Jewet, Physics For Scientists and Engineers, Ed.8 2. Tipler, Paul A. 1998. Fisika Untuk Sains dan Teknik Edisi Ketiga. Jakarta: Penerbit Erlangga. 3. Giancoli, Douglas C. 2001. Fisika Jilid 1 dan 2 Edisi Kelima. Jakarta: Penerbit Erlangga. 4. Halliday, David dan Robert Resnick. 1985. Fisika Jilid 1 dan 2. Jakarta: Penerbit Erlangga. 5. Jearl Walker, Halliday, David dan Robert Resnick, Fundamentals of physics ,10th Edition, 2014 6. Mirko Schäfer, Stefan Schramm. 2016. New Horizons in Fundamental Physics, Springer International Publishing

Assessment Guidance	Rubric focus group discussion (presentation)/ Quiz/Problem Set/assignment (90%); Comprehensive evaluation (10%)

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Fundamental Physics I Lab. Work

Academic Year	2023/2024
Code/ Semester	D10C20.1002/ 1nd Semester
Course/ Credit points	Fundamental Physics I Lab. Works/ 1 SKS ~ 1.81 ECTS
Language	Indonesian
Responsible Person	Camellia Panatarani
Lecturer	Camellia Panatarani, Lusi Safriani, Togar Saragi
Workload	Lab Works: 1 x 160 = 160 minutes per week
Contents	The scope of this course includes basic measurements and uncertainty of measurement; least squares method, the viscosity of liquid, voltmeter and ampere meter, lens properties and shadow formation, Atwood machine, specific heat of solids, Wheatstone bridge.
Learning Objectives	Able to carry out experiments to determine physical quantities in mechanics, electronics, and optics.
Course Method	Lab. Works
Form of Examination	Paperwork Presentation
Prerequisites	-
Requirements according to the examination regulations	Registered in Regular Live Unpad 100% attendance in this course
Reading list	1. Modul Praktikum Fisika Dasar I, Laboratorium Fisika Dasar, FMIPA, Universitas Padjadjaran 2. Raymond A. Serway and John W. Jewett, Jr, Physics for Scientists and Engineers with Modern Physics, Eight Edition, 2010. 3. Tipler, Paul A and Gene Mosca, Physics for Scientists and Engineers, 6th Edition, 2007 Giancoli, Douglas C. Physics for Scientists & Engineers with Modern Physics, 5th Edition, Pearson Education Inc. USA 2020.
Assessment Guidance	Rubrics

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Mathematical Physics 1

Academic Year	2023/2024
Code/ Semester	D10C20.1003 / 1st Semester
Course/ Credit points	Mathematical Physics 1/ 2 SKS ~ 3.62 ECTS
Language	Indonesian
Responsible Person	Lusi Safriani
Lecturer	Lusi Safriani, Annisa Aprilia
Workload	1. Lectures: 2 x 50 = 100 minutes per week. 2. Assignments: 2 x 60 = 120 minutes per week. Individual study: 2 x 60 = 120 minutes per week.
Contents	1. Basic calculus 2. Algebra of Complex Functions 3. Infinite series and Power Series Vector Calculus
Learning Objectives	Learning Goals: 1. Students are able to understand and use the basic mathematical tools covered in basic calculus material. 2. Students are able to perform algebraic manipulation of complex numbers in different representations correctly, solve complex equations and can apply them in analyzing physical phenomena correctly. 3. Students are able to describe certain functions in the appropriate series and can use the Fourier series description for harmonic analysis of periodic functions. 4. Students can use methods in vector calculus to solve Physics cases, including differential and integral of vector functions, Green's theorem and Stokes theorem to solve line integrals, surface integrals, and volume integrals.
Course Method	1. Lecture course: lecture presentation, interactive learning quizzes (discussion and sharing), Collaborative based learning, problem-based learning, small group discussion 2. Interactive learning: exercise and presentation, Individual study: homework/assignment
Form of Examination	To be defined by lecturer at the beginning of course
Prerequisites	-
Requirements according to the examination regulations	Registered in this course, Minimum 80% attendance in this course
Reading list	1. Boas, M. L. (2006), Mathematical methods in the physical sciences, 3rd ed., John Wiley & Sons, New York. 2. Riley, K. F., M. P. Hobson and S. J. Bence (2006), Mathematical Methods for Physics and Engineering 3rd edition, Cambridge University Press. Alexander Altland, Jan von Delft. (2019) Mathematics for Physicists: Introductory Concepts and Methods 1st Edition, Cambridge University Press
Assessment Guidance	Test/Homework/assignment (40%); Evaluation 1 (10%); Evaluation 2 (15%); Evaluation 3 (15%); Evaluation 2 (20%)

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Algorithm and Programming

Academic Year	2023/2024
Code/ Semester	D10C20.1004 / 1st Semester
Course/ Credit points	Algorithm and Programming / 2 SKS ~ 3.62 ECTS
Language	Indonesian
Responsible Person	Sahrul Hidayat
Lecturer	Sahrul Hidayat, Ferry Faizal
Workload	1. Lectures : 2 x 50 = 100 minutes per week. 2. Assignments : 2 x 60 = 120 minutes per week. Private learning : 2 x 60 = 120 minutes per week.
Contents	Algorithms and problem solving, algorithm design techniques, and types of problems in computing. Introduction to Python programming language. I/O Operators and Statements, Control Structures, Repetition, 1D Arrays, Functions, Graph Plots, N-Dimensional Arrays, Symbolic Math Operations and File Reading/Writing
Learning Objectives	1. Able to design and analyze algorithms, including problem-solving techniques, algorithmic strategies, and algorithmic complexity 2. Students have basic of programming using Python 3. Students have basic of the syntax and semantics of the Python programming language, including variables, data types, control structures, functions, and modules 4. Able to analyze and solve problems using Python programming Able to collaboratively and communicate effectively as part of a programming team
Course Method	Lectures and *case based study*
Form of Examination	Essay (case study)
Prerequisites	-
Requirements according to the examination regulations	Registered in this course Minimum 80% attendance in this course
Reading list	1. Learn Python The Hard Way 3th Edition, Zed A. Shaw, Addison Wesley 2014 Tutorial Pemrograman Python 2. Sandy H.S. Hero, WCPL Press, Bandung 2017
Assessment Guidance	Case based rubric (25); assignment (25%); midterm exam (25%); final exam (25%)

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Algorithm and Programming Lab Work

Academic Year	2023/2024
Code/ Semester	D10C20.1005 / 1st Semester
Course/ Credit points	Algorithm and Programming Lab Work / 1 SKS ~ 1.81 ECTS
Language	Indonesian
Responsible Person	Sahrul Hidayat
Lecturer	Sahrul Hidayat, Ferry Faizal
Workload	1. Lectures : 4 x 50 = 200 minutes per week. Private learning : 2 x 60 = 120 minutes per week.
Contents	Algorithms and problem solving, algorithm design techniques, and types of problems in computing. Introduction to Python programming language. I/O Operators and Statements, Control Structures, Repetition, 1D Arrays, Functions, Graph Plots, N- Dimensional Arrays, Symbolic Math Operations and File Reading/Writing
Objectives	1. Have basic of programming using Python 2. Have basic of the syntax and semantics of the Python programming language, including variables, data types, control structures, functions, and modules 3. Able to analyze and solve problems using Python programming Able to collaboratively and communicate effectively as part of a programming team
Course Method	Practicum in the lab
Form of Examination	Practical Examination
Prerequisites	-
Requirements according to the examination regulations	Registered in this course Minimum 80% attendance in this course
Reading list	1. Learn Python The Hard Way 3th Edition, Zed A. Shaw, Addison Wesley **2014** Tutorial Pemrograman Python 2. Sandy H.S. Hero, WCPL Press, Bandung **2017**
Assessment Guidance	Pre test (25%); final report (50%); final exam (25%)

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Religion

Academic Year	2023/2024
Code/ Semester	UNX01-001 / 1st Semester
Course/ Credit points	Religion / 2 SKS ~ 3.62 ECTS
Language	Indonesian
Responsible Person	Otong Nurhilal
Lecturer	Otong Nurhilal, Cukup Mulyana
Workload	1. Lectures : 2 x 50 = 100 minutes per week. 2. Assignments : 2 x 60 = 120 minutes per week. Private learning : 2 x 60 = 120 minutes per week.
Contents	The concept of man as a divine being, the role of religion in building civilization, implementation of Islamic teachings in family development, implementation of Islamic teachings in multicultural societies, Islamic concepts of state and government, Islamic concepts of the environment, concepts of hijrah, jihad, religious radicalism, and Islamic moderation, the role of religion in dealing with issues contemporary, Islam and information literacy and the development of an anti-corruption culture.
Objectives	1. Mastering the concept of humans as godly beings; 2. Mastering the role of religion in building civilization; 3. Mastering the implementation of Islamic teachings in family development; 4. Mastering the implementation of Islamic teachings in a multicultural society; 5. Mastering the Islamic concept of state and government; 6. Mastering Islamic concepts about the environment; 7. Mastering the concepts of hijrah, jihad, religious radicalism, and Islamic moderation; 8. Mastering the role of religion in dealing with contemporary issues: Islam and information literacy and the development of an anti-corruption culture.
Course Method	Lectures are held by lecture and discussion methods. Giving assignments to test the accuracy of answering questions both in the form of concepts and problem solving.
Prerequisites	-
Requirements according to the examination regulations	Registered in this course Minimum 80% attendance in this course
Reading list	1. al-Khatib, Sulaiman, *Al-Falsafah al-'Aammah wa al- Akhlaaq*, Minia: Jami'ah Minia, Aman, Saifudin, *Tren Spiritualitas Milenium Ketiga*, Jakarta: Ruhama, 2013 Kailah, Salaamah, *Al-Islaam fi Siyaaqihi at- Taariikhy*, Beirut: Daar at-tanwiir, 2013

Assessment Guidance	Quiz (20%); Tasks (30%); MES (25%); FES (25%)
Prerequisites	-

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Indonesian Language

Academic Year	2023/2024
Code/ Semester	UNX01-004 / 1st Semester
Course/ Credit points	Indonesian Language / 2 SKS ~ 3.62 ECTS
Language	Indonesian
Responsible Person	Dr. Wahya, M.Hum
Lecturer	Lecturers team from the university, Dr. Wahya, M.Hum
Workload	1. Lectures: 2 x 50 = 100 minutes per week. 2. Assignments: 2 x 60 = 120 minutes per week. Individual study: 2 x 60 = 120 minutes per week.
Contents	1. Language Politics 2. Scope of Indonesian Language and scientific communication 3. Structure and technical writing of scientific work 4. Recent issues in Indonesian Language 5. Spelling contextualization 6. Exploring writing ideas and writing drafts 7. Popular and creative of scientific works 8. Presentation and public speaking 9. Introductory Creative digital media Creative content based Indonesian Language.
Objectives	Learning Goals: 1. Students able to determine, analyze, and show the linguistic aspects contained on a variety of language. 2. Students able to determine, analyze and present the distinctive linguistic aspects contained in the variety of journalistic languages of culinary medicines, ceremonial buying and selling transactions. 3. Students able to determine, analyze and present the distinctive linguistic aspects contained in the variety of journalistic languages of religious business scientific law.
Course Method	1. Lecture course: lecture presentation, interactive learning quizzes (discussion and sharing). 2. Interactive learning: presentation (Focus Group Discussion), homework/assignment
Form of Examination	To be defined by lecturer at the beginning of course
Prerequisites	-
Requirements according to the examination regulations	Registered in this course, Minimum 80% attendance in this course
Reading list	1. Sugono, Dendy. Berbahasa Indonesia dengan Benar. Puspa Swara, 1994. 2. Moeliono, Anton M. and Lapoliwa, Hans and Alwi, Hasan and Tjatur, Sry Sattya and Sasangka, Wisnu and Sugiyono, Sugiyono (2017) Tata bahasa baku bahasa Indonesia. Edisi keempat. Badan Pengembangan dan Pembinaan Bahasa, Kementrian Pendidikan dan Kebudayaan, Jakarta. ISBN

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Assessment Guidance	Quiz (20%); Tasks (30%); MES (25%); FES (25%)

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Creative Development and Entrepreneurship

Academic Year	2023/2024
Code/ Semester	UNX01-006 / 1st Semester
Course/ Credit points	Creative Development and Entrepreneurship (OKK) / 3 SKS ~ 5.43 ECTS
Language	Indonesian
Responsible Person	Dianne Amor
Lecturer	Lecturers team from the university, Dianne Amor
Workload	1. Lectures: 3 x 50 = 100 minutes per week. 2. Assignments: 3 x 60 = 180 minutes per week. Group/individual study: 3 x 60 = 180 minutes per week.
Contents	1. Identity and culture 2. Intercultural dialogue 3. Local and global community 4. Conceptual in entrepreneurship 5. Social work planning Development and continuing social work
Objectives	Learning Goals: 1. Students are able to determine, analyze, and show their identity and culture as Indonesian students. 2. Students are able to involve in intercultural dialogue. 3. Students are able to understand, be tolerant and involve in a local and global community. 4. Students are able to determine the conceptual work of entrepreneurship. Students are able to involve the social work activity
Course Method	1. Lecture course: (discussion and sharing). 2. Interactive learning: Project-based study, field work, (Focus Group Discussion), homework/assignment: Problem-based learning, Individual study
Form of Examination	To be defined by lecturer at the beginning of course
Prerequisites	-
Requirements according to the examination regulations	Registered in this course, Minimum 80% attendance in this course
Reading list	1. Technical Guide of OKK, Team teaching of Universitas Padjadjaran, 2022. Lecturer notes.
Assessment Guidance	Knowledge (Quizzes active citizens and entrepreneurship) (25%); Attitude (students activity, discipline, communication (35%); Social work (creativity, planning, content, presentation, usefulness, reports, and video of social work) (40%). Quiz (20%); Tasks (30%); MES (25%); FES (25%)

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Pancasila

Academic Year	2023/2024
Code/ Semester	UNX01-007/ 1st Semester
Course/ Credit points	Pancasila / 2 SKS ~ 3.62 ECTS
Language	Indonesian
Responsible Person	Hadiyanto A. Rachim
Lecturer	Lecturers team from the university, Hadiyanto A. Rachim
Workload	1. Lectures: 2 x 50 = 100 minutes per week. 2. Assignments: 2 x 60 = 120 minutes per week. Individual study: 2 x 60 = 120 minutes per week.
Contents	1. National Identity and Integrity 2. Constitutions of Republic Indonesia (UUD 1954) and examples of practical. 3. Anti-corruption, Obligations, and rights of citizens Insight into the archipelago and national resilience.
Objectives	Learning Goals: 1. Students able to recognize and have the national identity and integrity. 2. Students able to recognize and apply the constituents of Republic Indonesia. 3. Students able to perform anti-corruption attitudes, knowing and understanding the obligations and rights of citizens Republic of Indonesia.
Course Method	1. Lecture course: lecture presentation, interactive learning quizzes (discussion and sharing). 2. Interactive learning: presentation (Focus Group Discussion), Homework/assignment: Problem based learning, Individual study
Form of Examination	To be defined by lecturer at the beginning of course
Prerequisites	-
Requirements according to the examination regulations	Registered in this course, Minimum 80% attendance in this course
Reading list	1. Kemenristekdikti. 2016. Modul Pendidikan Kewargnegaraan Untuk Perguruan Tinggi. Jakarta: Dirjen Belmawa Kemenristekdikti 2. Pasha, MK. 2008. Pendidikan Kewarganegaraan (Civic Education). Yogyakarta. Citra Karsa Mandiri. Sunarso, dkk. 2006. Pendidikan Kewarganegaraan. Yogyakarta: UNY Press.
Assessment Guidance	Rubric focus group discussion (presentation) (20%); Homework/assignment (20%); middle exam (30%); final exam (30%)

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Citizenship Education

Academic Year	2023/2024
Code/ Semester	UNX01-007/ 1st Semester
Course/ Credit points	Citizenship Education / 2 SKS ~ 3.62 ECTS
Language	Indonesian
Responsible Person	Hadiyanto A. Rachim
Lecturer	Lecturers team from the university, Hadiyanto A. Rachim
Workload	1. Lectures: 2 x 50 = 100 minutes per week. 2. Assignments: 2 x 60 = 120 minutes per week. Individual study: 2 x 60 = 120 minutes per week.
Contents	1. National Identity and Integrity 2. Anti-corruption, Obligations, and rights of citizens Insight into the archipelago and national resilience.
Objectives	Learning Goals: 1. Students able to recognize and have the national identity and integrity. 2. Students able to recognize and apply the constituents of Republic Indonesia. 3. Students able to perform anti-corruption attitudes, knowing and understanding the obligations and rights of citizens Republic of Indonesia.
Course Method	1. Lecture course: lecture presentation, interactive learning quizzes (discussion and sharing). 2. Interactive learning: presentation (Focus Group Discussion), Homework/assignment: Problem based learning, Individual study
Form of Examination	To be defined by lecturer at the beginning of course
Prerequisites	-
Requirements according to the examination regulations	Registered in this course, Minimum 80% attendance in this course
Reading list	1. Kemenristekdikti. 2016. Modul Pendidikan Kewargnegaraan Untuk Perguruan Tinggi. Jakarta: Dirjen Belmawa Kemenristekdikti 2. Pasha, MK. 2008. Pendidikan Kewarganegaraan (Civic Education). Yogyakarta. Citra Karsa Mandiri. Sunarso, dkk. 2006. Pendidikan Kewarganegaraan. Yogyakarta: UNY Press.
Assessment Guidance	Rubric focus group discussion (presentation) (20%); Homework/assignment (20%); middle exam (30%); final exam (30%)

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Fundamental Physics 2

Academic Year	2022/2023
Code/ Semester	D10C20.2001/ 2nd Semester
Course/ Credit points	Fundamental Physics 2 / 4 SKS ~ 7.24 ECTS
Language	Indonesian
Responsible Person	Camellia Panatarani
Lecturer	Camellia Panatarani, Togar Saragi
Workload	1. Lectures: 4 x 50 = 200 minutes per week. 2. Assignments: 4 x 60 = 240 minutes per week. Individual study: 4 x 60 = 240 minutes per week.
Contents	1. Oscillation and Waves 2. Sound 3. Electric Charge and Electric Field 4. Electric Potential, Capacitance and Electric Energy 5. Electric Current 6. DC Circuits 7. Magnetism 8. Electromagnetic Induction and Faraday's Law 9. Alternating Current Circuits 10. Electromagnetic Waves 11. Light and Geometric Optics Wave Properties of Light
Learning Objectives	Learning Goals: After taking Fundamental Physics II course, students are able to apply the basic principles and concepts of physics to find solutions to simple and practical physics problems in everyday life
Course Method	1. Lecture course: lecture presentation, interactive learning quizzes (discussion and sharing). 2. Interactive learning: presentation (Focus Group Discussion and Small Group Discussion), Case- based learning, and problem-based learning 3 homework/assignment: Problem set, Individual study
Form of Examination	To be defined by lecturer at the beginning of course
Prerequisites	Fundamental Physics 1
Requirements according to the examination regulations	Registered in this course, Minimum 80% attendance
Reading list	1. Serway Jewet, Physics For Scientists and Engineers, Ed.8 2. Tipler, Paul A. 1998. Fisika Untuk Sains dan Teknik Edisi Ketiga. Jakarta: Penerbit Erlangga. 3. Giancoli, Douglas C. 2001. Fisika Jilid 1 dan 2 Edisi Kelima. Jakarta: Penerbit Erlangga. Jearl Walker, Halliday, David dan Robert Resnick, Fundamentals of physics ,10th Edition, 2014
Assessment Guidance	Rubric focus group discussion (presentation)/ Quiz/Problem Set/assignment (90%); Comprehensive evaluation (10%)

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Fundamental Physics II Lab. Work

Academic Year	2023/2024
Code/ Semester	D10C20.2002/ 2nd Semester
Course/ Credit points	Fundamental Physics II Lab. Works/ 1 SKS ~ 1.81 ECTS
Language	Indonesian
Responsible Person	Camellia Panatarani
Lecturer	Camellia Panatarani, Togar Saragi
Workload	Lab Works: 1 x 160 = 160 minutes per week
Contents	The scope of this course includes characteristics of some electrical elements, determining the modulus of elasticity, moment of inertia of an object, physical pendulum, spring force and gravity constants, microscope, spectrometer, sound wave resonance, and oscilloscope.
Learning Objectives	Able to carry out experiments to determine physical quantities in electrics and mechanics.
Course Method	Lab. Works
Form of Examination	Paperwork Presentation
Prerequisites	-
Requirements according to the examination regulations	Registered in Regular Live Unpad 100% attendance in this course
Reading list	1. Modul Praktikum Fisika Dasar I, Laboratorium Fisika Dasar, FMIPA, Universitas Padjadjaran 2. Raymond A. Serway and John W. Jewett, Jr, Physics for Scientists and Engineers with Modern Physics, Eight Edition, 2010. 3. Tipler, Paul A and Gene Mosca, Physics for Scientists and Engineers, 6th Edition, 2007 Giancoli, Douglas C. Physics for Scientists & Engineers with Modern Physics, 5th Edition, Pearson Education Inc. USA 2020.
Assessment Guidance	Rubrics

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Mathematical Physics 2

Academic Year	2022/2023
Code/ Semester	D10C20.2003 / 2nd Semester
Course/ Credit points	Mathematical Physics 2/ 3 SKS ~ 5.43 ECTS
Language	Indonesian
Lecturer	Lusi Safriani (**PIC**), Fitrilawati
Workload	1. Lectures: 3 x 50 = 150 minutes per week. 2. Assignments: 3 x 60 = 180 minutes per week. Individual study: 3 x 60 = 180 minutes per week.
Contents	1. Linier Algebra 2. Coordinate systems 3. Ordinary Differential Equation Partial Differential Equation
Learning Objectives	Learning Goals: 1. Students able to understand and solve matrix algebra and solve the linear equation. 2. Students able to understand and solve the physics phenomena relate to coordinate system. 3. Students able to identify the differential equation and establish the solution equation of the simple physical phenomena. 4. Students able to identify the partial differential equation and establish the solution equation of the simple physical phenomena.
Course Method	1. Lecture course: lecture presentation, interactive learning quizzes (discussion and sharing). 2. Interactive learning: exercise and presentation, Individual study: homework/assignment
Form of Examination	To be defined by lecturer at the beginning of course
Prerequisites	1. Mathematical Physics 1 Fundamental Physics 1
Academic Year	2022/2023
Requirements according to the examination regulations	Registered in this course, Minimum 80% attendance in this course
Reading list	1. Boas, M. L. (2006), Mathematical methods in the physical sciences, 3rd ed., John Wiley & Sons, New York. 2. Riley, K. F., M. P. Hobson and S. J. Bence (2006), Mathematical Methods for Physics and Engineering 3rd edition, Cambridge University Press. Alexander Altland, Jan von Delft. (2019) Mathematics for Physicists: Introductory Concepts and Methods 1st Edition, Cambridge University Press
Assessment Guidance	Quizzes (10%); Homework/assignment (20%); middle exam (35%); final exam (35%)

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Modern Physics

Academic Year	2022/2023
Code/ Semester	D10C20.2004/2nd Semester
Course/ Credit points	Modern Physics/2 SKS ~ 3.62 ECTS
Language	Indonesian
Responsible Person	Ayi Bahtiar
Lecturer	Ayi Bahtiar, Andri Abdurrachman
Workload	1. Lecturer 3 x 50 = 150 minutes per week. 2. Assignments: 3 x 60 = 180 minutes per week. Individual study: 3 x 60 = 180 minutes
Contents	Concepts of classical and modern physics, failure of classical physics concepts in modern physics, special theory of relativity and mechanical relativistic, basic concepts of quantum physics (particle like properties electromagnetic radiation and wavelike properties of particles), Heisenberg uncertainty, Model of Atoms, Schrodinger equation, Classical model of the Hydrogen atom, Quantum theory of the Hydrogen atom
Learning Objectives	1. Able to explain the basic concepts of modern physics and their phenomena and experimental results in modern physics correctly, 2. Able to solve the Schrodinger equation in describing the interaction of waves with their environment (at the boundaries, confined/boxes, ladder potentials, quantum wells, tunneling, and harmonic oscillator) correctly, 3. Able to analyze the quantum quantities (set of numbers that characterize the energy levels and wave functions of the electron in the atom) in the Hydrogen atom correctly.
Course Method	At the beginning of the lecture for each topic, an explanation of the basic concepts is given and followed by working on problems that are done in the class and/or at home as homework and case study.
Form of Examination	To be defined by lecturer at the beginning of course
Prerequisites	Fundamental Physics
Requirements according to the examination regulations	Minimum 80% attendance in this course
Reading list	1. Kenneth S. Krane, “Modern Physics”, 4th Edition, Wiley, USA, 2020, 2. Arthur Beiser, Shobhit Mahajan and S. Rai Choudhury, “Concepts of Modern Physics”, 7th Edition, Mc-Graw Hill, USA, 2017,
Assessment Guidance	Student work/assignments (30%); case study (20%), midterm exam (30%); final term exam (30%)

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Numerical Computation

Academic Year	2022/2023
Code/ Semester	D10C20.2005 / 2nd Semester
Course/ Credit points	Numerical Computation / 2 SKS ~ 3.62 ECTS
Language	Indonesian
Responsible Person	Sahrul Hidayat
Lecturer	Sahrul Hidayat, Ferry Faizal
Workload	1. Lectures : 2 x 50 = 100 minutes per week. 2. Assignments : 2 x 60 = 120 minutes per week. Private learning : 2 x 60 = 120 minutes per week.
Contents	Taylor series, roots of non-linear equations with bisection, false position and fixed point iteration approaches. System of linear equations with Gauss elimination method, Jacobi iteration and Gauss-Seidel iteration. Vectors and eigenvalues with power and inverse power method approaches. Curve matching with interpolation and linear regression approaches. Numerical integrals with Trapezoid, Simpson and Monte Carlo method approaches. The subject matter of ordinary differential equations with Taylor series approach, Euler method and Runge Kutta method.
Learning Objectives	1. Understanding of numerical methods and their applications in various fields. 2. Able to solve mathematical problems using numerical methods, including methods for finding roots of equations, system of linear equations, numerical integration, numerical differential, Eigen Value and solving differential equations. 3. Able to develop skills in programming using Python, to implement and analyze numerical algorithms 4. Understand the limitations and sources of error in numerical methods 5. Have experience working with real-world problems that can be solved using numerical methods, and develop critical thinking and problem-solving skills.
Course Method	Lectures and *case based study*
Form of Examination	Essay (case study)
Prerequisites	Algorithm and Programming
Requirements according to the examination regulations	Registered in this course Minimum 80% attendance in this course
Reading list	1. Steven C. Chapra and Raymond P. Canale, Numerical Methods for Engineers 7th, , McGraw-Hill 2015 2. Rubin H Landau and Manuel Jose Paez, Computational Problems for Physics, , Taylor & Francis Group, 2018
Assessment Guidance	Case based rubric (25); assignment (25%); midterm exam (25%); final exam (25%)

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Numerical Computation Lab Work

Academic Year	2022/2023
Code/ Semester	D10C20.2006 / 2nd Semester
Course/ Credit points	Numerical Computation Lab Work / 1 SKS ~ 1.81 ECTS
Language	Indonesian
Responsible Person	Sahrul Hidayat
Lecturer	Sahrul Hidayat, Ferry Faizal
Workload	1. Lectures : 4 x 50 = 200 minutes per week. Private learning : 2 x 60 = 120 minutes per week.
Contents	Taylor series, roots of non-linear equations with bisection, false position and fixed-point iteration approaches. System of linear equations with Gauss elimination method, Jacobi iteration and Gauss-Seidel iteration. Vectors and eigenvalues with power and inverse power method approaches. Curve matching with interpolation and linear regression approaches. Numerical integrals with Trapezoid, Simpson and Monte Carlo method approaches. The subject matter of ordinary differential equations with Taylor series approach, Euler method and Runge Kutta method.
Learning Objectives	1. Able to solve mathematical problems using numerical methods, including methods for finding roots of equations, system of linear equations, numerical integration, numerical differential, Eigen Value and solving differential equations. Able to develop skills in programming using Python, to implement and analyze numerical algorithms
Course Method	Practicum in the lab
Form of Examination	Practical Examination
Prerequisites	Algorithm and Programming
Requirements according to the examination regulations	Registered in this course Minimum 80% attendance in this course
Reading list	1. Steven C. Chapra and Raymond P. Canale, Numerical Methods for Engineers 7th, , McGraw-Hill 2015 2. Rubin H Landau and Manuel Jose Paez, Computational Problems for Physics, , Taylor & Francis Group, 2018
Assessment Guidance	Pre-test (25%); final report (50%); final exam (25%)

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Mechanics

Academic Year	2022/2023
Code/ Semester	D10C20.2007/2nd Semester
Course/ Credit points	Mechanics / 4 SKS ~ 7.24 ECTs
Language	Indonesian
Responsible Person	Risdiana
Lecturer	Risdiana, Liu Kin Men
Workload	1. Lecturer: 4 x 50 = 200 minutes per week. 2. Assignments: 4 x 60 = 240 minutes per week. Individual study: 4 x 60 = 40 minutes per week.
Contents	1. Kinematics 2. Particle Dynamics 3. Simple Harmonic Motion 4. Particle System Dynamics 5. Rotational Motion of Rigid Bodies 6. Central Force System 7. General Coordinate and General Momentum 8. The D'Alembert Principle and the Lagrange Formulation Hamilton Formulation
Learning Objectives	1. Students are able to understand, explain, solve, and analyze the concepts of classical mechanics including Newtonian kinematics and dynamics, as well as the concepts of force and energy, Students are able to understand, explain, solve problems, and analyze the concept of analytic mechanics by using Lagrange and Hamilton formulation, as well as solve problems and analyze the motion of the central force and particle collisions.
Course Method	Problem based learning, Students centered learning, Discovery learning, Small Group Discussion, and Contextual Instruction
Form of Examination	To be defined by lecturer at the beginning of course
Prerequisites	Fundamental Physics 1; Mathematical Physics 1
Requirements according to the examination regulations	Registered in this course
Reading list	1. Arya, A.P., An Introduction to Classical Mechanics, Prentice Hall, 1990. 2. Fowles, G. R., Analytical Mechanics, Saunders College Publishing, 1986. Daniel Kleppner, Robert Kolenkow. 2013. An Introduction to Mechanics 2nd Edition, Cambridge University Press
Assessment Guidance	Quiz and Assignments (40%); Midterm Exam (30%), Final Exam (30%)

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Thermodynamics

Academic Year	2022/2023
Code/ Semester	D10C20.2008 / 2nd Semester
Course/ Credit points	Thermodynamics / 3 SKS ~ 5.43 ECTS
Language	Indonesian
Responsible Person	Otong Nurhilal
Lecturer	Otong Nurhilal, Cukup Mulyana
Workload	1. Lectures : 3 x 50 = 150 minutes per week. 2. Assignments : 3 x 60 = 180 minutes per week. Private learning : 3 x 60 = 180 minutes per week.
Contents	Concepts and definitions of thermodynamics, energy and first law of thermodynamics, evaluation of properties, control volume energy analysis, second law of thermodynamics, entropy, exergy analysis and power plant systems.
Objectives	1. Be able to understand and apply the concept of thermodynamics 2. Able to understand and apply the concept of energy and the first law of thermodynamics 3. Able to understand and apply the concept of evaluating the properties 4. Able to understand and apply the concept of control volume energy analysis 5. Able to understand and apply the concept of the second law of thermodynamics 6. Able to understand and apply the concept of entropy 7. Able to understand and apply the concept of exergy Able to understand and apply the concept of power plant systems
Course Method	The learning process is carried out by lecture and discussion methods. Giving assignments for each subject is given to students to test their ability to master concepts and the accuracy of answering questions.
Prerequisites	1. Physics Mathematical physics
Requirements according to the examination regulations	Registered in this course Minimum 80% attendance in this course
Academic Year	2022/2023
Reading list	1. Michael J. Moran, Howard N. Shapiro, Daisie D. Boettner Brigadier General (Retired), USA Margaret B. Bailey Rochester Institute of Technology, Fundamentals of Engineering Thermodynamics y John Wiley & Sons, Inc. All rights reserved, 2018.
Assessment Guidance	Quiz (20%); Tasks (10%); MES (35%); FES (35%)

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MODULE HANDBOOK

YEARS 2

UNDERGRADUATE PROGRAM IN PHYSICS

FACULTY OF MATHEMATICS
AND NATURAL SCIENCES
UNIVERSITAS PADJADJARA023

Electronics

UNPAD
PHYSICS

Electronics

Academic Year	2023/2024
Code/ Semester	D10C20.3002/ 3rd Semester
Course/ Credit points	Electronics / 4 (course) /1 (Lab. Work)/ 4 SKS ~ 7.24 ECTS
Language	Indonesian
Responsible Person	Ferry Faizal
Lecturer	Ferry Faizal, Andri Abdurrochman, Setianto, Budi Adiperdana
Workload	1. Lecturer 4 x 50 = 200 minutes per week. 2. Assignments: 4 x 60 = 240 minutes per week. 3. Individual study: 4 x 60 = 240 minutes Lab. Work for Electronic: 1x170 = 170 minutes
Contents	Equivalent circuit, Transient current, Alternating current, Semiconductors, Diodes and Transistor, Amplifiers (Junction & FET), JFET dan MOSFET, Design and analysis of electronic circuit, Operational-Amplifier, Op-amp Circuit with Feedback, Oscillator circuit, Analog vs Digital information, Logic gates, Binary Code, BCD, Arithmetics Circuit, Flip-flop and Sequential logic, Examples of Digital circuit application: Mux-Demux, ALU, regiser etc.
Learning Objectives	1. Students can understand and explain the concepts of analogue and digital's electronics 2. Students can recognize some of the components used in electronics 3. Students can understand the concept of DC-AC electric circuits in simple electronic circuits 4. Students can explain semiconductor materials and explain the functions and characteristics of electronic components from semiconductor materials 5. Students can explain the concept of amplifier circuits and can analyze them 6. Students can analyze the types of filter circuits 7. Students can explain the basic principles of oscillators and distinguish between types of oscillators. Students can apply the concept of logic gates to flip-flop, register and counter circuits.
Course Method	Discussion, assignment, lab-practice
Form of Examination	To be defined by lecturer at the beginning of course
Prerequisites	-
Requirements according to the examination regulations	Registered in this course, Minimum 80% attendance in this course
Reading list	1. Malvino, A.; David J Bates, Electronic Principles, McGraw-Hill, 2007 2. Dennis L. Eggleston, Basic Electronics for Scientists and engineers, Cambridge University Press, 2011 3. John Adler & Sutono. 2020. Elektronika Dasar. Informatika, 7. ISBN 9786237131267
Assessment Guidance	Quiz, Problem solving, Rubric for presentation, Report for lab practice

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Electronics Lab Work

Academic Year	2023/2024
Code/ Semester	D10C20.3002/ 3rd Semester
Course/ Credit points	Electronics Lab Work / 2 credits ~ 3.62 ECTS
Language	Indonesian
Responsible Person	Ferry Faizal
Lecturer	Ferry Faizal, Andri Abdurrochman
Workload	1. Labwork: 4 x 50 = 200 minutes per week. Private learning : 2 x 60 = 120 minutes per week.
Contents	Introduction, passive component characteristic, RC Circuit on AC and DC current sources, Diode and its application, Transistor, Operational Amplifier / OpAmp, Multistep Amplifier using OpAmp, Instrumention Amplifier, Filter and Active Filter, Oscilator, Logic and Digital Electronic, Digital Arithmetic, Flip flop, Counter.
Learning Objectives	1. Students are able to understand and explain the concepts of analog and digital electronics. 2. Students are able to recognize some of the components used in electronics. 3. Students are able to understand the concept of DC-AC electric circuits in simple electronic circuits. 4. Students are able to explain semiconductor materials and explain the functions and characteristics of components of semiconductor materials. 5. Students are able to explain and analyze the concept of amplifier circuits 6. Students are able to analyze the types of filter circuits \ 7. Students are able to explain the basic principles of oscillators and distinguish between types of oscillators Students are able to apply the concept of logic gates to flip-flop, register and counter circuits
Course Method	Lab work
Form of Examination	Practical Examination
Prerequisites	-
Requirements according to the examination regulations	Registered in this course Minimum 80% attendance in this course
Reading list	Malvino, A.; David J Bates, Electronic Principles, McGraw---Hill, 2007 Dennis L. Eggleston, Basic Electronics for Scientists and engineers, Cambridge University Press, 2011 Fundametal of Analog Circuits, Second Ed., Prentice Hall, John Adler & Sutono. 2020. Elektronika Dasar. Informatika, ISBN 9786237131267
Assessment Guidance	Pre-test (25%); final report (50%); final exam (25%)

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Electricity and Magnetism

Academic Year	2023/2024
Code/ Semester	D10C20.3003/ 3rd Semester
Course/ Credit points	Electricity and Magnetism / 4 SKS ~ 7.24 ECTS
Language	Indonesian
Responsible Person	Lusi Safriani
Lecturer	Lusi Safriani, Togar Saragi
Workload	1. Lectures: 4 x 50 = 200 minutes per week. 2. Assignments: 4 x 60 = 240 minutes per week. Individual study: 4 x 60 = 240 minutes per week.
Contents	1. Review of Vector Analysis and Coordinate System 2. Electrostatic forces (Coulomb's Law) by discrete charges and their superposition 3. Static Electric Field due to discrete charges and their superpositions as well as by continuous charges 4. Electric flux, Gauss's Law and its applications 5. Electric Potential by discrete charges, superposition and by continuous charges. Potential due to dipoles, and Multipole Expansion. 6. Special techniques for solving electric potential (variable separation method and method of images) 7. Electric Polarization and Dielectric Materials 8. Capacitance, Electric Energy and Boundary Conditions. 9. Static Magnetic Field and Magnetic Force 10. Biot Savart's Law (steady/stationary current) 11. Divergence and Curl of magnetic field (Ampere's Law) 12. Magnetic Vector Potential Magnetic Materials 14. Faraday's Law and Induced Current 15. Maxwell's equations in vacuum and materials Electromagnetic Wave Equations in vacuum and materials
Learning Objectives	Learning Goals: 1. Able to explain the fundamentals of force, electric field, and static electric potential accurately and effectively. 2. Able to determine electric potential using special techniques, and calculate electrical energy accurately. 3. Able to determine magnetic force, induced magnetic field, magnetic potential, magnetic materials, Faraday's law and induced current correctly. Able to derive Maxwell's equations from electrostatics and magnetostatics to electrodynamics correctly.
Course Method	1. Lecture course: lecture presentation, interactive learning quizzes (discussion and sharing). 2. Interactive learning: presentation (Focus Group Discussion and Small Group Discussion), Case-based learning, and problem-based learning 3 homework/assignment: Problem set, Individual study

Form of Examination	To be defined by lecturer at the beginning of course
Prerequisites	Fundamental Physics 1, Fundamental Physics 2, Mathematical Physics 1, and Mathematical Physics
Requirements according to the examination regulations	Registered in this course, Minimum 80% attendance
Reading list	1. Reitz, J. R., Milford, F. J., and Christy, R. W., (1993), "Foundation of Electromagnet Theory": 4rd Edition, Addition-Wesley Publishing Company Inc., USA. 2. David J. Griffiths, Introduction to Electrodynamics, Prentice Hall, New Jersey, 1999. 3. Saslow, W.M., "Electricity, Magnetism and Light", Thomson Learning Inc., Canada, 2002 4. Yohanes Surya, 2014. Listrik dan Magnet. Kandel
Assessment Guidance	Rubric focus group discussion (presentation)/ Homework/assignment (70%); midterm exam (15%); final exam (15%)

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Physics Experiments

Academic Year	2023/2024
Code/ Semester	D10C20.3005 / 3rd Semester
Course/ Credit points	Physics Experiments / 1 SKS ~ 1.81 ECTS
Language	Indonesian
Responsible Person	Annisa Aprilia
Lecturer	Annisa Aprilia
Workload	1. Laboratory work 1 x 170 = 170 minutes per week. Individual Study
Contents	1. Thermodynamics: anomaly of water 2. Optic: ABBE refractometer, reflection, and refraction of light, prism. 3. Wave: Standing waves, ripple tank, harmonic rotary 4. Electrodynamics: dielectric constants. Oscilloscope.
Objectives	Learning Goals: 1. Students able to plan and prepare several physics experiment in detailed. Students able to take correlation between theory and experiments of several physical phenomena.
Course Method	Laboratory work: presentation (Focus Group Discussion), Individual Study: plan and prepare logbook, final report.
Form of Examination	To be defined by lecturer at the beginning of course
Prerequisites	1. Fundamental physics 1 2. Fundamental physics 2 3. Thermodynamic Modern Physics
Requirements according to the examination regulations	Registered in this course, Minimum 80% attendance in this course
Reading list	1. Adrian C. Melissinos and Jim Napolitano, Experiment in Modern Physics, Academic Press, 2011 2. Jearl Walker, Halliday, David dan Robert Resnick, Fundamentals of physics ,10th Edition, 2014
Assessment Guidance	Rubric activity laboratory work: Activity work (40%) ; Final report (35%); pre-test (10%); post-tes (15%)

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Mathematical Physics 3

Academic Year	2023/2024
Code/ Semester	D10C20.3006 / 3rd Semester
Course/ Credit points	Mathematical Physics 3/ 3 SKS ~ 5.43 ECTS
Language	Indonesian
Responsible Person	Fitrilawati
Lecturer	Fitrilawati, Liu Kin Men
Workload	1. Lectures: 3 x 50 = 150 minutes per week. 2. Assignments: 3 x 60 = 180 minutes per week. Individual study: 3 x 60 = 180 minutes per week.
Contents	1. Special Function Function of Complex variable
Learning Objectives	Learning Goals: 1. Students able to identify and operate integral of special function and establish the solution equation of differential equation. Students able to describe the special function characteristics and applying to phenomena physical analyzes.
Course Method	1. Lecture course: lecture presentation, interactive learning quizzes (discussion and sharing). Interactive learning: exercise and presentation, Individual study: homework/assignment
Form of Examination	To be defined by lecturer at the beginning of course
Prerequisites	Mathematical Physics 2
Requirements according to the examination regulations	Registered in this course, Minimum 80% attendance in this course
Reading list	1. Boas, M. L. (2006), Mathematical methods in the physical sciences, 3rd ed., John Wiley & Sons, New York. 2. Riley, K. F., M. P. Hobson and S. J. Bence (2006), Mathematical Methods for Physics and Engineering 3rd edition, Cambridge University Press. Alexander Altland, Jan von Delft. (2019) Mathematics for Physicists: Introductory Concepts and Methods 1st Edition, Cambridge University Press
Assessment Guidance	Quizzes (10%); Homework/assignment (20%); middle exam (35%); final exam (35%)

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Scientific Research Method

Academic Year	2023/2024
Code/ Semester	D10C20.3002/ 3rd Semester
Course/ Credit points	Scientific Research Method / 2 credits ~ 3.62 ECTS
Language	Indonesian
Responsible Person	Ayi Bahtiar
Lecturer	Ayi Bahtiar, Sahrul Hidayat
Workload	1. Course: 4 x 50 = 200 minutes per week. Private learning : 2 x 60 = 120 minutes per week.
Contents	Basic concepts of research design, research proposal writing techniques, presentation techniques and preparation of presentation materials, discussion techniques and peer review.
Learning Objectives	1. Students are able to explain the basic concepts of research design from defining problems to determining research objectives to writing research proposals Students are able to understand presentation techniques and techniques for preparing presentation material, practice presentation techniques, discussion techniques and techniques for conducting peer reviews
Course Method	Lecture, Discussion and Practice
Form of Examination	Presentation, quiz/assignment, test
Prerequisites	-
Requirements according to the examination regulations	Registered in this course minimum 80% attendance in this course
Reading list	1. Luis M. Camarinha-Matos, (2009). “Scientific Research Methodologies and Techniques Muller”, Lecture Notes. 2. Maura Borrego, Elliot P. Douglas, Catherine T. Amelink, “Quantitative, Qualitative, and Mixed Research Methods in Engineering Education”, Journal of Engineering Education Vol. 98 (2009), pp. 53-66 3. Scott A. Gold (2016), “Research Methods in Science and Engineering”, CRC Press. 4. L. Y. Hong, (2005),”Research Methods in Engineering and Science”, Lecture Notes.
Assessment Guidance	Assignment (30%); Midterm Test (30%); Final Project (40%)

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Waves

Academic Year	2023/2024
Code/ Semester	D10C20.3008/ 3rd Semester
Course/ Credit points	Waves / 4 SKS ~ 7.24 ECTS
Language	Indonesian
Responsible Person	Togar Saragi
Lecturer	Togar Saragi, Otong Nurhilal. Setianto, Nowo Riveli
Workload	1. Lectures: 4 x 50 = 200 minutes per week. 2. Assignments: 4 x 60 = 240 minutes per week. Private learning: 4 x 60 = 240 minutes per week.
Contents	Simple and coupled oscillator, elastic waves (wave equation in string, energy propagation and impedance, sound wave, reflection and refraction of mechanical waves at the boundary, superposition of waves, Doppler effect), Fourier analysis and transform, Modulation of waves, electromagnetic wave, electromagnetic wave in structured media (layered media, waveguide, conducting tube and crystals).
Learning Objectives	1. Able to explain the simple and coupled oscillator and their examples, propagation of mechanical waves and superposition of waves, 2. Able to apply the Fourier analysis and its transform in different waveforms, 3. Able to analyze the modulation techniques of waves and propagation of electromagnetic wave in different media, 4. Able to calculate analytically and numerically the reflectance and transmittance of electromagnetic wave at the boundary, Able to analyze the electromagnetic wave in structured media
Course Method	At the beginning of the lecture for each topic, an explanation of the basic concepts is given and followed by working on problems that are done in the class and/or at home as homework and case study.
Form of Examination	To be defined by lecturer at the beginning of course
Prerequisites	1. Fundamental Physics Mathematical Physics
Requirements according to the examination regulations	Minimum 80% attendance in this course
Reading list	1. Richard E Haskell, “Fourier Analysis By Example”, Independently Published, 2020, 2. J. E. Houle and D. M. Sullivan, "Electromagnetic Simulation Using The FDTD Method with Phyton", 3rd Edition, John Wiley & Sons, Inc, 2020,
Assessment Guidance	Student work/assignments (40%); Case study (20%); Midterm exam (20%); Final term exam (20%)

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Quantum Physics

Academic Year	2022/2023
Code/ Semester	D10C20.4003 / 4th Semester
Course/ Credit points	Quantum Physics / 4SKS ~ 7.24 ECTS
Language	Indonesian
Responsible Person	Liu Kin Men
Lecturer	Liu Kin Men, Setianto, Nowo Riveli
Workload	1. Lectures : 4 x 50 = 200 minutes per week. 2. Assignments : 4 x 60 = 240 minutes per week. Private learning : 4 x 60 = 240 minutes per week.
Contents	Introduction, Wave Functions, and Operators, Application of Schroedinger Equation, Angular Momentum, Hydrogen Atom, Perturbation Theory, Many Electrons Systems.
Learning Objectives	1. Students are able to explain the idea of the emergence of quantum theory correctly. 2. Students are able to explain the principles of quantum theory and Schrodinger equation correctly. 3. Students are able to explain the application of Schrodinger's equation correctly. 4. Students are able to explain the concept of angular momentum, Hydrogen atom, perturbation theory and many electron system correctly.
Course Method	Lectures are held using lecture and discussion methods and use case-based study methods as support for application material from Quantum Physics. Video learning is used for the process of understanding the material.
Form of Examination	To be defined by lecturer at the beginning of course
Prerequisites	1. Mathematical physics Wave
Requirements according to the examination regulations	Minimum 80% attendance in this course
Reading list	1. R. E. Siregar (2018), Fisika Kuantum, Unpad Press, Bandung. . David J. Griffiths, Darrell F. Schroeter (2018), Introduction to Quantum Mechanics 3rd edition, Cambridge University Press, UK
Assessment Guidance	Rubrik case based (20);Tugas (20%); UTS (30%); UAS (30%)

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Introduction to Nuclear Physics

Academic Year	2022/2023
Code/ Semester	D10C20.4004 / 4th Semester
Course/ Credit points	Introduction to Nuclear Physics / 3 SKS ~ 5.43 ECTS
Language	Indonesian
Responsible Person	Annisa Aprilia
Lecturer	Annisa Aprilia, Norman Syakir
Workload	1. Lectures: 3 x 50 = 150 minutes per week. 2. Assignments: 3 x 60 = 180 minutes per week. Individual study: 3 x 60 = 180 minutes per week.
Contents	1. Nuclear Structure; 2. Concept of Quantum mechanics; 3. Radioactivity and nuclear decay; 4. Nuclear reaction; 5. Application of Radioactivity; Application of Nuclear Physics in energy and medicine
Learning Objectives	Learning Goals: 1. Students are able to describe the composition, characteristics, and physical principles applicable to the atomic nucleus. 2. Students are able to explain the dynamic phenomena of atomic nuclei and the underlying physical principles. Students are able to explain the technological applications of physical phenomena in nuclei.
Course Method	a. Lecture course: lecture presentation, interactive learning, quizzes (discussion and sharing). b. Interactive learning: presentation (Focus Group Discussion), Collaborative learning Homework/assignment: Problem based learning, Individual study
Form of Examination	To be defined by lecturer at the beginning of course
Prerequisites	1. Electricity and Magnetism 2. Modern Physics Waves
Requirements according to the examination regulations	Registered in this course, Minimum 80% attendance in this course
Reading list	1. Kenneth S. Krane, Introductory Nuclear Physics (2008). 2. John Lilley, Nuclear Physics: Principles and Applications (2001). J. Kenneth Shultis, Richard E. Faw, Douglas S. McGregor, (2016). Fundamentals of Nuclear Science and Engineering 3rd Edition. CRC Press.
Assessment Guidance	Rubric focus group discussion (presentation) (50%); Homework/assignment (10%); midterm exam (15%); final exam (25%)

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Advanced Physics Experiments

Academic Year	2022/2023
Code/ Semester	D10C20.4005/4th Semester
Course/ Credit points	Advanced Physics Experiments/1 SKS ~1.81 ECTS
Language	Indonesian
Responsible Person	Annisa Aprilia
Lecturer	Annisa Aprilia
Workload	1. Laboratory work 1 x 170 = 170 minutes per week. Individual Study
Contents	Atomic physics (Balmer series), optics (diffraction of light), wave (elastic gas resonance), electrodynamics (electron in fine beam tube), modern physics (stefan-boltzman), electronics and instrumentation, energy conversion (solar cell)
Objectives	Learning Goals: 1. Students able to plan and prepare several physics experiment in detailed (atomic physics, modern physics, wave, optics, electronics) 2. Students able to take correlation between theory and experiments of several physical phenomena (atomic physics, modern physics, wave, optics, electronics)
Course Method	Laboratory work: presentation (Focus Group Discussion), Individual Study: plan and prepare logbook, final report.
Form of Examination	To be defined by lecturer at the beginning of course
Prerequisites	1. Thermodynamic 2. Wave Modern Physics
Requirements according to the examination regulations	Registered in this course, Minimum 80% attendance in this course
Reading list	Adrian C. Melissinos and Jim Napolitano, Experiment in Modern Physics, Academic Press, 2011 Steve Adams, Advanced Physics (Advanced Sciences) 2nd UK ed. Edition, Oxford University Press, USA, 2013
Assessment Guidance	Rubric activity laboratory work: Activity work (40%) ; Final report (35%); pre-test (10%); post-tes (15%)

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Computational Physics

Academic Year	2022/2023
Code/ Semester	D10C20.4007 / 4th Semester
Course/ Credit points	Computational Physics / 2 SKS ~ 3.62 ECTS
Language	Indonesian
Responsible Person	Sahrul Hidayat
Lecturer	Sahrul Hidayat, Ferry Faizal
Workload	1. Lectures : 2 x 50 = 100 minutes per week. 2. Assignments : 2 x 60 = 120 minutes per week. Private learning : 2 x 60 = 120 minutes per week.
Contents	Review of Python programming, Euler Method, Kuta Runge Method and Monte Carlo method. The physical cases of spring, damped spring, free fall motion, pendulum, bullet motion and RLC circuit solution are discussed. At an advanced stage, we will introduce the solution of PDE cases using the Finite Difference and Finite Difference Time Domian method. Examples cased of PDE solutions in the physical case of diffusion, Laplace and Poisson cases in temperature distribution and electric field, 1D wave propagation, and 2D wave propagation are discussed.
Learning Objectives	1. Able to understand and analyze physical cases based 2. Able to reconstruct physical cases and express them into mathematical language using a numerical approach 3. Able to create algorithms to obtain solutions to physical cases 4. Able to translate the case solution algorithm into python programming 5. Able to animate simple physical problems in the case of ODE and PDE Able to analyze the suitability of physical case solutions based on the theory of physics
Course Method	*Contextual Instruction and case based study*
Form of Examination	Essay (case study)
Prerequisites	1. Algorithm and Programming Numerical Computation
Requirements according to the examination regulations	Registered in this course Minimum 80% attendance in this course
Reading list	1. Rubin H Landau and Manuel Jose Paez, *Computational Problems for Physics*, Taylor & Francis Group, 2018 2. Nicholas J Giordano, Hisao Nakanishi, *Computaional Physics with Matlab*, 2012
Assessment Guidance	Case based rubric (25); assignment (25%); midterm exam (25%); final exam (25%)

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Environmental Physics

Academic Year	2022/2023
Code/ Semester	D10C20.4201/ 4th Semester
Course/ Credit points	Environmental Physics / 2 SKS ~ 3.62 ECTS
Language	Indonesian
Responsible Person	Norman Syakir
Lecturer	Norman Syakir
Workload	1. Lectures: 2 x 50 = 100 minutes per week. 2. Assignments: 2 x 60 = 120 minutes per week. Individual study: 2 x 60 = 120 minutes per week.
Contents	1. Environmental concept, characteristics, and quality of human environmental and its problems with a physical approach. 2. The nature of substance according to the transfer molecules, humidity, and temperature factors. 3. Concept of environmental radiation ant its effect to the human livings. 4. The relevance of properties of noise, vibration, and sounds impact to the environment. Apply the concept of significant impacts and alternatives for handle the impacts.
Learning Objectives	Learning Goals: 1. Students able to understand and explain environmental problems in the life including the problem of sounds sources, physical quantities. 2. Students able to calculate the effect of temperature in the environment, explain the effect of radiation on humans and calculate the intensity of radiation.
Course Method	1. Lecture course: lecture presentation, interactive learning quizzes (discussion and sharing). 2. Interactive learning: presentation (Focus Group Discussion), Homework/assignment: Problem set, Individual study
Form of Examination	To be defined by lecturer at the beginning of course
Prerequisites	-
Requirements according to the examination regulations	Registered in this course, Minimum 80% attendance in this course
Reading list	1. J.F., Gabriel, 2001, Fisika Lingkungan, Hipokrates, Jakarta 2. John Monteith, Mike Unsworth, Principles of Environment Physics 3. Sastrawijaya. 1991, Pencemaran lingkungan. Rineka Cipta. Jakarta John L. Monteith and Mike H. Unsworth, 2014. Principles of Environmental Physics. Elsevier.
Assessment Guidance	Rubric focus group discussion (presentation) (20%); Homework/assignment (20%); middle exam (30%); final exam (30%)

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Energy Conversion

Academic Year	2022/2023
Code/ Semester	D10C20.4202 / 4th Semester
Course/ Credit points	Energy Conversion / 2 SKS ~ 3.62 ECTS
Language	Indonesian
Responsible Person	Otong Nurhilal
Lecturer	Otong Nurhilal, Cukup Mulyana
Workload	1. Lectures : 2 x 50 = 100 minutes per week. 2. Assignments : 2 x 60 = 120 minutes per week. Private learning : 2 x 60 = 120 minutes per week.
Contents	Introduction, the basic principles of energy conversion, the main sources of energy conversion, thermal energy conversion, mechanical energy conversion, electrical energy conversion (generator, termionic, thermoelectric), fuel cell energy conversion, battery and supercapacitor electrical energy conversion.
Learning Objectives	1. Able to understand the basic principles of energy conversion Able to understand and analyze the types of energy conversion
Course Method	Lectures are held by lecture and discussion methods. Giving assignments to test the accuracy of answering questions both in the form of concepts and problem solving.
Form of Examination	-
Prerequisites	Physics of energy
Requirements according to the examination regulations	Registered in this course Minimum 80% attendance in this course
Reading list	1. Energy Conversion 2nd edition. D. Yogi Goswani and Frank Kreith. 2017 Energy Conversion. by Kenneth C. Weston 2000
Assessment Guidance	Quiz (20%); Tasks (10%); MES (35%); FES (35%)

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Heat Transfer

Academic Year	2022/2023
Code/ Semester	D10C20.4203 / 4th Semester
Course/ Credit points	Heat Transfer / 2 SKS ~ 3.62 ECTS
Language	Indonesian
Responsible Person	Cukup Mulyana
Lecturer	Cukup Mulyana
Workload	1. Lectures: 2 x 50 = 100 minutes per week. 2. Assignments: 2 x 60 = 120 minutes per week. Private learning: 2 x 60 = 120 minutes per week.
Contents	Heat transfer courses explain heat transfer by conduction, convection and radiation. Followed by discussing heat transfer equipment.
Learning Objectives	1. Be able to understand the concept of 1D, 2D, steady and unsteady conduction heat transfer 2. Be able to understand the concept of forced and natural convection heat transfer 3. Be able to understand the concept of radiant heat transfer Able to understand the working principle of heat transfer equipment
Course Method	Lectures are held by lecture and discussion methods. Giving assignments after each subject is finished is given to students to test their ability to master concepts and the accuracy of answering questions.
Form of Examination	-
Prerequisites	Fundamental Physics
Requirements according to the examination regulations	Registered in this course Minimum 80% attendance in this course
Reading list	1. Holman, J.P. (2010). Heat transfer (10th ed.). New York : McGraw-Hill, a business unit of the McGraw- Hill] Companies, Inc., 1221 Avenue of the americas, New York,. Retrieved from www.mhhe.com 2. John H Lienhard IV, Dr. John H Lienhard V. 2019. A Heat Transfer Textbook: Fifth Edition. Dover Publications
Assessment Guidance	Quiz (20%); Tasks (10%); MES (35%); FES (35%)

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PHYSICS

Robotics

Academic Year	2022/2023
Code/ Semester	D10C20.4205/ 4th Semester
Course/ Credit points	Robotics / 2 credits ~ 3.62 ECTS
Language	Indonesian
Responsible Person	I Made Joni
Lecturer	I Made Joni
Workload	1. Course: 4 x 50 = 200 minutes per week. Private learning : 2 x 60 = 120 minutes per week.
Contents	1. Classification of robots according to their functions 2. Robot system hardware 3. Software for Robot control systems 4. Sensors and Actuators in Robots 5. Review of the approach to Mathematical Models in Robots Functional Robot Manufacturing Project
Learning Objectives	1. Able to know and understand the workings of the types of robots according to their functions 2. To understand how the components work in a robot, either independently or integrated, explain the use of each basic electronic component in a robot, and analyze the problems that can occur in these components 3. To understand the use of a software to complete robot movements and be able to make commands in software language on robots. 4. To explain the use of actuators and sensors and design according to the robot's functionalization 5. To explain and make calculations and mathematical models needed in the design of intelligent robots To make proposals and design functional robotic systems
Course Method	Lecture, Discussion and Practice
Form of Examination	Presentation, quiz/assignment, test
Prerequisites	Microcontroller, Control System
Requirements according to the examination regulations	Registered in this course Minimum 80% attendance in this course
Reading list	Robotic: Fundamental Concept and Analysis, Oxford University Press, Second reprint, 2008 Bruno Siciliano and Oussama Khatib, Springer Handbook of Robotics, 1st Eds., 2008, 978-3-540-30301-5, doi: 10.1007/978-3-540-30301-5 Richard M. Murray, A Mathematical Introduction to Robotic Manipulation 1st Edition, 1994 - CRC Press, ISBN 9780849379819 Peter Mckinnon, 2016. Robotics: Everything You Need to Know About Robotics from Beginner to Expert. CreateSpace Independent Publishing Platform.
Assessment Guidance	Assignment (30%); Midterm Test (30%); Final Project (40%)

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Data Science

Academic Year	2022/2023
Code/ Semester	D10C20.4206 / 4th Semester
Course/ Credit points	Data Science / 2 SKS ~ 3.62 ECTS
Language	Indonesian
Responsible Person	Ferry Faizal
Lecturer	Ferry Faizal
Workload	1. Lectures : 2 x 50 = 100 minutes per week. 2. Assignments : 2 x 60 = 120 minutes per week. Private learning : 2 x 60 = 120 minutes per week.
Contents	Data Science, Machine learning, Data analysis, Statistics, Virtual Private Server (VPS), Problem Statement, Data Collection, Cleaning Datasets (Data accuracy), Data Quality Issue (Mean, median and modus), Data Analysis, Data Modeling, Communication Result
Objectives	1. Creating a well-defined problem statement is the first and critical step in data science. 2. Data collection methods, with a systematic approach to gathering relevant information from various sources. 3. Data quality analysis that will produce accurate data that takes into account the mean, mode, and median values. 4. Modeling that formulates each step and gathers the necessary techniques to reach a solution. Communicating the results, in a way that is easy to understand, so that stakeholders can make actionable plans.
Course Method	Lectures are conducted using lecture and discussion methods and use case-based study methods as support for application material from Quantum Physics. Learning videos are used for the process of understanding the material.
Form of Examination	To be defined by lecturer at the beginning of course
Prerequisites	Numerical computation
Requirements according to the examination regulations	Minimum 80% attendance in this course
Reading list	1. David Donoho, 50 years of Data Science, Sept. 18, 2015, Version 1.00. 2. Fionn Murtagh,and Keith Devlin, The Development of Data Science: Implications for Education,Employment, Research, and the Data Revolution for Sustainable Development, Big Data Cogn. Comput. 2018, 2, 14
Assessment Guidance	Rubrik case based (20);Tugas (20%); UTS (30%); UAS (30%)

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Artificial Intelligence

Academic Year	2022/2023
Code/ Semester	D10C20.4207 / 4th Semester
Course/ Credit points	Artificial Intelligence/ 2 SKS ~ 3.62 ECTS
Language	Indonesian
Responsible Person	Budi Adiperdana
Lecturer	Budi Adiperdana
Workload	1. Lectures: 2 x 50 = 100 minutes per week. 2. Assignments: 2 x 60 = 120 minutes per week. Individual study: 2 x 60 = 120 minutes per week.
Contents	1. Introduction to Artificial Intelligence (AI) 2. Search Methods 3. Machine Learning 4. Evolutionary Algorithm 5. Fuzzy Logic Cellular Automata
Objectives	Learning Goals: 1. Students able to know history and development of AI, understand the concept of finding the best solutions, agent and their environment, and state space and search space. 2. Students able understand and applied informed and uninformed search methods to real life case. 3. Students able to understand the concept of pattern recognition through supervised and unsupervised machine learning concept. 4. Students able to understand and applied evolutionary algorithm to real cases. 5. Student able to understand and applied fuzzy logic concept to real cases. Student able to understand and applied cellular automata concept.
Course Method	1. Lecture course: lecture presentation, interactive learning quizzes (discussion and sharing). 2. Interactive learning: exercise and presentation, Individual study: homework/assignment and project
Form of Examination	To be defined by lecturer at the beginning of course
Prerequisites	Algorithm dan Programming, and Numerical Methods
Requirements according to the examination regulations	Minimum 80% attendance in this course
Reading list	1. Russel, Norvig (2021). Artificial Intelligence: A Modern Approach, Global Edition 4th., Pearson. Tim Jones (2008) Artificial Intelligence: A System Approach, Infinity Science Press.
Assessment Guidance	Homework/assignment (40%); final project (60%)

UNPAD
PHYSICS

The Physics of Anatomy and Physiology

Academic Year	2022/2023
Code/ Semester	D10C20.4208/ 4th Semester
Course/ Credit points	The Physic of Anatomy & Physiology/ 2 credits ~ 3.62 ECTS
Language	Indonesian
Responsible Person	Norman Syakir
Lecturer	Norman Syakir
Workload	Course: 4 x 50 = 200 minutes per week. Private learning : 2 x 60 = 120 minutes per week.
Contents	Part I Structure of cells-tissues-organ-systems-individual- electrical overview: • Load and Potential, Potential gradient, Ionic charge distribution, Ionic concentration gradient • Cell anatomy and cell membrane Ionic channels in the cell membrane • Mathematical/electronic model of ionic channels Action Potential, models and simulations Network anatomy • Impulse Propagation, core-conductor models, cable equations • electrical propagation in neural networks Organs and Organ Systems • Electricity in the Heart, Brain and Muscles Stimuli Part II • DNA Structure and Genetic Information
Learning Objectives	1.Students are able to understand the structural and functional/physiological levels of living things starting from the simplest level in terms of physical phenomena (electrical, mechanical, optical, informatics). 2.Students are able to simulate several models of physical phenomena that occur at the structural levels of living things and examine the results.
Course Method	Lecture, Discussion and Practice
Form of Examination	Presentation, quiz/assignment, test
Prerequisites	Microcontroller, Control System
Requirements according to the examination regulations	Registered in this course Minimum 80% attendance in this course
Reading list	Robotic: Fundamental Concept and Analysis, Oxford University Press, Second reprint, 2008 Bruno Siciliano and Oussama Khatib, Springer Handbook of Robotics, 1st Eds., 2008, 978-3-540-30301-5, doi: 10.1007/978-3-540-30301-5 Richard M. Murray, A Mathematical Introduction to Robotic Manipulation 1st Edition, 1994 - CRC Press, ISBN 9780849379819 Peter Mckinnon, 2016. Robotics: Everything You Need to Know About Robotics from Beginner to Expert. CreateSpace

	Independent Publishing Platform.
Assessment Guidance	Assignment (30%); Midterm Test (30%); Final Project (40%)

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The Physics of Atmosphere

Academic Year	2022/2023
Code/ Semester	D10C20.4209 / 4th Semester
Course/ Credit points	The Physics of Atmosphere / 2 SKS ~ 3.62 ECTS
Language	Indonesian
Responsible Person	Nowo Riveli
Lecturer	Nowo Riveli
Workload	1. Lectures : 2 x 50 = 100 minutes per week. 2. Assignments : 2 x 60 = 120 minutes per week. Private learning : 2 x 60 = 120 minutes per week.
Contents	Structure and Characteristics of Earth's atmosphere, Thermodynamis of the atmosphere, Radiative process, Clouds, Cimate, Atmospheric measurements model and instrumentation
Objectives	1. Able to understand the structure and characteristics of the Earth's atmosphere 2. Able to understand the application of thermodynamics on Earth's atmosphere 3. Able to understand the electromagnetic radiative processes on Earth's atmosphere 4. Able to understand the structure the concept of clouds 5. Able to understand the Earth's climate and it's changes Able to understand models and measurements of atmospheric quantities
Course Method	Lectures and Discussions, with Demonstration Assignments consists of writing, problem solving, and observations/experiments.
Form of Examination	To be defined by lecturer at the beginning of course
Prerequisites	-
Requirements according to the examination regulations	Registered in this course, Minimum 80% attendance in this course
Reading list	1. Wallace, J. M. and Hobbs P. V., Atmospheric Science an Introductory Survey, 2nd edn: ELsevier, 2006 2. Andrews, D. G., An Introduction to Atmospheric Physics, 2nd edn: Cambridge University Press, 2010 3. Robert Zakinyan, Arthur Zakinyan. (2022) Physics of the Atmosphere, Climatology and Environmental Monitoring. Springer.
Assessment Guidance	Quiz (20%); Assignments (10%); MES (35%); FES (35%)

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Renewable Energy

Academic Year	2022/2023
Code/ Semester	D10C20.4210 / 4th Semester
Course/ Credit points	Renewable Energy / 2 SKS ~ 3.62 ECTS
Language	Indonesian
Responsible Person	Cukup Mulyana
Lecturer	Cukup Mulyana
Workload	1. Lectures: 2 x 50 = 100 minutes per week. 2. Assignments: 2 x 60 = 120 minutes per week. Private learning: 2 x 60 = 120 minutes per week.
Contents	Renewable energy courses explain energy sources that come from wind energy, solar energy, water energy, geothermal energy, ocean wave energy, ocean energy.
Objectives	1. Be able to understand the concept of electrical energy from the wind 2. Be able to understand the concept of electrical energy from the sun 3. Be able to understand the concept of electrical energy from water 4. Be able to understand the concept of electrical energy from geothermal energy 5. Be able to understand the concept of electrical energy from ocean waves 6. Be able to understand the concept of electrical energy from the ocean
Course Method	Lectures are held by lecture and discussion methods. Giving assignments after each subject is finished is given to students to test their ability to master concepts and the accuracy of answering questions.
Prerequisites	Energy physics
Requirements according to the examination regulations	Registered in this course Minimum 80% attendance in this course
Reading list	1. Renewable Energy Resourses, John Twidell and Tiny Weir 3rd edition 2015 2. Power Plant Engineering, A.K. Raja, Amit P. Srivastava, Manish Dwivedi, 2006.
Assessment Guidance	Quiz (20%); Tasks (10%); MES (35%); FES (35%)
Academic Year	2022/2023

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Community Service Course

Academic Year	2022/2023
Code/ Semester	UNX10.050020/ 4th Semester
Course/ Credit points	Community Service Course (KKN) / 3 SKS ~ 5.43 ECTS
Language	Indonesian
Responsible Person	Sahrul Hidayat
Lecturer	Team teaching university, Sahrul Hidayat
Workload	Field Activity: 3 x 170 = 510 minutes per week.
Contents	Community service in certain village relate with the research topic and community service of supporting lecturers (managed by University)
Objectives	Learning Goals: 1. Students have an experience to directly apply the physics knowledge to the public. 2. Students able to connect between physics knowledge and all aspect in the social public. 3. Students are able to socialize with community life to develop creativity and innovation. Students have a sense of empathy for the village community and its problems.
Course Method	Interactive learning: presentation (Focus Group Discussion), Social work, activity field and teamwork.
Form of Examination	To be defined by lecturer at the beginning of course
Prerequisites	-
Requirements according to the examination regulations	Registered in this course, Minimum 80% attendance in this course
Reading list	Rhonda Phillips and Robert Pittman, "An Introduction to Community Development", 2nd Edition, Routledge USA, 2014
Assessment Guidance	Rubric focus group discussion (presentation) (20%); Student activity (20%); Final report (30%)

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MODULE HANDBOOK

YEARS 3

UNDERGRADUATE PROGRAM IN PHYSICS

FACULTY OF MATHEMATICS AND NATURAL SCIENCES
UNIVERSITAS PADJADJARAN 2023

Fundamental Physics

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PHYSICS

Applied Physics Expertise Lab Work

Academic Year	2023/2024
Code/ Semester	D10C20.5001 / 5th Semester
Course/ Credit points	Applied Physics Expertise Lab Work / 1 SKS ~ 1.81 ECTS
Language	Indonesian
Responsible Person	Annisa Aprilia
Lecturer	Annisa Aprilia
Workload	1. Laboratory work 1 x 170 = 170 minutes per week. Individual Study
Contents	1. Conversion and conservation energy. 2. Thermoelectric 3. Electrodynamics: Magnetic, Hall effect 4. X-ray Diffraction Electronics and Instrumentation
Objectives	Learning Goals: 1. Students able to plan and prepare several physics experiment in detailed. 2. Students able to take correlation between theory and experiments of several physical phenomena.
Course Method	Laboratory work: presentation (Focus Group Discussion), Individual Study: plan and prepare logbook, final report.
Form of Examination	To be defined by lecturer at the beginning of course
Prerequisites	1. Thermodynamics 2. Electrodynamics 3. Electronics 4. Experimental Physics Experimental Physics (Advanced)
Requirements according to the examination regulations	Registered in this course, Minimum 80% attendance in this course
Reading list	1. Adrian C. Melissinos and Jim Napolitano, Experiment in Modern Physics, Academic Press, 2011. 2. Electronics, Sutrisno, Penerbit ITB. 1986 3. John Adler & Sutono. 2020. Elektronika Dasar. Informatika, ISBN 9786237131267
Assessment Guidance	Rubric activity laboratory work: Activity work (40%); Final report (35%); pre-test (10%); post-test (15%)

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Introduction to Solid State Physics

Academic Year	2023/2024
Code/ Semester	D10C20.5002/ 5th Semester
Course/ Credit points	Introduction to Solid State Physics / 4 SKS ~ 7.24 ECTS
Language	English, Indonesian
Responsible Person	Risdiana
Lecturer	Risdiana, Norman Syakir, Otong Nurhilal
Workload	1. Lecturer 4 x 50 = 150 minutes per week. 2. Assignments: 4 x 60 = 180 minutes per week. Individual study: 4 x 60 = 180 minutes per week.
Contents	1. The concept of crystal structure, 2. The concept of bonding forces and bonds between atoms in crystals, 3. Heat Capacity according to Einstein and Debye, 4. Free electrons in a crystal, 5. The energy band theory, 6. Semiconductor materials, 7. Electron dynamics in metals, The concept of magnetism and its applications.
Objectives	Students are able to understand, explain and classify various crystal structures, understand and explain binding forces and atomic bonds in crystals and crystal lattice, understand and explain the concept of specific heat as a function of temperature according to Einstein and Debye, understand and explain the concept of free electrons in crystals, energy band theory and application of this energy band theory to semiconductor materials and linking energy band theory with electron dynamics in metals, understanding, explaining and classifying the concept of magnetism as well as various examples of magnetic materials and their applications.
Course Method	Student Center Learning, Problem-Based Learning
Form of Examination	To be defined by lecturer at the beginning of course
Prerequisites	Modern Physics, Quantum Physics, Wave
Requirements according to the examination regulations	Registered in this course, Minimum 80% attendance in this course
Reading list	C. Kittel (2005), Introduction to Solid State Physics, John Wiley and Sons, Inc, 8th edition. G. Grosso, G.P Parravicini, Solid State Physics 2nd Edition, Academic Press, 2013 James D. Patterson, Bernard C. Bailey, Solid-State Physics, Introduction to the Theory, Springer, 2018
Assessment Guidance	Assignments in the form of exercises and discussions in the form of presentations. The stages of levels of difficulty of the questions correspond to the stages of understanding that must be achieved by students. The presentation and discussion of the mate

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Optics

Academic Year	2023/2024
Code/ Semester	D10C20.5003/ 5th Semester
Course/ Credit points	Optics / 2 SKS ~ 3.62 ECTS
Language	Indonesian
Responsible Person	Ayi Bahtiar
Lecturer	Ayi Bahtiar, Budi Adiperdana
Workload	1. Lectures: 2 x 50 = 100 minutes per week. 2. Assignments: 2 x 60 = 120 minutes per week. Private learning: 2 x 60 = 120 minutes per week.
Contents	Review the Electromagnetic (EM) wave equation in dielectric and metallic mediums and their boundary conditions, Refractive index of dielectric and metal (concept and measuring techniques), reflection and refraction at the dielectric-dielectric and metal-dielectric boundary, Attenuated Total Reflection (ATR) and Surface Plasmon, 1-Dimensional Layered Medium (multilayer 1D and Reflector Bragg), Waveguide (Planar waveguide and optical fiber), Integrated optical device for all-optical signal processing.
Learning Objectives	1. Able to explain the refractive index of dielectric medium and metals and its measurement techniques and its consequences in the propagation of EM waves, 2. Able to calculate the transmittance and reflectance on a 1D periodic layered medium using analytical and numerical methods, 3. Able to analyze the propagation of EM waves on planar waveguides and optical fiber, Able to design integrated optical devices for high-speed optical signal processing (all-optical signal processing).
Course Method	At the beginning of the lecture for each topic, an explanation of the basic concepts is given and followed by working on problems that are done in the class and/or at home as homework and case study
Form of Examination	To be defined by lecturer at the beginning of course
Prerequisites	Electricity and Magnetism, Waves, Algorithm and Programming, Numerical Computation
Requirements according to the examination regulations	Minimum 80% attendance in this course
Reading list	1. J. E. Houle and D. M. Sullivan, "Electromagnetic Simulation Using The FDTD Method with Phyton", 3rd Edition, John Wiley & Sons, Inc, 2020, 2. B. E. A. Saleh and M. C. Teich, “Fundamental of Photonics”, 3rd Edition, John Wiley & Sons Inc., 2019.
Assessment Guidance	Student work/assignments (30%); Case study (30%); Midterm exam (20%); Final term exam (20%)

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Statistical Physics

Academic Year	2023/2024
Code/ Semester	D10C20.5004/ 5th Semester
Course/ Credit points	Statistical Physics/ 2 credits ~ 3.62 ECTS
Language	Indonesian
Responsible Person	I Made Joni
Lecturer	I Made Joni, Nowo Riveli
Workload	1. Course: 4 x 50 = 200 minutes per week. Private learning : 2 x 60 = 120 minutes per week.
Contents	Macroscopic and Microscopic view of physical phenomena, N-Particle system and statistic, Ensemble of Physical system, Distribution of Particles Energy (Maxwell-Boltzmann, Fermi-Dirac, Bose Einstein)
Learning Objectives	1. Students are able to correctly explain the position of the Physics of Statistics course and its relation to the Laws of Thermodynamics, probability theory, types of thermodynamic systems, kinetic theory of gases in statistical equilibrium systems in a classical view. 2. Able to correctly demonstrate the statistical mechanics equilibrium ensemble applied to Quantum-Mechanical systems on Fermion particles, Bosons, correctly and show and explain examples of its application. 3. Able to correctly compare Maxwel-Boltzman, Bose-Enstein, Fermi-Dirac distributions and their application to various systems.
Course Method	Lecture, Discussion and Practice
Form of Examination	Presentation, quiz/assignment, test
Prerequisites	Thermodynamics and Quantum Physics
Requirements according to the examination regulations	Registered in this course Minimum 80% attendance in this course
Reading list	Kerson Huang, 2001, “Statistical Physics” , Routledge Landau, 2014, “Guide to Montecarlo in Statistical Physics” , Cambridge University Press
Assessment Guidance	Assignment (30%); Midterm Test (30%); Final Project (40%)

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Energy Physics

Academic Year	2023/2024
Code/ Semester	D10C20.5201 / 5th Semester
Course/ Credit points	Energy Physics / 2 SKS ~ 3.62 ECTS
Language	Indonesian
Responsible Person	Otong Nurhilal
Lecturer	Otong Nurhilal, Cukup Mulyana, Sahrul Hidayat, Mulia Juarsa
Workload	1. Lectures : 2 x 50 = 100 minutes per week. 2. Assignments : 2 x 60 = 120 minutes per week. Private learning : 2 x 60 = 120 minutes per week.
Contents	Introduction, Mechanical Energy, energy conservation, heat and work, residential energy conservation and heat system control, solar energy, fossil energy, air pollution, global warming and thermal pollution, electricity, circuits and superconductors, electricity and magnetization, electricity from the sun, wind and water, atoms and nuclei, nuclear plants, fission reactions, effects of using radiation, fusion reactions (alternative future energy), biomass and geothermal
Objectives	1. Able to understand the basic principles of energy 2. Able to understand the energy sources Able to understand and analyze the energy resources and their utilization
Course Method	Lectures are held by lecture and discussion methods. Giving assignments to test the accuracy of answering questions both in the form of concepts and problem solving.
Prerequisites	Fundamental Physics
Requirements according to the examination regulations	Registered in this course Minimum 80% attendance in this course
Reading list	Roger A. Hinrichs & Merlin Kleinbach (2013). Energy: Its Use and the Environment. Fifth Edition, Publisher Brooks/Cole: cencage Learning.
Assessment Guidance	Quiz (20%); Tasks (10%); MES (35%); FES (35%)
Academic Year	2023/2024

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Instrumentation Physics

Academic Year	2023/2024
Code/ Semester	D10C20.5202/ 5th Semester
Course/ Credit points	Instrumentation Physics/ 2 credits ~ 3.62 ECTS
Language	Indonesian
Responsible Person	Andri Abdurrochman
Lecturer	Andri Abdurrochman
Workload	1. Course: 4 x 50 = 200 minutes per week. Private learning : 2 x 60 = 120 minutes per week.
Contents	1. Static characteristics and dynamic characteristics of instrumentation; 2. The working principle of sensors and transducers; 3. Analog and digital measurements; 4. Microprocessor; 5. Signal/image conditioning and processing; Communication and data transmission
Learning Objectives	1. Students can understand, be able to explain and classify the static and dynamic characteristics of instrumentation 2. Students can explain the working principles of sensors, transducers, and apply analog and digital measurement techniques. 3. Students can understand, explain and apply microprocessors, signal/image processing and communication and data transmission.
Course Method	Lecture, Discussion and Practice
Form of Examination	Presentation, quiz/assignment, test
Prerequisites	Fundamental Physics, Mathematical Physics, Electronics
Requirements according to the examination regulations	Registered in this course Minimum 80% attendance in this course
Reading list	Roger A. Hinrichs & Merlin Kleinbach (2013). Energy: Its Use and the Environment. Fifth Edition, Publisher Brooks/Cole Mark, Melvin and Arthur R. Foster. 1979. Thermodynamics. New York: Allyn and Bacon,Inc Handbook of Modern Sensors : Physics, Designs and Application, 2nd Ed. (Fraden, J., 1996, Springer-Verlag NY Inc.) Analog and Digital Signal Processing (Ambardar, A., 1999, Brooks/Cole Publishing)' Digital Image Processing (Gonzales, 2002, Prentice-Hall Inc.)' Microprocessor and Digital System (Hall, 1983, McGraw-Hill)
Assessment Guidance	Assignment (30%); Midterm Test (30%); Final Project/Test (40%)

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Material Physics

Academic Year	2023/2024
Code/ Semester	D10C20.5203 / 5th Semester
Course/ Credit points	Material Physics / 2 SKS ~ 3.62 ECTS
Language	Indonesian
Responsible Person	Norman Syakir
Lecturer	Norman Syakir
Workload	1. Lectures: 2 x 50 = 100 minutes per week. 2. Assignments: 2 x 60 = 120 minutes per week. Individual study: 2 x 60 = 120 minutes per week.
Contents	1. Basic concept of material science: atomic, solid state 2. Characteristics and properties of Material: Electrical, optical, semiconductors, thermal, and mechanical. Application of selected material in technology related to its characteristics and properties
Objectives	Learning Goals: 1. Students able to describe the atomic structure from some elements in periodic tables and classify the bonding type of molecule. 2. Students able to describe of materials structure and classify the materials based on their characteristics and properties. 3. Students able to describe the relation between material characteristics with technology and applications.
Course Method	1. Lecture course: lecture presentation, interactive learning quizzes (discussion and sharing). 2. Interactive learning: presentation (Focus Group Discussion), homework/assignment: Problem based learning, Individual study
Form of Examination	To be defined by lecturer at the beginning of course
Prerequisites	-
Requirements according to the examination regulations	Registered in this course, Minimum 80% attendance in this course
Reading list	1. W. D. Callister, Materials Science and Engineering: An Introduction 7th edition, John Wiley, Singapore 2007 S. M. Sze, Semiconductor Devices: Physics and Technology, 2nd Edition, John Wiley & Sons Ltd, New York. 1981 3. Mary Anne White. 2019. Physical Properties of Materials, Third Edition, CRC Press
Assessment Guidance	Rubric focus group discussion (presentation) (20%); Homework/assignment (20%); middle exam (30%); final exam (30%)

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Nano-science

Academic Year	2023/2024
Code/ Semester	D10C20.5204/ 5th Semester
Course/ Credit points	Nano-science / 2 credits ~ 3.62 ECTS
Language	Indonesian
Responsible Person	Camellia Panatarani
Lecturer	Camellia Panatarani
Workload	1. Lectures: 2 x 50 = 100 minutes per week. 2. Assignments: 2 x 60 = 120 minutes per week. Individual study: 2 x 60 = 120 minutes per week.
Contents	1. Introduction of the Course 2. Introduction to Nanoscience 3. Effect of Nanostructure/Size on Material Properties 4. The Physics of Nanoscale Synthesis and Characterization of Nanomaterials
Learning Objectives	Course Learning Outcomes(CLO): After completing the Nanoscience course, students are able to develop an understanding of the latest developments in nanoscience and apply nanoscience concepts in the fields of energy, environment or health with quality and measurability.
Course Method	1. Lecture course: lecture presentation, interactive learning quizzes (discussion and sharing), Quiz. 2. Interactive learning: presentation (Focus Group Discussion and Small Group Discussion), Case-based learning, and problem-based learning 3 homework/assignment: Case Study, Individual study
Form of Examination	To be defined by lecturer at the beginning of course
Prerequisites	Solid State Physics
Requirements according to the examination regulations	Registered in this course, Minimum 80% attendance
Reading list	1. Alain Nouailhat, An Introduction to Nanoscience and Nanotechnology, John Wiley & Sons, Inc., Hokoben, USA, 2008 2. C. Dupas P. Houdy M. Lahmani (Eds.), Nanoscience Nanotechnologies and Nanophysics, Springer-Verlag Berlin Heidelberg 2007 Wolfram Schommers. 2019. Basic Physics of Nanoscience. Elsevier.
Assessment Guidance	Assessment is on the basis of the assignment that have been done by students. The percentage of the achievement for Sub-CLO 2, 3, 4, 5 is 10% per Sub-CLO while Sub-CLO 6 and 7 is 30% for each Sub-CLO.

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Material Synthesis Method

Academic Year	2023/2024
Code/ Semester	D10C20.5205 / 5th Semester
Course/ Credit points	Material Synthesis Method / 2 SKS ~ 3.62 ECTS
Language	**English**
Responsible Person	Togar Saragi
Lecturer	Togar Saragi
Workload	1. Lectures: 2 x 50 = 100 minutes per week. 2. Assignments: 2 x 60 = 120 minutes per week. Individual study: 2 x 60 = 120 minutes per week.
Contents	1. Organic and Inorganic, Polar and non-Polar solvents 2. Solid State Reaction Method, 3. Coprecipitation, Sol-Gel and Hydrothermal Method 4. Reflux and Colloidal Method Polymer Synthesis by Addition and Condensation method
Learning Objectives	Learning Goals: 1. Students will be able to know the process of synthesizing inorganic matter. 2. Students will be able to know the process of synthesizing organic matter. Students will be able to know the process of synthesizing polymer matter.
Course Method	1. Lecture course: lecture presentation, interactive learning quizzes (discussion and sharing). 2. Interactive learning: exercise and presentation, Individual study: homework/assignment
Form of Examination	To be defined by lecturer at the beginning of course
Prerequisites	-
Requirements according to the examination regulations	Registered in this course, Minimum 80% attendance in this course
Reading list	1. C. Barry Carter and M. Grant Norton, Ceramic_Materials_Science_and_Engineering, Springer, 2007 2. Eduardo Vivaldo-Lima and Enrique Saldivar- Guerra, Handbook of Polymer Synthesis, Characterization, and Processing, 1st Edition, John Wiley and Sons, Inc., 2013
Assessment Guidance	Quizzes (10%); Homework/assignment (20%); middle exam (35%); final exam (35%)

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Digital Signal Processing

Academic Year	2023/2024
Code/ Semester	D10C20.5202/ 5th Semester
Course/ Credit points	Digital Signal Processing/ 2 credits ~ 3.62 ECTS
Language	Indonesian
Responsible Person	Andri Abdurrochman
Lecturer	Andri Abdurrochman, I Made Joni
Workload	1. Course: 4 x 50 = 200 minutes per week. Private learning : 2 x 60 = 120 minutes per week.
Contents	• Analog-discrete (digital) transformation • Discrete Transformation & Z-Transform Convolution & Correlation • Digital filters: FIR and IIR • Spectrum estimation and analysis
Learning Objectives	Students can understand, explain, use and analyze electronic signal conditioning so that it can be processed quickly and accurately.
Course Method	Lecture, Discussion and Practice
Form of Examination	Presentation, quiz/assignment, test
Prerequisites	Mathematical Physics, Wave Physics
Requirements according to the examination regulations	Registered in this course minimum 80% attendance in this course
Reading list	• Digital Signal Processing: A Practical Approach (Ifeachor & Jervis, 1995, Addison-Wesley) • Analog and Digital Signal Processing (Ambardar, A., 1999, Brooks/Cole Publishing) • Digital Signal Processing: Principles and Applications (Thomas Holton, 2021, Cambridge University Press)
Assessment Guidance	Assignment (30%); Midterm Test (30%); Final Project/Test (40%)

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Design of Electronic System and Microcontroller

Academic Year	2023/2024
Code/ Semester	D10C20.5207/ 5th Semester
Course/ Credit points	Design of Electronic System and Microcontroller/ 2 credits ~ 3.62 ECTS
Language	Indonesian
Responsible Person	I Made Joni
Lecturer	I Made Joni, Ferry Faizal
Workload	Course: 4 x 50 = 200 minutes per week. Private learning : 2 x 60 = 120 minutes per week.
Contents	1. System planning/design, instrumentation and control systems 2. Assembling circuits, testing and building systems using applications. 3. Simulation of analog and digital circuit planning for instrumentation and control systems. 4. Analysis of instrumentation system performance. 5. Integration of hardware and software. 6. Communication system planning and its application.
Learning Objectives	1. Students are able to plan and design instrumentation and control systems. 2. Students are able to design and implement PCBs and simulate designs with the Simulink application. 3. Students are able to make analog and digital circuit planning simulations for instrumentation and control systems using software. 4. Students are able to make test instruments and determine test patterns. 5. Students are able to plan hardware & software integration with system interfaces (RS232/USB). 6. Students are able to design wireless data communication devices and integrate them with software.
Course Method	Lecture, Discussion and Practice
Form of Examination	Presentation, quiz/assignment, test
Prerequisites	Electronics
Requirements according to the examination regulations	Registered in this course Minimum 80% attendance in this course
Reading list	1. Horowitz, P., Hill, W., 1995, The Art of Electronics, Cambridge. 2. Williams, T. , 2005 , The Circuit Designer's Companion, Newnes. Co 3. Cooper W. D. And Helfrick A. D.,1988, Electronic Instrumentation and Measurement Techniques. Prentice- Hall Inc. 4. Gupta B. R.,2003. Electronics and Instrumentation. S.

	Chand & Company Ltd Khurana Rohit, 2015. Electronic Instrumentation and Measurement. Vikas Publishing House
Assessment Guidance	Assignment (30%); Midterm Test (30%); Final Project/Test (40%)

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Biomass

Academic Year	2023/2024
Code/ Semester	D10C20.5208 / 5th Semester
Course/ Credit points	Biomass / 2 SKS ~ 3.62 ECTS
Language	Indonesian
Responsible Person	Otong Nurhilal
Lecturer	Otong Nurhilal, Noto Susanto
Workload	1. Lectures : 2 x 50 = 100 minutes per week. 2. Assignments : 2 x 60 = 120 minutes per week. 3. Private learning : 2 x 60 = 120 minutes per week.
Contents	Characteristics of biomass, briquetting, pyrolysis, torrefaction, gasification, carbon materials and characterization of carbon materials.
Objectives	1. Able to understand the characteristics of biomass 2. Able to understand and apply the concept of biobriquette 3. Able to understand and apply the concept of pyrolysis 4. Able to understand and apply the concept of torrefaction 5. Able to understand and apply the concept of gasification 6. Be able to understand the properties of carbon materials Able to understand the characterization of carbon materials
Course Method	Lectures are held by lecture and discussion methods. Giving assignments to test the accuracy of answering questions both in the form of concepts and problem solving.
Prerequisites	Physics of energy
Requirements according to the examination regulations	Registered in this course Minimum 80% attendance in this course
Reading list	Prabir Basu. Biomass gasification and pyrolysis : practical design and theory. Elsevier, 2010 K R Hakeem, M Jawaid, U Rashid. Biomass and Bioenergy: Processing and Properties. Springer, 2014
Assessment Guidance	Quiz (20%); Tasks (10%); MES (35%); FES (35%)
Academic Year	2023/2024

UNPAD
PHYSICS

Fluid Dynamics

Academic Year	2023/2024
Code/ Semester	D10C20.5209 / 5th Semester
Course/ Credit points	Fluid Dynamics / 2 SKS ~ 3.62 ECTS
Language	Indonesian
Responsible Person	Budi Adiperdana
Lecturer	Budi Adiperdana, Cukup Mulyana
Workload	1. Lectures: 2 x 50 = 100 minutes per week. 2. Assignments: 2 x 60 = 120 minutes per week. Private learning: 2 x 60 = 120 minutes per week.
Contents	Heat transfer courses explain Introduction and Basic Concepts, Properties Of Fluids, Pressure And Fluid Statics, Fluid Kinematics, Mass, Bernoulli, And Energy Equations, Momentum Analysis Of Flow Systems, Flow In Pipes, Dimensional Analysis And Modeling.
Objectives	1. Be able to understand the Basic Concepts 2. Be able to understand the concept of Properties of Fluids 3. Be able to understand the concept of Fluid Kinematics 4. Be able to understand the concept of Flow in Pipes Be able to understand the concept of modelling
Course Method	Lectures are held by lecture and discussion methods. Giving assignments after each subject is finished is given to students to test their ability to master concepts and the accuracy of answering questions.
Prerequisites	Fundamental Physics
Requirements according to the examination regulations	Registered in this course Minimum 80% attendance in this course
Reading list	1. Fluid mechanics: fundamentals and applications / Yunus A. Çengel, John M. Cimbala.-1st ed. p. cm.— (McGraw-Hill series in mechanical engineering). **2006**. 2. Peter S. Bernard, **2015**. Fluid Dynamics 1st Edition. Cambridge University Press.
Assessment Guidance	Quiz (20%); Tasks (10%); MES (35%); FES (35%)

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PHYSICS

Sensor and Actuator

Academic Year	2023/2024
Code/ Semester	D10C20.5207/ 5th Semester
Course/ Credit points	Sensor and Actuator/ 2 credits ~ 3.62 ECTS
Language	Indonesian
Responsible Person	Andri Abdurrochman
Lecturer	Andri Abdurrochman
Workload	1. Course: 4 x 50 = 200 minutes per week. Private learning : 2 x 60 = 120 minutes per week.
Contents	Sensor characteristics, elements and characterization, sensor element domains, sensor basic principles, sensor electronics circuits, sensor calibration, actuators, electrical and mechanical actuators, pneumatics, hydraulics, and integration of sensor and actuator systems.
Learning Objectives	1. Students can understand, explain, identify, implement/apply, the basic principles of sensors, types of sensors and their electronic circuits. 2. Students can understand, explain, identify, apply/apply actuator systems 3. Students can explain and apply to sensor and actuator system integration applications.
Course Method	Lecture, Discussion and Practice
Form of Examination	Presentation, quiz/assignment, test
Prerequisites	Fundamental Physics I&II, Electromagnetics, Electronics
Requirements according to the examination regulations	Registered in this course minimum 80% attendance in this course
Reading list	(1) Y.L. Lin, "Smart Sensors and Systems", Springer, 2015; (2) S. Soloman, "Sensors Handbood", 2nd, Mc Graw Hill, Newyork, 2009; (3) Jacob Fraden, "Handbook of Modern Sensors: Physics, Designs, and Applications", Fourth Edition, Springer, New York, 2010
Assessment Guidance	Assignment (30%); Midterm Test (30%); Final Project/Test (40%)

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PHYSICS

Radiation Physics and Dosimetry

Academic Year	2023/2024
Code/ Semester	D10C20.5211 / 5th Semester
Course/ Credit points	Radiation Physics and Dosimetry / 2 SKS ~ 3.62 ECTS
Language	Indonesian
Responsible Person	Nowo Riveli
Lecturer	Nowo Riveli
Workload	1. Lectures : 2 x 50 = 100 minutes per week. 2. Assignments : 2 x 60 = 120 minutes per week. Private learning : 2 x 60 = 120 minutes per week.
Contents	Types of radiations, nuclear and atomic radiation processes, interaction between radiation and matter, measurement of radiation quantities, radiation detector.
Learning Objectives	1. Able to identify and understand types of radiation and its characteristics 2. Able to understand nuclear and atomic processes that produce radiation 3. Able to understand the interaction between radiation and matter 4. Able to understand the concepts of radiation measurements Able to understand the principle of radiation detectors
Course Method	Lectures and Discussions, with Demonstration. Assignments consists of writing, problem solving, and observations/experiments.
Form of Examination	To be defined by lecturer at the beginning of course
Prerequisites	-
Requirements according to the examination regulations	Registered in this course, Minimum 80% attendance in this course
Reading list	1. Podgorsak, E. B. Radiation Physics for Medical Physicists, 2nd edn: Springer, 2010 2. Podgorsak, E. B. Radiation Oncology Physics: a Handbook for Teachers and Students: IAEA 2005 3. Mayles, P. et al. Handbook of Radiotherapy Physics: Theory and Practice: Taylor & Francis 2007 Bailey, D. L. Nuclear Medicine Physics, A Handbook for Teachers and Students: IAEA 2014
Assessment Guidance	Quiz (20%); Assignments (10%); MES (35%); FES (35%)

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PHYSICS

Asset Integrity Management of Geothermal and Gas Power Plant Facilities

Academic Year	2023/2024
Code/ Semester	D10C20.5212 / 5th Semester
Course/ Credit points	Asset Integrity Management of Geothermal and Gas Power Plant Facilities / 3 SKS ~ 5.43 ECTS
Language	Indonesian
Responsible Person	Otong Nurhilal
Lecturer	Otong Nurhilal, Cukup Mulyana
Workload	1. Lectures: 3 x 50 = 150 minutes per week. 2. Assignments: 3 x 60 = 180 minutes per week. Private learning: 3 x 60 = 180 minutes per week.
Contents	Power plants or power generation installations from both fossil (oil and gas, coal) and non-fossil energy (eg water, wind and geothermal) are very important and strategic assets in the economic and industrial life of a country, so to ensure a power plant operate safely, all equipment involved and used must have very high reliability and integrity to avoid failure or damage that leads to the risk of power black-out. With integrity management including understanding: Design concept, Metal damage mechanism, Inspection techniques, and Reliability study and engineering calculations, it is expected that the equipment can operate safely according to the design life.
Learning Objectives	1. Be able to know the physics that underlies Power Plant facilities and Equipment 2. Able to know the Power Plant Equipment Design Concept 3. Able to understand the damage mechanism and equipment failure mode 4. Able to understand the procedures for inspection and characterization of power plant equipment 5. Able to perform calculation analysis and analyze the residual life and remaining strength of power plant equipment
Course Method	Lectures are held by lecture and discussion methods. Giving assignments to test the accuracy of answering questions both in the form of concepts and problem solving.
Form of Examination	Fundamental physics, Mathematical Physics
Prerequisites	2023/2024
Requirements according to the examination regulations	Registered in this course Minimum 80% attendance in this course
Reading list	1. William J, Callister Jr & David G. Rethwisch, Materials Science and Engineering, An Introduction, John Wiley & Sons, Inc. 2018. 2. Dr. Peter McClean Millar, Asset Integrity

	Management Handbook (Free eBook).2015.
Assessment Guidance	Quiz (20%); Tasks (10%); MES (35%); FES (35%)

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PHYSICS

Computational Physical System

Academic Year	2023/2024
Code/ Semester	D10C20.5213 / 5th Semester
Course/ Credit points	Computational Physical System / 2 SKS ~ 3.62 ECTS
Language	Indonesian
Lecturer	Budi Adiperdana
Workload	1. Lectures: 2 x 50 = 100 minutes per week. 2. Assignments: 2 x 60 = 120 minutes per week. Private learning: 2 x 60 = 120 minutes per week.
Contents	1. Models, Mathematical Models and Modelling Physical System 2. SIR Model 3. Monte Carlo Approach 4. Lennard-Jones Model 5. Ising Model 6. Single and multi-Processing 7. Introduction to Density Functional Theory Methods Final Project
Learning Objectives	1. Understand the concept of modelling, mathematical model and modelling a physical system 2. Able to design and analyze physical systems using differential equations in disease-spreading case 3. Able to understand, analyze and solve problems using Monte Carlo approach for complex system 4. Able to understand, analyze and solve computational problems using parallel processing 5. Able to understand, analyze and solve problems in computational material science using density functional theory for solids and molecules.z Able to collaboratively and communicate effectively as part of a final project team
Course Method	Lectures, case-based study and final project
Form of Examination	To be defined by the lecturer at the beginning of course
Prerequisites	Algorithm and Programming, Numerical Methods, Computational Physics, Statistical Physics (recommended), Solid State Physics (recommended), Quantum Physics (recommended)
Requirements according to the examination regulations	Registered in this course Minimum 80% attendance in this course
Reading list	1. Nicholas J Giordano, Hisao Nakanishi, Computational Physics with Matlab, 2012 1. Clayton & Hills, Statistical Models in Epidemiology, 2013 2. Werner Krauth, Statistical Mechanics: Algorithms and Computations. 2006 Peter W. Atkins, Ronald S. Friedman, Molecular Quantum Mechanics 5th Edition. 2010 Richard M. Martin, Electronic Structure: Basic Theory and Practical Methods 1st Edition. 2008

Assessment Guidance	Assignment and quizzes (40%); case based (20%); final project (40%)

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Thin Film Technology

Academic Year	2022/2023
Code/ Semester	D10C20.6202 / 6th Semester
Course/ Credit points	Thin Film Technology / 3 SKS ~ 5.43 ECTS
Language	Indonesian
Responsible Person	Fitrilawati
Lecturer	Fitrilawati
Workload	1. Lectures : 2 x 50 = 100 minutes per week. 2. Assignments : 2 x 60 = 120 minutes per week. Private learning : 2 x 60 = 120 minutes per week.
Contents	Introduction, Deposition techniques using Solution Method (solution casting, deep coating, spincoating, doctor blading, screen printing, spraycoating, electrospinning), Self Assembled Monolayer, Langmuir Blodgett Khunn, Electrochemical technique, Physical Vapor Deposition (PVD), Sputtering (RF, DC), Ion Sputtering, Pulsed Laser Deposition (PLD), Chemical Vapor Deposition (CVD): Molecular Organic-CVD (MOCVD), Plasma Enhanced CVD (PECVD), Molecular Beam Epitaxy (MBE)
Objectives	Students are able to explain the unique properties of thin films Students are able to explain basic deposition principle of organic using various solution techniques Students are able to explain the basic principle of self- assembled monolayer and Langmuir Blodget Kuhn technique Students are able to explain the basic principle of physical vapour deposition techniques Students are able to explain the basic principle of chemicall vapour deposition techniques Students are able to explain the basic principle molecular beam epitaxy
Course Method	**Case based study**, with help of visualization using vedeo. reading list, hand outs of each topics provided by the lecture.
Form of Examination	To be defined by lecturer at the beginning of course
Prerequisites	Material Physics
Requirements according to the examination regulations	Registered in this course, Minimum 80% attendance in this course
Reading list	1. M. C. Petty, Organic Thin Film Deposition Techniques in Encyclopedia of Nanoscience and Nanotechnology Volume 8 Number 1 (ed. H.S Nalwa) page 295, 2004 2. Hartmut Frey • Hamid R. Khan Editors, Handbook of Thin- Film Technology, Springer-Verlag Berlin Heidelberg 2015
Assessment Guidance	Quiz (20); Problem Set of each topics (20%); Mid-test (30%); Final-test (30%)

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Material Characterization Technique

Academic Year	2022/2023
Code/ Semester	D10C20.5207/ 6th Semester
Course/ Credit points	Material Characterization Technique/ 2 credits ~ 3.62 ECTS
Language	Indonesian
Responsible Person	Ayi Bahtiar
Lecturer	Ayi Bahtiar, Fitrilawati, Norman Syakir
Workload	1. Course: 4 x 50 = 200 minutes per week. Private learning : 2 x 60 = 120 minutes per week.
Contents	UV-Vis and FTIR Spectroscopy Techniques, TEM and SEM Electron Microscopy Techniques, DTA and TGA thermal analysis techniques, Hall effect technique, EIS electrochemical impedance technique, Potentiostat and galvanostat techniques
Learning Objectives	1. Students will be able to understand and know the right/required type of characterization as well as analyze the results of UV-Vis and FTIR spectroscopy characterization 2. Students will be able to understand and know the right/required type of characterization as well as analyze the results of the characterization of the TEM and SEM Electron Microscopy Techniques) 3. Students will be able to understand and know the right/required type of characterization as well as analyze the results of the spectroscopic characterization of DTA and TGA thermal analysis techniques 4. Students will be able to understand and know the right/required type of characterization as well as analyze the results of the Hall effect technique characterization 5. Students will be able to understand and know the right/required type of characterization as well as analyze the results of the EIS electrochemical impedance technique characterization 6. Students will be able to understand and know the right/required type of characterization as well as analyze the results of the potentiostat and galvanostat technique characterization
Course Method	Lecture, Discussion and Practice
Form of Examination	Presentation, quiz/assignment, test
Prerequisites	Material Physics
Requirements according to the examination regulations	Registered in this course Minimum 80% attendance in this course
Reading list	1. Laurence M. Harwood, Timothy D.W. Claridge, 1997, Introduction to Organic Spectroscopy, Oxford University Press. 2. Mool Chand Gupta, 2001, Atomic and Molecular Spectroscopy, New Age International (P) Limited, Publishers Günter Gauglitz, David S. Moore. 2014. Handbook of Spectroscopy. Wiley.

Assessment Guidance	Assignment (30%); Midterm Test (30%); Final Project/Test (40%)

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Optical Communication System

Academic Year	2022/2023
Code/ Semester	D10C20.6204/ 6th Semester
Course/ Credit points	Optical Communication System / 2 SKS ~ 3.62 ECTS
Language	Indonesian
Responsible Person	Ayi Bahtiar
Lecturer	Ayi Bahtiar, Andri Abdurrachman
Workload	1. Lectures: 2 x 50 = 100 minutes per week. 2. Assignments: 2 x 60 = 120 minutes per week. Private learning: 2 x 60 = 120 minutes per week.
Contents	Introduction to optical communication systems (OCS), Device components of OCS, Propagation of electromagnetic waves in optical fiber, Operational characteristics of OCS, High capacity and high-speed OCS and the latest development of future optical communication systems
Learning Objectives	1. Able to analyze device components in OCS, 2. Able to analyze the operational characteristics and performance of OCS, 3. Able to design high-capacity and high-speed OCS, 4. Able to identify the future of optical system communication.
Course Method	At the beginning of the lecture, an explanation of the basic concept and working principle of optical system communication (OCS) and the needs for future OCS is given, followed by working on case study and assignments. The students must write the papers and present them in the class
Form of Examination	To be defined by lecturer at the beginning of course
Prerequisites	1. Waves Optics
Requirements according to the examination regulations	Minimum 80% attendance in this course
Reading list	1. M.O. Tjia dan R.E. Siregar, “Pengantar Sistem Komunikasi Serat Optik”, Penerbit ITB, 2016. 2. Govind G. Agrawal, “Fiber-Optic Communication Systems”, 5th Edition, Wiley, 2021. 3. R. Hui, "Introduction to Fiber-Optic Communications", Academic Press-Elsevier, UK, 2020.
Assessment Guidance	Student work/assignments (30%); Case study (30%); Midterm exam (20%); Final term exam (20%)

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Magnetic Materials and Superconductors

Academic Year	2022/2023
Code/ Semester	D10C20.6205 /6th semester
Course/ Credit points	Magnetic Materials and Superconductors / 2 SKS ~ 3.62 ECTS
Language	Indonesian
Responsible Person	Togar Saragi
Lecturer	Togar Saragi
Workload	1. Lecturer 2 x 50 = 100 minutes per week. 2. Assignments: 2 x 60 = 120 minutes per week. Individual study: 2 x 60 = 120 minutes per week.
Contents	1. Magnetic field, Magnetic moment 2. Magnetic measurement 3. Properties, characteristics, and applications of magnetic materials Properties, characteristics, and applications of superconductor
Learning Objectives	1. Students are able to analyze the structure, properties and behavior of spin in magnetic materials 2. Students are able to explain the concept of experiments and measurements of magnetic materials 3. Students are able to demonstrate the relationship between magnetic fields and moments with the properties and applications of magnetic and superconducting materials
Course Method	Student Center Learning, Problem-Based Learning
Form of Examination	To be defined by lecturer at the beginning of course
Prerequisites	Introduction to Solid State Physics
Requirements according to the examination regulations	Registered in this course, Minimum 80% attendance in this course
Reading list	1. C. Kittel (2005), Introduction to Solid State Physics, John Wiley and Sons, Inc, 8th edition. 2. Mourachkine (2003), Room-Temperature Superconductivity, Cambridge. 3. S. Blundell (2003), Magnetism in Condensed Matter, Oxford University Press. Risdiana (2015), Superkonduktor, Sifat Dasar dan Karakteristiknya, Unpad Press
Assessment Guidance	Assignments in the form of exercises and discussions in the form of presentations. The stages of levels of difficulty of the questions correspond to the stages of understanding that must be achieved by students. The presentation and discussion of the mate

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Functional Materials

Academic Year	2022/2023
Code/ Semester	D10C20.6206 / 6th Semester
Course/ Credit points	Functional Materials / 2 SKS ~ 3.62 ECTS
Language	Indonesian
Responsible Person	Annisa Aprilia
Lecturer	Annisa Aprilia
Workload	1. Lectures: 2 x 50 = 100 minutes per week. 2. Assignments: 2 x 60 = 120 minutes per week. Individual study: 2 x 60 = 120 minutes per week.
Contents	1. General Introduction in Functional materials: Application, Importance of Material Sciences, History, Principals to classify and Order, Structure-property- correlations, Phases and Crystals 2. Phenomenological properties of Functional Materials 3. Functional Materials and their applications; selected material
Learning Objectives	Learning Goals: 1. Students able to describe the properties of materials and its characteristics. 2. Students able to identify functional material for certain application by individual paper works. 3. Students able to analyze the multifunctional materials for application technology in accordance with its properties.
Course Method	1. Lecture course: lecture presentation, interactive learning quizzes (discussion and sharing). 2. Interactive learning: presentation (Focus Group Discussion), 3. homework/assignment: Problem based learning, Individual study
Form of Examination	To be defined by lecturer at the beginning of course
Prerequisites	-
Requirements according to the examination regulations	Registered in this course, Minimum 80% attendance in this course
Reading list	1. Hasse Frederiksson, Physics of Functional Material, John Wiley and Sons, Stockholm, 2008 2. S. Banerjee and A. K. Tyagi (Eds), Functional Materials: Preparation, Processing and Applications, Elsevier, Boston 2012. 3. Ewa Klodzinska. 2015. Functional Materials: Properties, Performance and Evaluation. Apple Academic Press.
Assessment Guidance	Quizzes (10%); Homework/assignment (20%); middle exam 4. (35%); final exam (35%)

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Particle Physics

Academic Year	2022/2023
Code/ Semester	D10C20.6207 / 6th Semester
Course/ Credit points	Particle Physics / 2 SKS ~ 3.62 ECTS
Language	Indonesian
Responsible Person	Liu Kin Men
Lecturer	Liu Kin Men
Workload	1. Lectures : 2 x 50 = 100 minutes per week. 2. Assignments : 2 x 60 = 120 minutes per week. Private learning : 2 x 60 = 120 minutes per week.
Contents	Types of elementary particles, fundamental interactions, relativistic kinematics, symmetry and consevation laws, quantum electrodynamics.
Learning Objectives	1. Able to understand the origin of elementary particles discoveries 2. Able to understand types if fundamental interactions. 3. Able to understand Special Relativity 4. Able to understand the symmetry principle. Able to understand Quantum Electrodynamics
Course Method	Lectures and Discussions, Problem solving Assignments
Form of Examination	To be defined by lecturer at the beginning of course
Prerequisites	-
Requirements according to the examination regulations	Registered in this course, Minimum 80% attendance in this course
Reading list	1. David J. Griffiths, 2008, Introduction to Elementary Particles, 2nd edition, Wiley. 2. Francis Halzen, Alan D. Martin, 1984, Quarks and Leptons: An Introductory Course in Modern Particle Physics, 1st edition, Wiley.
Assessment Guidance	Quiz (20%); Assignments (10%); MES (35%); FES (35%)

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Battery System

Academic Year	2022/2023
Code/ Semester	D10C20.6208 / 6th Semester
Course/ Credit points	Battery System / 2 SKS ~ 3.62 ECTS
Language	Indonesian
Responsible Person	Sahrul Hidayat
Lecturer	Sahrul Hidayat
Workload	1. Lectures : 2 x 50 = 100 minutes per week. 2. Assignments : 2 x 60 = 120 minutes per week. Private learning : 2 x 60 = 120 minutes per week.
Contents	Basic concepts and classification of batteries, electrochemical principles of batteries, identifying factors affecting battery performance, battery standardization, design/construction for battery safety, research developments in Li-ion batteries, Li-Sulfur batteries, Lithium Nickel batteries as well as packaging design and battery safety security.
Learning Objectives	1. Able to describe the basic principles of batteries in general 2. Able to write battery electrochemical reactions for commonly used battery types 3. Able to identify factors that affect battery performance 4. Able to analyze factors that affect battery safety 5. Know and be able to explain the development of research on Li-Ion batteries, Li-Sulfur, Li-Nickel etc
Course Method	*Contextual Instruction* and *Small Group Discussion*
Form of Examination	Essay
Prerequisites	-
Requirements according to the examination regulations	Registered in this course Minimum 80% attendance in this course
Reading list	1. T.R. Crompton, **Battery Reference Book 3th** edition, Newnes 2000 Reiner Korthauer, **Lithium-Ion Batteries: Basics and Applications**, Springer 2018
Assessment Guidance	SGD rubric (25); assignment (25%); midterm exam (25%); final exam (25%)

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Medical Instrumentation

Academic Year	2022/2023
Code/ Semester	D10C20.6209/ 6th Semester
Course/ Credit points	Medical Instrumentation/ 2 credits ~ 3.62 ECTS
Language	Indonesian
Responsible Person	Andri Abdurrochman
Lecturer	Andri Abdurrochman
Workload	1. Course: 4 x 50 = 200 minutes per week. Private learning : 2 x 60 = 120 minutes per week.
Contents	1. Typical sensors used in Medical Instrumentation 2. Electrodes and biopotentials 3. Biopotential booster 4. Measurement of blood flow and respiratory system Biosensors and clinical laboratory instrumentation
Learning Objectives	Student are able to acquire knowledge on application of the principle of Instrumentation toward health aspect of human being.
Course Method	Lecture, Discussion and Practice
Form of Examination	Presentation, quiz/assignment, test
Prerequisites	Instrumentation of Physics, Electronics, Fundamental Physics, Physics of Anatomy and Physiology
Requirements according to the examination regulations	Registered in this course minimum 80% attendance in this course
Reading list	Medical Instrumentation: Application and Design (Webster, 1992, Houghton Mifflin) Biophysical Measurements (Strong, P., 1970, Tektronix) Handbook of Biomedical Instrumentation (Khandpur, 2014 MC Graw Hill India)
Assessment Guidance	Assignment (30%); Midterm Exam(30%); Final Project/Test (40%)

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Networking, Instrumentation & Data Logger

Academic Year	2022/2023
Code/ Semester	D10C20.6209/ 6th Semester
Course/ Credit points	Networking, Instrumentation & Data Logger / 2 credits ~ 3.62 ECTS
Language	Indonesian
Responsible Person	Ferry Faizal
Lecturer	Ferry Faizal
Workload	1. Course: 4 x 50 = 200 minutes per week. Private learning : 2 x 60 = 120 minutes per week.
Contents	Introduction to Network Systems, OSI & TCP/IP Reference Model and Wiring Techniques, Hardware and software instrumentation data acquisition system, Wireless data acquisition on local computer network-based instrumentation systems, Web-Based Instrumentation System (Hardware and Software), Proposal and Design of a Web-based Instrumentation System with a wireless data acquisition system
Learning Objectives	Student are able to understand and know the OSI & TCP/IP reference model and make network cabling Student are able to understand and apply systematically and according to Hardware and Software Instrumentation data acquisition systems Student are able to understand and design systematically and suitable for wireless data acquisition on local computer network-based instrumentation systems Student are able to understand and design Web-Based Instrumentation systems (Hardware and Software) Student are able to make proposals and design Web-based Instrumentation Systems with wireless data acquisition systems
Course Method	Lecture, Discussion and Practice
Form of Examination	Presentation, quiz/assignment, test
Prerequisites	Instrumentation of Physics
Requirements according to the examination regulations	Registered in this course Minimum 80% attendance in this course
Reading list	1. John Park and Steve Mackay, Practical Data Acquisition for Instrumentation and Control Systems, Newnes , 2003, ISBN-10: 0750657960 2. Mathivanan, PC-based Instrumentation: Concepts and Practice, Prentice Hall of India; 1st edition (2007), ISBN-10: 8120330765 3. W. Stallings, Wireless Communications and Networks. Pearson Prentice Hall, 2002. 4. B. A. Forouzan, DATA COMMUNICATIONS AND NETWORKING, vol. 32. 2010 Larry L. Peterson & Bruce S. Davie, “Computer Network A System Approach 6th edition”, 2021
Assessment Guidance	Assignment (30%); Midterm Exam (30%); Final Project/Test (40%)

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UNDERGRADUATE PROGRAM

UNPAD
PHYSICS

Technology of Optoelectronics

Academic Year	2022/2023
Code/ Semester	D10C20.6211/ 6th Semester
Course/ Credit points	Technology of Optoelectronics / 2 SKS ~ 3.62 ECTS
Language	Indonesian
Responsible Person	Ayi Bahtiar
Lecturer	Ayi Bahtiar
Workload	1. Lectures: 2 x 50 = 100 minutes per week. 2. Assignments: 2 x 60 = 120 minutes per week. Private learning: 2 x 60 = 120 minutes per week.
Contents	Roadmap of Technology development of optoelectronics beyond 2020, Light Emitting Diode (LED/OLED), Display, Photodetector, Thin Film Transistors, Solar Cells, Integrated optoelectronic devices and Printing technology for flexible optoelectronic devices (printed technology for optoelectronic devices)
Learning Objectives	1. Able to analyze the structure and working principles of optoelectronic devices correctly, 2. Able to design integrated optoelectronic devices correctly, 3. Able to identify the latest technology in flexible optoelectronic devices correctly.
Course Method	At the beginning of the lecture, an explanation of the basic concept and working principle of optoelectronic devices is given, followed by working on case study and assignments. The students must write the papers and present them in the class.
Form of Examination	To be defined by lecturer at the beginning of course
Prerequisites	1. Electronics Optics
Requirements according to the examination regulations	Minimum 80% attendance in this course
Reading list	1. Simon M. Sze, Ming-Kwei Lee, "Semiconductor Devices: Physics and Technology- International Student Version", 3rd Edition, Wiley, 2012, 2. S.D. Brotherton, "Introduction to Thin Film Transistors: Physics and Technology of TFTs", Springer, 2013, 3. S. Ahmad, S. Kazim and M. Grätzel, "Perovskite Solar Cells: Materials, Processes, and Devices", Wiley-VCH Weinheim Germany, 2022, 4. Colin Tong, "Advanced Materials for Printed Flexible Electronics", Springer, 2022.
Assessment Guidance	Student work/assignments (30%); Case study (30%); Midterm exam (20%); Final term exam (20%)

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Biomaterial & Biosensor

Academic Year	2022/2023
Code/ Semester	D10C20.6212/ 6th semester
Course/ Credit points	Biomaterial & Biosensor / 2 SKS ~ 3.62 ECTS
Language	Indonesian
Responsible Person	Ferry Faizal
Lecturer	Ferry Faizal
Workload	1. Lecturer 2 x 50 = 150 minutes per week. 2. Assignments: 2 x 60 = 180 minutes per week. Individual study: 2 x 60 = 180 minutes
Contents	1. Introduction, Implant & Biocompatibility 2. Material: Metal, Ceramics, Polymer, Composite as biomaterials 3. Review of material synthesis methods and their characterization 4. Sensing, transducer Material characterization and biosensors
Learning Objectives	Students can explain the importance of biomaterials for various applications, identify criteria and types, identify the essential characteristics of biomaterials, and report the results systematically. Students can examine the potential of a material as a biosensor material and apply the principles of measurement instrumentation to the properties of materials that have potential as biosensors (optical, electronic).
Course Method	Class discussion, quiz and project-presentation
Form of Examination	To be defined by lecturer at the beginning of course
Prerequisites	Solid State Physics, Instrumentation
Requirements according to the examination regulations	Registered in this course, Minimum 80% attendance in this course
Reading list	1. Vasif Hasirci, Nesrin Hasirci (2018) Fundamental of Biomaterial, Springer NY 2. Chandran Karunakaran, Kalpana Bhargava, Robson Benjamin (2015) Biosensors and Bioelectronics, Elsevier
Assessment Guidance	rubric/peer assessment, quiz

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Solar Panels

Academic Year	2023/2024
Code/ Semester	D10C20.6213 / 6th Semester
Course/ Credit points	Solar Panels / 2 SKS ~ 3.62 ECTS
Language	Indonesian
Responsible Person	Sahrul Hidayat (**PIC**), Noto Susanto Gultom
Lecturer	1. Lectures : 2 x 50 = 100 minutes per week. 2. Assignments : 2 x 60 = 120 minutes per week. Private learning : 2 x 60 = 120 minutes per week.
Workload	Principles of Solar Cells, Silicon Based Solar Cells, Solar Cells based on Thin Film Technology, Solar cells based on organic materials and Perovsikte, Solar cells based on hybrid materials (organic/inorganic), Basics of Solar Panel Installation, Charge controller and Inverter, ON Grid Solar Panel System, Solar Panel Installation Project.
Contents	1. Able to explain the physics concepts involved in solar cells and their working principles 2. Able to explain the development of solar panel technology, namely silicon-based, thin film technology-based and hybrid material-based 3. Able to install a simple solar panel system consisting of a solar panel module, charge controller, battery and electrical system Able to test the performance of solar panels and are able to analyze them
Learning Objectives	Lectures and project based learning
Course Method	Essay and project presentation
Form of Examination	-
Prerequisites	Registered in this course Minimum 80% attendance in this course
Requirements according to the examination regulations	1. Physics of Solar Cells, From Basic Principles to Advaned Concepts, Peter Wurfel and Uli Wurfel, Wiley-VCH Verlag GmbH & Co, 2016 Aplikasi Sel Surya: Sistem Sel Surya Wearable, Fitria Hidayanti, LP_UNAS, 2021
Reading list	project based rubric (25); assignment (25%); midterm exam (25%); final exam (25%)
Assessment Guidance	2023/2024

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Polymer Material

Academic Year	2022/2023
Code/ Semester	D10C20.6214/ 6th Semester
Course/ Credit points	Polymer Material / 2 SKS ~ 3.62 ECTS
Language	Indonesian
Responsible Person	Fitrilawati
Lecturer	Fitrilawati
Workload	1. Lectures: 2 x 50 = 100 minutes per week. 2. Assignments: 2 x 60 = 120 minutes per week. Individual study: 2 x 60 = 120 minutes per week.
Contents	1. Introduction: Polymers around us and some terminology 2. Polymer synthesis 3. Polymer characterization 4. Polymer structure and properties 5. Polymer processing Polymer Applications
Learning Objectives	1. Students are able to explain some terminology in polymers and give examples of polymers around them. 2. Students are able to explain the polymer synthesis 3. Students are able to explain how to measure polymer characteristics and interpret the results. 4. Students are able to explain the correlation between polymer structure and its properties 5. Students are able to explain polymer processing methods Students are able to explain the application of polymers
Course Method	Lectures are carried out using the Case Based Learning method, where students are provided with instructional materials in the form of Learning Videos, Lecturer Notes and core Reference Books before the lecture.
Form of Examination	To be defined by lecturer at the beginning of course
Prerequisites	Material Physics
Requirements according to the examination regulations	Registered in this course Minimum 80% attendance in this course
Reading list	1. W. D. Callister, Materials Science and Engineering: An Introduction (John Wiley 2018, 10th edition) 2. Cowie, J.M.G., Polymers Chemistry and Physics of Modern Materials (3rd. ed.), CRC Press, Boca Raton, 2008 Fitrilawati, Kimia Fisika Polimer, Lecture Notes
Assessment Guidance	Student work/assignments (25%); Quiz (5%); Midterm exam (35%); Final presentation (35%)

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PHYSICS

Semiconductor

Academic Year	2022/2023
Code/ Semester	D10C20.6215/ 6th Semester
Course/ Credit points	Semiconductor / 2 SKS ~ 3.62 ECTS
Language	Indonesian
Responsible Person	Ayi Bahtiar
Lecturer	Ayi Bahtiar
Workload	1. Lectures: 2 x 50 = 100 minutes per week. 2. Assignments: 2 x 60 = 120 minutes per week. Individual study: 2 x 60 = 120 minutes per week.
Contents	Review of current development in devices and technology of semiconductors, energy band, and charge transport in semiconductor, transport phenomena, p-n junction, p-i-n junction, semiconductor-based devices (diode, transistor and solar cells).
Learning Objectives	1. Able to describe the current development of semiconductor based devices and technology, 2. Able to analyze energy band and intrinsic-extrinsic charge carriers in semiconductors, 3. Able to analyze charge transport phenomena in semiconductor 4. Able to analyze semiconductor p-n , p-i-n junctions Able to compare the working principle in semiconductor based devices (diode, transistor and solar cells).
Course Method	The lecture method used this course is contextual instruction. At the beginning of the lecture for each topic, an explanation of the basic concepts is given and followed by working on problems that are done in the class and/or at home as homework and case study. The students discuss the working principles of semiconductor devices based on p-n/p-i-n connections, such as diodes, transistors and solar cells.
Form of Examination	To be defined by lecturer at the beginning of course
Prerequisites	NA
Requirements according to the examination regulations	Registered in this course Minimum 80% attendance in this course
Reading list	1. Simon M. Sze, Ming-Kwei Lee, "*Semiconductor Devices: Physics and Technology*", 3rd Edition, John Wiley & Sons Inc., 2012. 2. Donald A. Neamen, "*Semiconductor Physics and Devices: Basic Principles*", 4th Edition, McGraw Hill, 2011. 3. S.D. Brotherton, "*Introduction to Thin Film Transistors: Physics and Technology of TFTs*", Springer, 2013. Newest scientific related articles on semiconductor based optoelectronic devices.
Assessment Guidance	Student work/assignments (35%); Case study (25%); Midterm exam (20%); Comprehensive evaluation (20%)

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MODULE HANDBOOK

YEARS 4

UNDERGRADUATE PROGRAM IN PHYSICS

FACULTY OF MATHEMATICS
AND NATURAL SCIENCES
UNIVERSITAS PADJADJARAN

2023

UNPAD
PHYSICS

Scientific Writing

Academic Year	2023/2024
Code/ Semester	D10C20.7203/ 7th Semester
Course/ Credit points	Scientific Writing / 2 credits ~ 3.62 ECTS
Language	Indonesian
Responsible Person	Camellia Panatarani
Lecturer	Camellia Panatarani
Workload	1. Course: 4 x 50 = 200 minutes per week. Private learning : 2 x 60 = 120 minutes per week.
Contents	Introduction to the types of scientific work, Anatomy of Scientific Work, Anatomy of Advanced Scientific Work, Theme, outline and framework of scientific work, Major and Framework of Scientific Work, Word Choices, Effective Sentences, Write Scientific Work (Research objectives, problem formulation, research methods, results and discussion, and conclusions), Plagiarism.
Learning Objectives	Student are: 1. Able to plan processes and formulate lecture material with proper and appropriate procedures (psychomotor work skills) 2. Able to analyze lecture material based on good and correct procedures (knowledge mastery - cognitive) 3. Able to manage and be responsible (managerial ability) 4. Be ethical, creative, communicative; and cooperate. Can make a scientific work
Course Method	Lecture, Discussion and Practice
Form of Examination	Presentation, quiz/assignment, test
Prerequisites	-
Requirements according to the examination regulations	Registered in this course Minimum 80% attendance in this course
Reading list	Essentials of Scientific Writing, Publisher EIAR Editor: Abebe K, 2014. ISBN: 978-99944-53-98-6 Joseph Mugah, (2016) Essentials of Scientific Writing, Author House
Assessment Guidance	Assignment (30%); Midterm Test (30%); Final Project/Test (40%)

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Measurement Techniques and Devices

Academic Year	2023/2024
Code/ Semester	D10C20.7202/ 7th Semester
Course/ Credit points	Measurement Techniques and Devices / 2 credits ~ 3.62 ECTS
Language	Indonesian
Responsible Person	Sahrul Hidayat
Lecturer	Sahrul Hidayat, Norman Syakir
Workload	1. Course: 4 x 50 = 200 minutes per week. Private learning : 2 x 60 = 120 minutes per week.
Contents	Typical instruments for basic physical quantities and the basic principles of measurement; Accuracy and accuracy of measurement results; Basic principles of measuring instruments such as galvanometers and voltmeters; Basic principles of measuring instruments L(inductor) C(capacitor) R(resistor) meter; Spatial quantity sensor (displacement, thickness, position, location, altitude); Sensors of temporal magnitude (time and frequency); Sensor of mechanical quantities of solids (mass, density, strain, torque); Sensors for mechanical quantities of liquids (pressure, flow, viscosity, surface tension); Sensors for thermal properties of objects (temperature, thermal conductivity, heat flow, thermal imaging, energy);
Learning Objectives	Students are able: 1. To complete independent assignments and group assignments well so that a responsible attitude is formed in their field and academic ethical norms. 2. To recognize the types of measuring instruments for basic physical quantities and the basic principles of measurement as well as the criteria for the accuracy and accuracy of measurements. 3. To understand the basic principles of physics measuring instruments such as galvanometers, voltmeters and LCR meters. 4. To understand and explain the basic principles of spatial and temporal measurement sensors and their implementation. 5. To understand and explain the basic principles of sensors for measuring the magnitude of solid objects and their implementation. 6. To understand and explain the basic principles of sensors for measuring the mechanical quantity of liquid objects and their implementation. To understand and explain the basic principles of thermal measurement sensors and their implementation.
Course Method	Lecture, Discussion and Practice
Form of Examination	Presentation, quiz/assignment, test
Prerequisites	Fundamental Physics I & II
Requirements according to	Registered in this course

the examination regulations	Minimum 80% attendance in this course
Reading list	John G. Webster (2017) Measurement, Instrumentation, and Sensors Handbook. CRC Press
Assessment Guidance	Assignment (30%); Midterm Test (30%); Final Project/Test (40%)

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Designing and Modeling of Physical System

Academic Year	2023/2024
Code/ Semester	D10C20.7203/ 7th Semester
Course/ Credit points	Designing and Modelling of Physical System / 2 credits ~ 3.62 ECTS
Language	Indonesian
Responsible Person	I Made Joni
Lecturer	I Made Joni
Workload	1. Course: 4 x 50 = 200 minutes per week. Private learning : 2 x 60 = 120 minutes per week.
Contents	Fundamentals of Physical System Modeling, Analysis of Dynamic Physical Systems, Block Diagram and PID Control System Application Modeling, Block Diagram and Predictive Control System Application Modeling, Modeling of Multivariable Physical Systems, Physical system modeling for Buck and Boost control, Application of Buck and Boost Controller for DC- DC conversion of renewable energy.
Learning Objectives	Student are: 1. Able to create and apply mathematical equation models and transfer function models of a dynamic physical system 2. Able to analyze the stability and dynamic responses of physical systems/processes 3. Able to empirically determine the dynamics of the physical system process by testing the step response data 4. Mamapu implemented various types of feedback control systems for physical process systems in the PID case study 5. Able to read and make physical process system block diagrams, create system designs and model feedback control, enactment, and predictive control. 6. Know and be able to model process systems and their interactions with multiple variables 7. Able to make mathematical models and models for Buck and Boost systems on DC-DC conversion systems, and use system modeling to design Buck-Boost Controllers for solar cell energy applications and windmill generators 8. Able to apply the MPPT control system to the Buck-boost system and process modeling, and able to use system modeling to design a Buck- Boost Controller for solar cell energy applications and windmill generators
Course Method	Lecture, Discussion and Practice
Form of Examination	Presentation, quiz/assignment, test
Prerequisites	Instrumentation of Physics, Control System
Requirements according to the examination regulations	Registered in this course Minimum 80% attendance in this course
Reading list	Johnson, C.D.(2006)."Process control instrumentation technology," Prentice-Hall, New Delhi Franklyn W. Kirk, Thomas A. Weedon, Phillip Kirk (2019)

	Instrumentation and Process Control 7th Edition. American Technical Publishers
Assessment Guidance	Assignment (30%); Midterm Test (30%); Final Project/Test (40%)

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Energy Conservations

Academic Year	2023/2024
Code/ Semester	D10C20.7204 / 7th Semester
Course/ Credit points	Energy Conservations / 2 SKS ~ 3.62 ECTS
Language	Indonesian
Responsible Person	Otong Nurhilal
Lecturer	Otong Nurhilal
Workload	1. Lectures : 2 x 50 = 100 minutes per week. 2. Assignments : 2 x 60 = 120 minutes per week. Private learning : 2 x 60 = 120 minutes per week.
Contents	Introduction, the concept of energy conservation, building structures, heating systems, cooling systems, power systems, water distribution systems, electrical data systems, compressed air systems and energy audit methods.
Learning Objectives	1. Able to understand the basic principles of energy conservation 2. Able to understand the structure and building system Able to understand and analyze the energy audits
Course Method	Lectures are held by lecture and discussion methods. Giving assignments to test the accuracy of answering questions both in the form of concepts and problem solving.
Form of Examination	-
Prerequisites	Registered in this course Minimum 80% attendance in this course
Requirements according to the examination regulations	Patrick, Dale R. et al, Energy Conservation Guidebook. Third edition 2014.
Reading list	Quiz (20%); Tasks (10%); MES (35%); FES (35%)
Assessment Guidance	2023/2024

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Geothermal Power Plant

Academic Year	2023/2024
Code/ Semester	D10C20.7205 / 7th Semester
Course/ Credit points	Geothermal Power Plant / 2 SKS ~ 3.62 ECTS
Language	Indonesian
Responsible Person	Otong Nurhilal
Lecturer	Otong Nurhilal
Workload	1. Lectures: 2 x 50 = 100 minutes per week. 2. Assignments: 2 x 60 = 120 minutes per week. Private learning: 2 x 60 = 120 minutes per week.
Contents	Fundamental of Power Plant, Non-Conventional Energy Resources and Utilization, Power Plant Economics and Variable Load Problem, Steam Power Plant, Steam Generator, Steam Turbine, Fuels and Combustion, Electrical System, Pollution and its Control.
Learning Objectives	1. Able to understand the basic concept of steam generator 2. Able to understand the steam generator system Able to understand steam generator system equipment
Course Method	Lectures are held by lecture and discussion methods. Giving assignments to test the accuracy of answering questions both in the form of concepts and problem solving.
Form of Examination	To be defined by lecturer at the beginning of course
Prerequisites	Energy physics
Requirements according to the examination regulations	Registered in this course, Minimum 80% attendance in this course
Reading list	1. A.K. Raja, Amit P. Srivastava, Manish Dwivedi, (2006) Power Plant Engineering, New Age International Publishers. 2. Zark Bedalov, (2020) Practical Power Plant Engineering. Wiley-IEEE Press.
Assessment Guidance	Quiz (20%); Tasks (10%); MES (35%); FES (35%)

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Measurement of Magnetic Properties

Academic Year	2023/2024
Code/ Semester	D10C20.7206 / 7th Semester
Course/ Credit points	Measurement of Magnetic Properties / 2 SKS ~ 3.62 ECTS
Language	Indonesian
Responsible Person	Togar Saragi
Lecturer	Norman Syakir, Togar Saragi
Workload	1. Lectures: 2 x 50 = 100 minutes per week. 2. Assignments: 2 x 60 = 120 minutes per week. Individual study: 2 x 60 = 120 minutes per week.
Contents	1. Permagraph and VSM Characterization Technique 2. Josephson Junction and SQUID Characterization Technique 3. Data Processing Techniques M-H Loop, M-T Loop and M-t Loop NMR, AC-Susceptibility and MOKE Characterization Technique
Learning Objectives	Learning Goals: 1. Students are able to analyze and determine remanent magnetization (Mr), saturation magnetization (Ms), coercive field (Hc) and magnetic energy by measuring the M-H loop, alanysize M-T and M-t Loop 2. Students are able to analyze time relaxation and magnetocrystalline anisotropy Students are able to analyze the dependence of Kerr rotation as a function of wavelength from MOKE measurements.
Course Method	1. Lecture course: lecture presentation, interactive learning quizzes (discussion and sharing). 2. Interactive learning: exercise and presentation, Individual study: homework/assignment
Form of Examination	To be defined by lecturer at the beginning of course
Prerequisites	Introduction to Solid State Physics, Magnetic Materials and Superconductors
Requirements according to the examination regulations	Registered in this course, Minimum 80% attendance in this course
Reading list	1. J.M.D. Coey, Magnetism_and_Magnetic Materials, Cambridge University Press, 2009. 2. M_David Jiles, Introduction to Magnetism and Magnetic, Springer, 1991 Neeraj Panwar (2018) Magnetism and Magnetic Materials. IntechOpen
Assessment Guidance	Assignment (30%); Midterm Test (30%); Final Project/Test (40%)

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Maintenance Management of Instrumentation System

Academic Year	2023/2024
Code/ Semester	D10C20.7207/ 7th Semester
Course/ Credit points	Maintenance Management of Instrumentation System / 2 credits ~ 3.62 ECTS
Language	Indonesian
Responsible Person	I Made Joni
Lecturer	I Made Joni
Workload	1. Course: 4 x 50 = 200 minutes per week. Private learning : 2 x 60 = 120 minutes per week.
Contents	Background and problems in maintenance of instrumentation system facilities, system maintenance activities and support, maintenance department organization, maintenance planning and control, supporting factors in the maintenance system, system reliability, issues related to control, maintainability, factors affecting smooth maintenance, maintenance costs , workshop management as a maintenance function, Total Productive Maintenance to carry out the necessary precautions in maintenance, RCM to ensure that the instrumentation/equipment system can operate properly, Case Study.
Learning Objectives	Students are: 1. Able to know and understand the background and problems in maintenance Industrial facility" 2. Able to know and understand system maintenance activities and support. 3. Able to understand and understand the organization of the maintenance department 4. Able to know and understand compassion Able to analyze Total Productive Maintenance to carry out prevention and maintenance quality assurance
Course Method	Lecture, Discussion and Practice
Form of Examination	Presentation, quiz/test, assignment
Prerequisites	Instrumentation of Physics
Requirements according to the examination regulations	Registered in this course Minimum 80% attendance in this course
Reading list	Haroun et. Al. (2009) Handbook of Maintenance Management and Engineering, Springer-Verlag. Keith Mobley (2014) Maintenance Engineering Handbook, Eighth Edition 8th Edition, McGraw Hill.
Assessment Guidance	Assignment (30%); Midterm Test (30%); Final Project/Test (40%)

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Biophysics

Academic Year	2023/2024
Code/ Semester	D10C20.7208/ 7th Semester
Course/ Credit points	Biophysics / 2 credits ~ 3.62 ECTS
Language	Indonesian
Responsible Person	Norman Syakir
Lecturer	Norman Syakir
Workload	1. Course: 4 x 50 = 200 minutes per week. Private learning : 2 x 60 = 120 minutes per week.
Contents	Biomechanics, Biofluids, Bioelectricity, Bioacoustics, Biooptics, Radiobiology, Thermodynamics in Biological systems, Membrane Systems, Insect communication, Virus characteristics, structure and reproduction
Learning Objectives	Student are to: 1. Explains Biomechanics which includes the physical aspects of muscle work, the body's center of mass and its applications 2. Explains about Biofluids, about the concept of blood flow in the body and the physical aspects of the work of the lungs 3. Explains about bioelectricity, about the physical aspects of the emergence of electric pulses, their delivery to cells nerves. 4. Explains about Thermodynamics in Biological systems that discusses the principles of Thermodynamics 5. in Biological systems and can apply the Gibbs Energy Application of Human Metabolism. Gibbs 6. in biological systems. Explain about the membrane system that discusses the transport of molecules or ions in the membrane
Course Method	Discussion and Practice
Form of Examination	Test/Presentation
Prerequisites	Fundamental Physics I & II, Mathematical Physics
Requirements according to the examination regulations	Registered in this course Minimum 80% attendance in this course
Reading list	Biophysics, Dadan Rosana, Yogjakarta State University; 2. Wiliam Bialeck, Searching and Principle Biopysics, 2011. Mohammad Ashrafuzzaman, Jack Tuszynski. (2013) Membrane Biophysics, Springer.
Assessment Guidance	Assignment (30%); Midterm Test (30%); Final Project/Test (40%)

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Liquid Waste Treatment Plant

Academic Year	2023/2024
Code/ Semester	D10C20.7209 / 7th Semester
Course/ Credit points	Liquid Waste Treatment Plant / 2 SKS ~ 3.62 ECTS
Language	Indonesian
Responsible Person	I Made Joni
Lecturer	I Made Joni
Workload	1. Lectures: 2 x 50 = 100 minutes per week. 2. Assignments: 2 x 60 = 120 minutes per week. Private learning: 2 x 60 = 120 minutes per week.
Contents	1. Suspended solids; 2. Organic (biodegradable) material; 3. Nutrients (nitrogen and phosphorous); 4. Pathogenic organisms (expressed as E. Coli) 5. Medicine residues, organic chemicals (POP´s) Heavy metals
Learning Objectives	1. Students can explain the basic principles of Liquid Waste Treatment 2. Students can identify the types of liquid waste 3. Students can explain the difference Suspended solids, Pathogenic organisms, Medicine residues and Heavy metals
Course Method	Lectures, case-based study and final project
Form of Examination	To be defined by the lecturer at the beginning of course
Prerequisites	-
Requirements according to the examination regulations	Registered in this course Minimum 80% attendance in this course
Reading list	Handbook of Water and Wastewater Treatment Technologies, Nicholas P. Cheremisinoff, Butterworth- Heinemann 2002
Assessment Guidance	Assignment and quizzes (40%); case based (20%); final project (40%)

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Nanoparticle Imaging

Academic Year	2023/2024
Code/ Semester	D10C20.7210 / 7th Semester
Course/ Credit points	Nanoparticle Imaging / 2 SKS ~ 3.62 ECTS
Language	Indonesian
Responsible Person	Ferry Faizal
Lecturer	Ferry Faizal
Workload	1. Lectures: 2 x 50 = 100 minutes per week. 2. Assignments: 2 x 60 = 120 minutes per week. Private learning: 2 x 60 = 120 minutes per week.
Contents	1. Introduction 2. Nanoparticles & Nanostructures 3. Nanoparticle Characteristics 4. Signal & Image Review 5. Optical and electron imaging 6. Morphology and sizing 7. Software usage 8. Nanoparticles as contrast agent/tracer (Opt) AI in Nanoparticle Imaging (Opt)
Learning Objectives	1. Students can explain the basic principles of imaging techniques in the field of Nanotechnology 2. Students can identify the image data acquisition systems to micrometer and nanometer scale objects Students can use/create simple software to analyze example of images at the nanometer scale
Course Method	Lectures, case-based study and final project
Form of Examination	To be defined by the lecturer at the beginning of course
Prerequisites	-
Requirements according to the examination regulations	Registered in this course Minimum 80% attendance in this course
Reading list	1. Dong ZhiLi - Fundamentals of Crystallography, Powder X-ray Diffraction, and Transmission Electron Microscopy for Materials Scientists-CRC Press (2022) 2. Nobuo Tanaka (auth.) - Electron Nano-Imaging_ Basics of Imaging and Diffraction for TEM and STEM (2017, Springer) Phil Kim-matlab Deep Learning With Machine Learning, Neural Networks And Artificial Intelligence-apress (2017)
Assessment Guidance	Assignment and quizzes (40%); case based (20%); final project (40%)

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Biomedical Materials

Academic Year	2023/2024
Code/ Semester	D10C20.7212/ 7th Semester
Course/ Credit points	Biomedical Materials / 2 SKS ~ 3.62 ECTS
Language	Indonesian
Responsible Person	Risdiana
Lecturer	Risdiana
Workload	1. Lectures: 2 x 50 = 100 minutes per week. 2. Assignments: 2 x 60 = 120 minutes per week. Individual study: 2 x 60 = 120 minutes per week.
Contents	1. Concept of Biomedical Materials 2. Types of Biomedical Materials 3. Preparation techniques of biomedical materials Characterization analysis of biomedical materials
Learning Objectives	1. Able to understand and explain the Concept of biomedical materials and its types 2. Able to understand, explain, and prepare biomedical materials Able to understand, explain, and analyze the characterization results of biomedical materials
Course Method	Lectures are conducted using the methods of Project based learning, Discovery Learning, Small Group Discussion, Contextual Instruction, and experiments. Before the lecture, students will be asked to study the upcoming lecture material and discuss it in groups. Furthermore, students are required to present it in front of the class to reach a collective conclusion. Students will also gain experience to synthesize biomedical materials, characterize and analyze the properties of these materials.
Form of Examination	To be defined by lecturer at the beginning of course
Prerequisites	Introduction to Solid-State Physics
Requirements according to the examination regulations	Registered in this course Minimum 80% attendance in this course
Reading list	1. Barca, F. Caporossi, T. dan Rizzo, S. (2014) Silicone Oil : Different Physical Properties and Clinical Applications. *Journal of Biomedicine and Biotechnology* 2014. 2. Caramoy, A. Schröder, S. Fauser, S. dan Kirchhof, B. (2010). In Vitro Emulsification Assessment of New Silicone Oils. *Br. J. Ophthalmol.*,94 (4), 509-512. 3. Swindle, K E. dan Ravi, N. (2007). Recent advances in polymeric vitreous substitutes. *Expert Rev. Ophthalmol.* 2 (2) 255- 265. 4. Fitrilawati, Fauza, A R. Atikah, A. Novianti, R M. Syakir, N. Kartasasmita, A. S. dan Risdiana. (2018). Effect of KOH Concentration on Characteristics of Polydimethylsiloxane Synthesized by Ring Opening Polymerization Method. *Journal of Physics: Conf. Series* 1080 012016.
Assessment Guidance	Student work/assignments/presentation/Quiz (60%); Midterm Exam

	(30%); Final Exam (30%)

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Bioelectric Signal Processing

Academic Year	2023/2024
Code/ Semester	D10C20.7215 / 7th Semester
Course/ Credit points	Bioelectric Signal Processing / 2 SKS ~ 3.62 ECTS
Language	Indonesian
Responsible Person	Andri Abdurrochman
Lecturer	Andri Abdurrochman
Workload	1. Lectures : 2 x 50 = 100 minutes per week. 2. Assignments : 2 x 60 = 120 minutes per week. Private learning : 2 x 60 = 120 minutes per week.
Contents	The course is initiated with the basis of bio-potential or bioelectric or bioelectric generator. It follows by methods of harvesting the bioelectric that need electrodes in i.e. bipolar, unipolar and their combinations. These methods are elaborated more in the following subjects: EEG, ECG, MEG, REG etc.; which are delivered by students in groups. Each and every group presents the basis and acquiring of bioelectric concerning their topic, including the Signal Processing applied in hardware and software. Through the rest of the course, students work in group in the workshop room to develop hardware and software needed to process the bioelectric Signal. Every week they must delivering the progress report.
Learning Objectives	1. Able to understand and analyze bioelectric phenomenon based on Physics 2. Able to understand and analyze methods harvesting bioelectric using electrodes 3. Able to recreate the block diagram of any existing bioelectric Signal processing 4. Able to recreate and analyze Bioelectric Signal processing 5. Able to present and reporting the work of recreating Bioelectric Signal processing
Course Method	The first quarter of course delivered as theoretical lectures, then follow with workshops and presentation reports.
Form of Examination	
Prerequisites	1. Electronics 2. Algorithm and Programing 3. The physics of anatomy and Physiology Instrumentation Physics
Requirements according to the examination regulations	Registered in this course Minimum 80% attendance in this course
Reading list	1. Webb, Andrew G. 2018. Principles of Biomedical Instrumentation. Cambridge University Press. 2. Webster, John G., Eren, Halit. 2014. Measurement, Instrumentation, and Sensors Handbook 2nd Ed. CRC Press. Webste Nicholas r, John G., et. al. 2010. Medical Instrumentation Application and Design 4th Ed. John Wiley & Sons, Inc.
Assessment Guidance	Rubric case based (25); Workshop (50%); Final Exam. (25%)

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UNDERGRADUATE PROGRAM

UNPAD
PHYSICS

Web Programming and Animation

Academic Year	2023/2024
Code/ Semester	D10C20.7216 / 7th Semester
Course/ Credit points	Web Programming and Animation / 2 SKS ~ 3.62 ECTS
Language	Indonesian
Responsible Person	Sahrul Hidayat
Lecturer	Sahrul Hidayat
Workload	1. Lectures : 2 x 50 = 100 minutes per week. 2. Assignments : 2 x 60 = 120 minutes per week. Private learning : 2 x 60 = 120 minutes per week.
Contents	Introduction to web design, hyperlinks, active elements, Introduction to Cascading Style Sheet (CSS) script, PHP programming, MySQL databases, Python script integration on the web, Physics animation with Python.
Learning Objectives	1. Able to create HTML and CSS scripts to display web pages with certain designs 2. Able to design a databases and able to create it in MySQL server 3. Able to design and create web displays for MSQL data input/output using PHP programming 4. Able to integrate HTML, PHP and Python scripts to carry out numerical calculations and display data in graphs or animations
Course Method	Lectures and *case based study*
Form of Examination	Essay (case study)
Prerequisites	-
Requirements according to the examination regulations	Registered in this course Minimum 80% attendance in this course
Reading list	1. Web Programming, Ani Oktarini Sari, Penerbit: Graha Ilmi, Yogyakarta 2019 2. Belajar Pemrograman Web Dasar, Dendy Kurniawan, Penerbit: Yayasan Prima Agus Teknik Semarang, 2020 3. Programming PHP, Rasmus Lerdorf, Kevin Tatroe and Peter Macintyre, O'Reilly 2013
Assessment Guidance	Case based rubric (25); assignment (25%); midterm exam(25%); final exam (25%)

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Preparation and Characterization of Superconducting Materials

Academic Year	2023/2024
Code/ Semester	D10C20.7213/ 7th Semester
Course/ Credit points	Preparation and Characterization of Superconducting Materials / 2 SKS ~ 3.62 ECTS
Language	**English**, Indonesian
Responsible Person	Risdiana
Lecturer	Risdiana
Workload	1. Lectures: 2 x 50 = 100 minutes per week. 2. Assignments: 2 x 60 = 120 minutes per week. Individual study: 2 x 60 = 120 minutes per week.
Contents	1. Concept of Superconductivity 2. Types of superconducting materials 3. Preparation techniques of superconducting materials Characterization analysis of superconducting materials
Learning Objectives	1. Able to explain the Concept of Superconductivity 2. Able to explain and analyze the types of superconducting materials 3. Understand superconducting material preparation techniques 4. Able to perform superconducting material preparation Able to analyze the characteristics of superconducting materials
Course Method	Lectures are conducted using the methods of Discovery Learning, Small Group Discussion, Contextual Instruction, and experiments. Before the lecture, students will be asked to study the upcoming lecture material and discuss it in groups. Furthermore, students are required to present it in front of the class to reach a collective conclusion. Students will also gain experience to synthesize superconducting materials and analyze the properties of these materials.
Form of Examination	To be defined by lecturer at the beginning of course
Prerequisites	Introduction to Solid State Physics
Requirements according to the examination regulations	Registered in this course Minimum 80% attendance in this course
Reading list	1. Risdiana, *Pengenalan Bahan Superkonduktor Sifat Dasar dan Karakteristiknya*. Sumedang: Unpad Press, 2015. 2. *E.W. Carlson, V.J. Emery, S.A. Kivelson, and D. Orgad, Concept in High-Temperature Superconductivity, Cond-mat/0206217v1,* arXiv:cond-mat/0206217v1 [cond-mat.supr-con] 12 Jun 2002 N. P. Armitage, P. Fournier, and R. L. Greene, "Progress and perspectives on electron-doped cuprates," *Rev. Mod. Phys.*, vol. 82, no. 3, pp. 2421–2487, 2010.
Assessment Guidance	Student work/assignments/presentation/Quiz (70%); Evaluation 1 (10%) Evaluation 2 (10%), Evaluation 3 (10%)

UNPAD
PHYSICS

Luminescence Material

Academic Year	2023/2024
Code/ Semester	D10C20.7214/ 7th Semester
Course/ Credit points	Luminescence Material / 2 SKS ~ 3.62 ECTS
Language	Indonesian
Responsible Person	Camellia Panatarani
Lecturer	Camellia Panatarani
Workload	1. Lectures: 2 x 50 = 100 minutes per week. 2. Assignments: 2 x 60 = 120 minutes per week. Individual study: 2 x 60 = 120 minutes per week.
Contents	1. Introduction: General introduction to luminescent materials 2. How do Luminescent Materials Absorb Excitation Energy? 3. Emission: Radiative Return of Electrons to Ground State 4. Non-Radiative Transition 5. Energy Transfer 6. Characterization methods of luminescent materials 7. Synthesis method of luminescent materials 8. Applications of luminescent materials Challenges and recent developments
Learning Objectives	1. Able to explain the description and learning objectives, carry out the lecture contract to obtain the expected final ability, and can follow the Luminous Material learning system using the REGULAR LIVE platform with a responsible attitude. 2. Able to explain the basic concepts of luminescent materials and luminescence principles accurately. 3. Able to explain the relationship between physical characteristics and properties of luminescent materials accurately. 4. Able to operate luminance characterization tools, process data and interpret the results with a responsible attitude. 5. Able to synthesize one type of luminescent material. 6. Able to evaluate the performance of luminescent materials for applications in the fields of energy, environment and health with quality, measurable and valid reference sources.
Course Method	Learning is managed using the Regular Live platform with synchronous and asynchronous learning, both in-person and online. Learning is carried out for 16 weeks with a total of one in-person session per week. Student success is evaluated by assessing their participations throughout the course and practicum, including attendance, class discussions, and presentations.
Form of Examination	To be defined by lecturer at the beginning of course
Prerequisites	Material Physics, Introduction to Solid State Physics
Requirements according to the examination regulations	Registered in this course Minimum 80% attendance in this course
Reading list	1. G. Blasse, B.B.Grabmaier, Luminescent Materials, Springer Berlin, Heidelberg, 1994; 2. Camellia Panatarani, Ilmu dan Teknologi material luminisensi, Unpad

	Press, Bandung, 2016. 3. William M. Yen, Shigeo Shionoya, Hajime Yamamoto (Eds), Phosphor handbook, 2nd ed.,The CRC Press Laser and Optical Science and Technology Series, CRC Press Taylor & Francis Group, Boca Raton, 2007 Luminescence: From Theory to Applications. Edited by Cees Ronda, 2008 WILEY-VCH Verlag GmbH & Co. KGaA, Weinheim ISBN: 978-3-527-31402-7
Assessment Guidance	Student work/assignments (30%); Reports/Presentations (70%)

UNPAD
PHYSICS

Particle Transport System

Academic Year	2023/2024
Code/ Semester	D10C20.7211 / 7th Semester
Course/ Credit points	Particle Transport System / 2 SKS ~ 3.62 ECTS
Language	Indonesian
Responsible Person	Togar Saragi
Lecturer	Togar Saragi
Workload	1. Lectures : 2 x 50 = 100 minutes per week. 2. Assignments : 2 x 60 = 120 minutes per week. Private learning : 2 x 60 = 120 minutes per week.
Contents	1. Review of nanomagnetic 2. Spinel and inverse spinel, Lewis's acids and bases, ligands 3. Amphiphilic, hydrophilic and hycriphobic compounds 4. Surface modification, and encapsulation 5. Analysis of magnetic characteristics, relaxation time, FTIR and Raman 6. Biomedical applications: catalysts, and drug delivery Project based: Laboratory experimental studies
Learning Objectives	Learning Outcomes of Bachelor Program: 1. Students are able to analyze simple and practical problems in one of the fields of theoretical, computational or experimental physics for energy, environmental and health physics (CPL3) 2. Students are able to work on scientific tasks that are clearly defined and able to explain the results orally and in writing, in the fields of theoretical physics, applied physics, computation or experimentation, and their application in the fields of energy, environment and health (CPL4) 3. Students are able to use the principles of lifelong learning to increase knowledge and current issues about physics in the fields of energy, environment and health (CPL5) Learning Goals: 1. Students are able to explain Lewis's acids and bases, ligands, and bonds between oxide materials and amphiphilic compounds and encapsulation. 2. Students are able to analyze FTIR, Raman or NMR on magnetic nanocore structure, surface modification and encapsulation. 3. Students are able to conclude the principle of magnetic nanoparticle nanocore as a biomedical application.
Course Method	1. Lecture course: lecture presentation, interactive learning quizzes (discussion and sharing). 2. Interactive learning: exercise and presentation, Small Group Discussion (SGD), dan Discover Learning (DL). 3. Individual study: homework/assignment
Form of Examination	
Prerequisites	Material Synthesis Methods, Magnetic Properties Measurement

Requirements according to the examination regulations	Registered in this course Minimum 80% attendance in this course
Reading list	1. Handbook of Magnetic Materials: Synthesis, Properties and Application of Magnetic nanoparticles. Ed. K.H.j. Buschow, Elsevier Press). 2. Composite Materials: Processing, Application, Characterization. Springer.
Assessment Guidance	Case base Quizzes (10%); Homework/assignment (20%); middle exam (35%); final exam (35%)

UNPAD
PHYSICS

Thesis/Final Project

Academic Year	2023/2024
Code/ Semester	D10C20.7001/ 7th Semester
Course/ Credit points	Thesis (Final Project) / 6 SKS ~ 10.86 ECTS
Language	Indonesian
Responsible Person	Sahrul Hidayat
Lecturer	Sahrul Hidayat, Annisa Aprilia, Otong Nurhilal, Ferry Faizal
Workload	1. Lab Work: 6 x 120 = 720 minutes per week. Private learning : 6 x 30 = 180 minutes per week.
Contents	Introduction to the types of scientific work, Anatomy of Scientific Work, Anatomy of Advanced Scientific Work, Theme, outline and framework of scientific work, Major and Framework of Scientific Work, Word Choices, Effective Sentences, Write Scientific Work (Research objectives, problem formulation, research methods, results and discussion, and conclusions), Plagiarism.
Learning Objectives	Student are: 1. Able to plan processes and formulate lecture material with proper and appropriate procedures (psychomotor work skills) 2. Able to analyze lecture material based on good and correct procedures (knowledge mastery - cognitive) 3. Able to manage and be responsible (managerial ability) 4. Be ethical, creative, communicative; and cooperate. 5. Can make a scientific work Can write scientific papers
Course Method	Practice in the lab, discussion and presentation
Form of Examination	Progress Presentation, assignment, seminar thesis
Prerequisites	-
Requirements according to the examination regulations	Registered in this course Must have taken at least 120 credits (217.2 ECTS)
Reading list	Essentials of Scientific Writing, Publisher EIAR Editor: Abebe K, ISBN: 978- 99944-53-98-6
Assessment Guidance	Progress presentation (30%); Final Project/Test (30%); Seminar thesis (40%)