MINISTRY OF EDUCATION AND CULTURE
UNIVERSITAS NEGERI SURABAYA
FACULTY OF MATHEMATICS AND NATURAL SCIENCES
DEPARTMENT OF PHYSICS
Ketintang Campus, Jalan Ketintang, C3 Building, Surabaya 60231
Website: https://pendidikan-fisika.fmipa.unesa.ac.id/, email: s1-pfis@unesa.ac.id

Undergraduate Programme of Physics Education **Module Handbook**

Module Name :	*Fisika Zat Padat* Solid-state Physics
Module level :	Bachelor degree/Undergraduate Programme
Course Code :	8420303080
Abbreviation, if applicable:	-
Courses included in the module, if applicable:	Not Applicable
Semester/Term	6/Third Year
Module coordinator(s)	Prof. Dr. Budi Jatmiko, M.Pd.
Lecturer(s):	Prof. Dr. Budi Jatmiko, M.Pd, Prof. Dr. Munasir, S.Si., M.Si.
Language:	*Bahasa Indonesia*
Classification within the curriculum:	Compulsory/ ~~Elective~~
Teaching format/class hours per week during the semester:	3 contact hours of lectures (Indonesia credit semester or sks*)
Workload :	3 x 50 minutes lectures, 3 x 60 minutes structured activity, 3 x 60 minutes individual activity, 14 weeks per semester, 135 total hours per semester ~ 4.77 ECTS**
Credit Point:	3 sks (4.77 ECTS)
Requirements:	Basic Physics I Basic Physics II Mathematic Physics Thermodynamic
Learning goals/competencies:	1. Understand and present the results of the study of solid material physics which includes: crystal structure of solid materials, crystal bonds, crystalline test methods of solid materials, phonons and thermal properties, electrical properties (conductors, semiconductors and conductors), semiconductor materials, optical properties of solid materials, properties of magnetic solid materials, superconductors, dielectrics and solid material supercapacitors, from various references; 2. Produce papers on the results of the presented Solid Substance Physics studies. 3. Produce solid material-themed projects that are presented
Content	Studying solid matter physics, which includes: Crystal Structure; X-Ray Diffraction, Neutron Diffraction, and Electron Diffraction (XRF, SEM, TEM, AFM); Crystal Bond; Vibration Grille; Einstein's models; Debye Model, Band Structure and Electrical Properties of Materials: Semiconductors, insulators and metals, The concept of

<table>
<tr><td></td><td>effective mass; Pure Semiconductors and Impurities: Donors and Acceptors, Fermi level, Ef, Carrier concentration equations, Donors and acceptors both present; p-n junction, Diode p-n junction; Electrical Conduction, Hall Effect; Light Emitting Diode; Paramagnetism, Diamagnetism, Ferromagnetism, Superconductors, Dielectrics, Supercapacitors</td></tr>
<tr><td>Attribute Soft skill:</td><td>Scientific report, public speaking, and team work</td></tr>
<tr><td>Study/exam achievements:</td><td>Students are considered to complete the course and pass if they obtain at least 40% of maximum final grade. The final grade (NA) is calculated based on the following ratio:
<table>
<tr><th>Assessment Components</th><th>Percentage of contribution</th></tr>
<tr><td>Participation</td><td>20%</td></tr>
<tr><td>Assignment</td><td>30%</td></tr>
<tr><td>Mid-semester test</td><td>20%</td></tr>
<tr><td>Final semester test</td><td>30%</td></tr>
</table></td></tr>
<tr><td>Learning Methods :</td><td>Student-centered approach, lecture and discussion, and presentations (structured activities)</td></tr>
<tr><td>Form of Media:</td><td>Power Point slides, e-book file, and multimedia.</td></tr>
<tr><td>Literature (primary references):</td><td>1. Anderson, J.C., Leaver. K.D., Rawlings, R.D., and Alexander, J.M. 1990. Materials Science, 4th Ed. London: Chapman & Hall.
2. Kittel, Ch. 1986. Introduction to Solid State Physics. New York: John Wiley & Sons, Inc.
3. Lee, H. Hong. 1990. Fundamentals of Microelectronics Processing. London: Mc Graw Hill.
4. Reka Rio, S., dan Iida, Masamori1982. Fisika dan Teknologi Semikonduktor. Jakarta: P.T. Pradnya Paramita.
5. Sze, S.M. 1985. Semiconductor Devices (Physics and Technology). New York: John Wiley & Sons: Lattice Press.</td></tr>
<tr><td rowspan="2">Notes:</td><td>*1 sks in learning process = three periods consist of: (a) scheduled instruction in a classroom or laboratory (50 minutes); (b) structured activity (60 minutes); and (c) individual activity (60 minutes) according to the Regulation of Indonesia Ministry of Research, Technology, and Higher Education No. 44 Year 2015 jo. the Regulation of Indonesia Ministry of Research, Technology, and Higher Education No. 50 Year 2018.</td></tr>
<tr><td>**1 sks = 1,59 ECTS according to Rector Decree Of Universitas Negeri Surabaya No. 598/Un38/Hk/Ak/2019</td></tr>
</table>