Module Descriptions

A **module** is a self-contained **learning unit** within a higher education program that includes thematically related courses and is assigned a **fixed number of credits**. It follows specific **learning objectives**, includes an **assessment component**, and contributes to achieving the qualifications of a degree program. In some countries, “modules” are also named “courses”.

Please provide a module description for each module. In addition to the compulsory and elective modules, this also includes credited internships and the final thesis.

Please summarize all module descriptions in one document (Module Handbook) and create a table of contents so that the modules can be found easily.

Module designation	*Chemical Spectroscopy /MPK8205*
Semester(s) in which the module is taught	2
Person responsible for the module	*Prof. Dr. Endang Widjajanti*
Language	*Indonesia*
Relation to curriculum	*Compulsory ~~/ elective / specialisation~~*
Teaching methods	*Lecture, discussion, project, demonstation*
Workload (incl. contact hours, self-study hours)	*(Estimated) Total workload:* *100 minutes/week for class learning*
Credit points	*2 sks*
Required and recommended prerequisites for joining the module	*Graduate in bachelor of Chemistry or Chemistry Education programme*
Module objectives/intended learning outcomes	*On successful completion of the course students should be able to:* *demonstrate obedience and mutual respect in learning process* *explain the spectroscopy principle its types and terms* *understand spectroscopy implementation and its types* *interpret spectra and its types* *understand theory of orbital symmetry groups* *understand electronic transition*

<table>
<tr><td>Content</td><td>This course is a compulsory subject for graduate students of the Chemical Education Study Program which discusses symmetry, group theory: point-group representation, non-degenerate representation, matrix and degenerate representation, irreducible and reducible representation, direct products; symmetry of atomic orbitals in molecules. The relationship between molecular symmetry and rotational and vibration spectroscopy. Application of group theory in ligand field theory: division diagrams d and f orbitals, term/state diagrams - Orgel and Tanabe-Sugano in cube fields and low symmetry fields. Electronic transition: the type of electronic transition and the intensity of the transition band. This course also entails discussion about the electronic spectrum of the first transition complex compound, d^1 - d^{10} and its applications in photoelectron spectroscopy and spin resonance spectroscopy.</td></tr>
<tr><td>Examination forms</td><td>Essay, project report, presentation, written tests</td></tr>
<tr><td>Study and examination requirements</td><td>Minimum attendance at lectures is 75% and lab work is 100%
Final score (NA) is calculated as follows:
<table>
<tr><th>Learning Outcome</th><th>Weight (%)</th><th>Technique of Assesment</th></tr>
<tr><td>1</td><td>5</td><td>Participation</td></tr>
<tr><td>1</td><td>5</td><td>Quizz</td></tr>
<tr><td>2</td><td>10</td><td>Group Discussion</td></tr>
<tr><td>2-3</td><td>25</td><td>Case study</td></tr>
<tr><td>3</td><td>25</td><td>Project</td></tr>
<tr><td>4</td><td>15</td><td>Mid-term Written Test</td></tr>
<tr><td>5</td><td>15</td><td>Final Exam Written Test</td></tr>
</table></td></tr>
<tr><td>Reading list</td><td>Aaron M. Pejlovas Onur Oncer, Lu Kang Stephen G. Kukolich, 2016, Microwave spectrum and gas phase structure of maleimide, Journal of Molecular Spectroscopy, 316, 26-29
Arias, F., and Sagues, F., "Obtaining Russell-Saunders Terms" in Education in Chemistry,1990, May, pp.83-84
Atkins,P.W., 2003, Physical Chemistry , Mc. Graw Hill
Christian Nölleke, Christoph Raab, Rudolf Neuhaus, Stephan Falke, 2018, Journal of Molecular Spectroscopy, 346, Pages 19-22
Hyde, K.E., "Methods for Obtaining Russell-Saunders Term Symbols for Electronic Configurations" in Journal of Chemical Education, 1975, 52, No.2, pp. 87-89
Kiremire, E.M.R., "A Numerical Algorithm Technique for Deriving Russell-Saunders (R-S) Terms" in Journal of Chemical Education, 1987, 64, No.11, pp. 951-953
N. A. Borisevich, I. V. Skornyakov, V. A. Khripach, G. B. Tolstorozhev, and V. N. Zhabinskii, 2007, Manifestation of Structure and Intermolecular Interaction of Biologically active Brassino steroids in Infrared Spectra , Journal of Applied Spectroscopy, Vol. 74, No. 5, 673-688
Vicente, J., "A Simple Method for Obtaining Russell-Saunders Term Symbols" in Journal of Chemical Education, 1983, 60, No.7, pp.560-561</td></tr>
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Prepared by	Verified by:	Authorized by:

Prof. Dr. Endang Widjajanti		Program Study Coordinator