## DEPARTMENT OF MATERIALS SCIENCE AND TECHNOLOGY **COURSE SYLLABUS**

| Course Details                  |  |  |          |      |               |   |      |          |  |  |
|---------------------------------|--|--|----------|------|---------------|---|------|----------|--|--|
| Code                            |  |  |          | Acad | Academic Year |   |      | Semester |  |  |
| NWI202                          |  |  |          | 2    | 2             |   |      | 4        |  |  |
| Title                           |  |  |          |      | Α             | L | ECTS |          |  |  |
| Physical Chemistry II           |  |  |          | 3    | 1             | 1 | 6    |          |  |  |
| Language                        | German   | German   |          |      |               |   |      |          |  |  |
| Level                           | Undergraduate  | х  | Graduate |      | Postgraduate  |   |      |          |  |  |
| Department / Program            | Materials Science ar   | nd Technolo  | gy       |      |               |   |      |          |  |  |
| Forms of Teaching and Learnin   | g Face to face   | Face to face   |          |      |               |   |      |          |  |  |
| Course Type                     | Compulsory   |  | x        | Ele  | Elective      |   |      |          |  |  |
| Objectives                      | <ul> <li>to discuss the pha</li> <li>equilibria based on</li> <li>Have a basic unde</li> <li>to master the most</li> </ul> | <ul> <li>Building on a deep understanding of the subject, students should be able to:</li> <li>to discuss the phase behavior of real systems, processes at electrodes, and chemical equilibria based on molecular and thermodynamic concepts.</li> <li>Have a basic understanding of chemical kinetics and reaction dynamics.</li> <li>to master the most important experimental techniques for the measurement and evaluation of physical-chemical quantities and processes.</li> </ul> |          |      |               |   |      |          |  |  |
| Content                         | elting diagra<br>nce of light k<br>n, viscosity o<br>lyte solution   | water; Electrochemistry; reaction kinetics; Atmospheric chemistry.<br>ting diagram of binary mixtures, pH-dependence of a solvolysis<br>ce of light by nematic liquids, viscosity of liquids, heat of evaporation,<br>viscosity of gases, decomposition of diacetone alcohol, charge<br>te solutions, pH balance of buffer ¬lösungen, Nernst distribution set,<br>quids, quantum mechanics   |          |      |               |   |      |          |  |  |
| Prerequisites                   | -  |  |          |      |               |   |      |          |  |  |
| Coordinator                     | -  | -  |          |      |               |   |      |          |  |  |
| Lecturer(s)                     | Dr. Samira FATMA K   | Dr. Samira FATMA KURTOĞLU ÖZTULUM  |          |      |               |   |      |          |  |  |
| Assistant(s)                    | -  | -  |          |      |               |   |      |          |  |  |
| Work Placement                  | No   |  |          |      |               |   |      |          |  |  |
| Recommended or Required Reading |  |  |          |      |               |   |      |          |  |  |
| Books / Lecture Notes           | G. Wedler: Lehrbuch de   | . Wedler: Lehrbuch der Physikalischen Chemie; VCH, 5. Aufl., 2004  |          |      |               |   |      |          |  |  |
| Other Sources                   | .P.W. Atkins: Physikalische Chemie; VCH-Wiley, 4. Aufl., 2006<br>.T Engel/P. Reid; Physikalische Chemie                    |  |          |      |               |   |      |          |  |  |
| Additional Course Material      |  |  |          |      |               |   |      |          |  |  |
| Documents                       | -  |  |          |      |               |   |      |          |  |  |
| Assignments                     | -  |  |          |      |               |   |      |          |  |  |
| Exams                           |  |  |          |      |               |   |      |          |  |  |
| Course Composition              |  |  |          |      |               |   |      |          |  |  |



## DEPARTMENT OF MATERIALS SCIENCE AND TECHNOLOGY COURSE SYLLABUS

| Matemidies with a set of the set of th |                  |             |   |                                     |                   |  |  |  |
|---|------------------|-------------|---|-------------------------------------|-------------------|--|--|--|
| Engineering Design     Independent of the set of t           |                  | d Basic     |   |                                     | 60%               |  |  |  |
| Social Sciences     Image: Sciences     Image: Sciences     Image: Sciences     Image: Sciences       Reductional Sciences     Image: Sciences     Image: Sciences     Image: Sciences       Natural Sciences     Image: Sciences     Image: Sciences     Image: Sciences       Reath     Image: Sciences     Image: Sciences     Image: Sciences       Sciences     Image: Sciences     Image: Sciences     Image: Sciences   |                  |             |   |                                     | 40%               |  |  |  |
| Educational Sciences     Image: minimize sciences     Image: minimize science scie                    | Engineering Des  | ign         |   |                                     | %                 |  |  |  |
| Natural Sciences%Health Sciences%Expert Knowledge%Kativity%ActivityPercentage (%)Midterm ExamMidterm ExamMidterm ExamMidterm ExamMidterm ExamMidterm ExamActivityAttendancesRecitationsMidterm ExamProjectsMidterm ExamCTS Points arrowSelf-Study15Self-StudySelf-StudiosMidterm Exam11PreparationMidterm Exam13Self-StudyImage: Self-StudyMidterm Exam13Midterm Exam10Image: Self-StudyMidterm Exam13Midterm Exam10Image: Self-StudyMidterm Exam1Midterm Exam10Image: Self-StudyImage: Self-StudyMidterm Exam1Image: Self-StudyImage: Self-StudyImage: Self-StudyImage: Self-Study <th>Social Sciences</th> <th></th> <th></th> <th></th> <th>%</th>   | Social Sciences  |             |   |                                     | %                 |  |  |  |
| Health Sciences         9           Expert Knowledge         0         %           Assessment         9         %           Activity         Curl         Percentage (%)           Midterm Exam         0         5%           Quiz         0         5%           Assignments         0.5%         5%           Assignments         0.5%         5%           Recitations         0.15%         5%           Recitations         0.15%         10%           Projects         0.10%         10%           Final Exam         0.10%         10%           Ectrations         0.10%         0.00%           Ectrations         0.10%         0.00%           Ectrations         0.10%         0.00%           Ectrations         0.10%         0.00%           Self-Study         NorkLoad (Hours)         0.00%           Self-Study         10         2.0         3.0           Self-Study         15         0.00%         0.00%           Self-Study         10         2.0         2.0           Midterm Exam         1.5         0.00%         0.0           Isoaton / Study         1  | Educational Scie | nces        |   |                                     | %                 |  |  |  |
| Expert Knowledge     Mider     Mider       Assessment     Precentage (%)       Midtern Exam     0     Percentage (%)       Midtern Exam     0     25%       Quiz     1     0     25%       Assignments     0     15%     35%       Assignments     0     15%     35%       Attendance     0     15%     35%       Recitations     0     10%     10%       Final Exam     0     10%     10%       Final Exam     0     10%     10%       CTO Protect Junce       Total 00%       CTO Protect Junce       Total 00%       Monton 0 WorkLoad (Hours)       Self-Study     0       Self-Study     0       Self-Study     0       Self-Study     0       Freeparation     10     2     30       Midderm Exam     1     2     30       Self-Study     1     2     30       Freeparation     1     2     30       Midderm Exam     1     2     30       Inal Exam     1     2     30       Inal Exam <th< th=""><th>Natural Sciences</th><th>;</th><th></th><th></th><th>%</th></th<>  | Natural Sciences | ;           |   |                                     | %                 |  |  |  |
| Assessment     Percentage (%)       Midtern Exam     Quiz     Image: Count     Percentage (%)       Midtern Exam     1     25%       Quiz     1     5%       Assignments     1     5%       Assignments     1     15%       Assignments     1     15%       Assignments     1     15%       Attendance     0     15%       Recitations     1     10%       Projects     1     10%       Final Exam     1     10%       CS Points and Work Load     More Load (Hours)       CECT Points and Vork Load     More Load (Hours)       Center     15     2     30       Self-Study     Nork Load (Hours)     More Load (Hours)       Lectures     15     2     30       Self-Study     In 15     2     30       Self-Study     In 1     2     30       Self-Study     In 1     2     30       Self-Study     In 1     2     30       Recitations     In 1     2     2       Integration     In 1     2     2       Recitations     In 1     2     2       Integration     In 1     2     2       P  | Health Sciences  |             |   |                                     | %                 |  |  |  |
| ActivityPercentage (%)Midterm Exam125%Quiz15%Quiz115%Assignments15%Assignments10%Attendance10%Recitations100%Final Exam10%Final Exam45%CTS Points45%CTS Points100%Ctures100Ctures30Self-Study1530Self-Study1230Preparation1575Preparation15375Midterm Exam12Nitiferm Exam151Indiferm Exam1530Nitiferm Exam112Projects12Indiferm Exam112Indiferm Exam112Indiferm Exam112Indiferm Exam112Indiferm Exam122Indiferm Exam12Indiferm Exam12Indiferm Exam12Indiferm Exam13Indiferm ExamIndiferm Exam6Indiferm ExamIndiferm Exam6Indiferm ExamIndiferm Exam166Indiferm ExamIndiferm Exam16Indiferm ExamIndiferm Exam16Indiferm ExamIndiferm Exam16Indiferm ExamIndiferm Exam16<   | Expert Knowled   | ge          |   |                                     | %                 |  |  |  |
| Midterm Exam125%Quiz15%Assignments115%Assignments115%Attendance110%Recitations110%Projects110%Final Exam145%Count10%Count100CountMork Load (Hours)CountMork Load (Hours)CountMork Load (Hours)Self-Study30Self-Study <td< th=""><th>Assessment</th><th></th><th></th><th></th><th></th></td<>   | Assessment       |             |   |                                     |                   |  |  |  |
| Quiz15%Assignments115%Attendance-115%Recitations-10%Projects210%Final Exam045%Total More datsCount10%Count0More datsCount0More datsAtsive30Count0More datsAtsive30Self-Study30Count0Self-Study30Self-Study<   | Activi           | ty          |   | Count                               | Percentage (%)    |  |  |  |
| Assignments     1     15%       Assignments     I     15%       Attendance     I     I       Recitations     I     10%       Final Exam     I     10%       Final Exam     I     45%       Total J0%       Total Sigments       Total Sigments       Total Sigments       Total Sigments       Self-Study     I       Assignments     I       Count     Duration       Work Load (Hours)       Assignments     I       I       Self-Study     I       I     I       Self-Study       I       Self-Study       Self-Study       I       I       I       I       I       I       I       I       I       I       I       I       I       I       I       I </th <th>Midterm Exam</th> <th></th> <th></th> <th>1</th> <th colspan="3">25%</th>   | Midterm Exam     |             |   | 1                                   | 25%               |  |  |  |
| Attendance       Indextechna in the set of the                          | Quiz             |             |   | 1                                   | 5%                |  |  |  |
| Recitations       Indextore       Indextore         Projects       1       10%         Final Exam       3.00       45%         Total 000         Count       Duration       Work Load (Hours)         Activity       Count       Duration       Work Load (Hours)         Lectures       15       2       30         Self-Study       15       2       30         Self-Study       15       2       30         Self-Study       10       12       12         Normality       10       12       2       12       13       15       1       15       1       15       1       15       1       15       1       15       1       15       1       15       1       15       1       15       1 <t< th=""><th>Assignments</th><th></th><th></th><th>1</th><th>15%</th></t<>  | Assignments      |             |   | 1                                   | 15%               |  |  |  |
| Projects       1       10%         Final Exam       1       45%         Total       100         ECTS Points and Work Load       100         ECTS Points and Work Load       100         ECTS Points and Work Load       More Load (Hours)         Activity       0       More Load (Hours)         Lectures       30         Self-Study       15       30         Self-Study       10       30         Self-Study       10       12         Self-Study       10       12         Self-Study       10       12         Self-Study       10       12         Self-Study       10       10       10         Self-Study       10 <td< th=""><th>Attendance</th><th colspan="2">ince</th><th></th><th></th></td<>   | Attendance       | ince        |   |                                     |                   |  |  |  |
| Find Exam1445%Total100ECTS Points ar/ CountOurationWork Load (Hours)ECTS Points ar/ CountOurationWork Load (Hours)ActiveCountDurationWork Load (Hours)Active CountOurationWork Load (Hours)Self-StudyCountDurationWork Load (Hours)Self-StudyCountOurationWork Load (Hours)Self-StudyCountOurationSelf-StudySelf-StudyCountOurationSelf-StudySelf-StudyCountOurationSelf-StudyAssignmentsCountOurationSelf-StudySelf-StudySelf-StudySelf-StudySelf-StudyPreparationSelf-StudySelf-StudySelf-StudyMiddig of the StudySelf-StudySelf-StudySelf-StudyNotal Work Load / Hours)Self-StudySelf-StudySelf-StudySelf-StudySelf-StudyNotal Work Load / Hours)Self-StudySelf-StudySelf-StudySelf-StudySelf-StudySelf-StudySelf-StudySelf-StudySelf-StudySelf-StudySelf-StudySelf-StudySelf-StudySelf-StudySelf-Study  | Recitations      |             |   |                                     |                   |  |  |  |
| Total       100         ECTS Points and Work Load         Activity       Count       Duration       Work Load (Hours)         Lectures       15       2       30         Self-Study       15       5       75         Assignments       0       0       0         Presentation / Siminar Preparation       12       6       12         Midterm Exam       1       2       2       30         Keitations       11       2       2       30         Projects       11       2       2       30         Final Exam       11       2       30       30         Projects       11       2       30       30         Final Exam       11       2       30       30         Ital Exam       11       2       30       30       30         Final Exam       11       2       166       30         Lecture Gutue       Second Se  | Projects         |             |   | 10%                                 |                   |  |  |  |
| ECTS Points and Work Load         Activity       Count       Duration       Work Load (Hours)         Lectures       15       30         Self-Study       15       75         Assignments       2       6       12         Assignments       2       6       12         Presentation / Seminar<br>Preparation       1       2       2         Midterm Exam       11       2       2         Nidterm Exam       15       1       15         Laboratory       15       2       30         Projects       15       2       30         Final Exam       1       2       30         Final Exam       1       2       30         Ectarting Outcert       11       2       30         Learning Outcert       11       2       2         1       12       2       30         Building on a deep understanding of the subject, students should be able to discuss the phase behavior of real systems, processes at electrodes, and chemical equilibria based on molecutar and thermodynamic concepts.         Wetek Cometer  | Final Exam       |             |   | 45%                                 |                   |  |  |  |
| ActivityCountDurationWork Load (Hours)Lectures1530Self-Study1530Self-Study1275Assignments26Assignments26Presentation / Seminar<br>Preparation12Presentation / Seminar<br>Preparation12Midterm Exam122Recitations15115Laboratory15230Projects1122Final Exam1122Total Work Load / Hours)Building on a deep understanding of the subject, students should be able to Scuess the phase behavior of real system.Building on a deep understanding of the subject, students should be able to Scuess the phase behavior of real system.Subject students should be able to Scuess the phase behavior of real system.Weekly Context  |                  |             |   | Total                               | 100               |  |  |  |
| Lectures15230Self-Study15575Assignments2612Presentation / S=minar<br>Preparation126Midterm Exam122Recitations15115Laboratory15230Projects11230Projects11230Final Exam1122Total Work Load166Learning Out=EVET Points (Total Work Load / Hours)6Learning of the subject, students should be able to stuss the phase behavior of real system; processes at electrodes, art chemical equilibria based on molecura and thermodynamic concepts.Weekly Contert   | ECTS Points an   | d Work Load | I   |                                     |                   |  |  |  |
| Self-Study15575Assignments2612Presentation / Seminar<br>Preparation122Midterm Exam122Recitations115115Laboratory115115Projects11230Projects1122Final Exam1122Total Work Load / Hours)6Learning OutLearning out deep understanding of the subject, students should be able to subset the phase behavior of real systems, processes at electrodes, and centrical equilibria based on molecular students should be able to subset the modynamic concepts.Weekly Content  | Activi           | ty          | Count   | Duration                            | Work Load (Hours) |  |  |  |
| Assignments     2     6     12       Assignments     2     6     12       Presentation / Seminar<br>Preparation     1     2     2       Midterm Exam     1     2     2       Recitations     15     1     15       Laboratory     15     2     30       Projects     11     2     2       Final Exam     1     2     2       Final Exam     1     2     2       Ectroing Outcert     1     2     2       Total Work Load / Hours)       6   Hearning Outcerts       Ectroing on deep understanding of the subject, students should be able to develop understanding of the subject, students should be able to develop understanding of the subject, students should be able to develop understanding of the subject, students should be able to develop understanding of the subject, students should be able to develop understanding of the subject students should be able to develop understanding of the subject students should be able to develop understanding of the subject students should be able to develop understanding of the subject students should be able to develop understanding of the subject students should be able to develop understanding of the subject students should be able to develop understanding of the subject students should be able to develop understanding of the subject students should be able to develop understanding of the subject students should be able to develop understanding of the subject students should be able to develop undersup understanding  | Lectures         |             | 15  |                                     | 30                |  |  |  |
| Presentation / Seminar       Presentation / Seminar         Presentation / Seminar       Image: Constraint of the seminar of the seminarea of the seminar of the seminar of the seminar of the seminar o  | Self-Study       |             | 15  | 5                                   | 75                |  |  |  |
| PreparationIndexIndexIndexMidterm Exam122Recitations15115Laboratory15230Projects1230Final Exam122Final Exam12166Eterring Outore to the puncter standing of the subject, students should be able to "subject, students and thermodynamic concepts.Weekly Content  | Assignments      |             | 2   | 6                                   | 12                |  |  |  |
| Recitations       15       15         Laboratory       15       2       30         Projects       115       2       2         Final Exam       11       2       2         Final Exam       11       2       2         Image: Comparison of the state of th  | -                | eminar      |   |                                     |                   |  |  |  |
| Laboratory       15       2       30         Projects       15       2       30         Final Exam       1       2       2         Total Work Load         Image: Second Colspan="4">Image: Secon   | Midterm Exam     |             | 1   | 2                                   | 2                 |  |  |  |
| Projects     Image: statistic statis statis statistic statistic statistic statistic statistic stati           | Recitations      |             | 15  | 1                                   | 15                |  |  |  |
| Final Exam       1       2       2         Final Exam       1   | Laboratory       |             | 15  | 2                                   | 30                |  |  |  |
| Initial Listing       Total Work Load       166         ECTS Points (Total Work Load / Hours)       6         Learning Outcomes         1       Building on a deep understanding of the subject, students should be able to discuss the phase behavior of real systems, processes at electrodes, and chemical equilibria based on molecular and thermodynamic concepts.         Weekly Content  | Projects         |             |   |                                     |                   |  |  |  |
| ECTS Points (Total Work Load / Hours)       6         Learning Outcomes       Building on a deep understanding of the subject, students should be able to discuss the phase behavior of real systems, processes at electrodes, and chemical equilibria based on molecular and thermodynamic concepts.         Weekly Content       Example time of reaction biostime  | Final Exam       |             | 1   | 2                                   | 2                 |  |  |  |
| Learning Outcomes         1       Building on a deep understanding of the subject, students should be able to discuss the phase behavior of real systems, processes at electrodes, and chemical equilibria based on molecular and thermodynamic concepts.         Weekly Content         Example times of reaction binetics   |                  |             |   | Total Work Load                     | 166               |  |  |  |
| 1       Building on a deep understanding of the subject, students should be able to discuss the phase behavior of real systems, processes at electrodes, and chemical equilibria based on molecular and thermodynamic concepts.         Weekly Content       Foundations of reaction biostics   |                  |             | EC  | TS Points (Total Work Load / Hours) | 6                 |  |  |  |
| 1       real systems, processes at electrodes, and chemical equilibria based on molecular and thermodynamic concepts.         Weekly Content         Semulations of reaction biostics   | Learning Outco   | omes        |   |                                     |                   |  |  |  |
| Provide times of the extremition  | 1                |             | real systems, processes at electrodes, and chemical equilibria based on molecular and thermodynamic |                                     |                   |  |  |  |
| 1 Foundations of reaction kinetics  |                  |             | , processes at electrodes, a  |                                     |                   |  |  |  |
|   | Weekly Content   | concepts.   |   |                                     |                   |  |  |  |



## DEPARTMENT OF MATERIALS SCIENCE AND TECHNOLOGY **COURSE SYLLABUS**

| 2   | Basics, complex kinetics and approximation, activation energy and catalysis           |    |    |    |    |    |    |    |
|---|---|----|----|----|----|----|----|----|
| 3   | postulates of quantum mechanics, Schrödinger equation, simple quantum chemical models |    |    |    |    |    |    |    |
| 4   | quantum-mechanical approximation, atomic structure                                    |    |    |    |    |    |    |    |
| 5   | chemical bond, electromagnetic spectrum   |    |    |    |    |    |    |    |
| Contribution of Learning Outcomes to Program Objectives (1-5)   |   |    |    |    |    |    |    |    |
|   | P1  | P2 | P3 | P4 | P5 | P6 | P7 | P8 |
| 1   | 3   | 1  |    |    |    |    |    |    |
| Contribution Lev  | on Level 1: Low 2: Low-intermediate 3: Intermediate 4: High 5: Very High              |    |    |    |    |    |    |    |
| Program Learning Outcomes: <u>https://obs.tau.edu.tr/oibs/bologna/progLearnOutcomes.aspx?lang=en&amp;curSunit=207</u> |   |    |    |    |    |    |    |    |
| Compiled by:  | Res. Asst. Sami Orçun KORTUNAY  |    |    |    |    |    |    |    |
| Date of Compila   | tion: 12.05.2022  |    |    |    |    |    |    |    |