

**Subject Examination Regulations for the  
Master's Program in  
Earth Oriented Space Science and Technology  
at the Technische Universität München**

**dated April 10, 2006**

**as amended from the second version from October 22<sup>nd</sup> 2007**

Hereafter the Technische Universität München issues the following Examination Regulations on the basis of Article 13 Paragraph 1 Sentence 2 in connection with Art. 61 Paragraph 2 Sentence 1 of the Bavarian Higher Education Law (BayHSchG):

Preliminary remark to linguistic usage:

In accordance with Article 3, Section 2, of the German Constitution, women and men have equal rights. All persons and functions described in the following rules are therefore equally valid for both women and men.

**The English version is provided merely as a convenience and is not intended to be a legally binding document. Only the German hardcopy version of these regulations is legally binding!  
In case of vagueness please refer to the German document!**

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## § 1

### Applicability, Academic Titles

- (1) Except as otherwise provided for hereinafter, the regulations of the *Allgemeine Diplomprüfungsordnung der Technischen Universität München (ADPO)* [general diploma examination regulations of the Technische Universität München] shall apply as amended.
- (2) <sup>1</sup> Upon successful completion of the Master's examination the academic degree "Master of Science"\*) (M.Sc.) is awarded. <sup>2</sup> This academic title may be used with the name of the university "(TUM)" as well.

## § 2

### Purpose of the Master's Examination

<sup>1</sup> The Master's Examination is the final component of the Master's program in Earth Oriented Space Science and Technology, qualifying the graduate for entry into professional practice or research. <sup>2</sup> The Master's Examination is designed to determine whether or not the student has acquired the thorough knowledge of the discipline that is necessary for transition into a professional career; has a comprehensive view of the discipline's interrelated issues; and has the ability to work independently according to academic principles.

## § 3

### Credits Required, Standard Period of Study, ECTS

- (1) <sup>1</sup> The maximum number of classes in required and required elective subjects needed to obtain the Master's degree is 90 Credits (70 weekly hours per semester) spread over three semesters. <sup>2</sup>To this are added a maximum of six months for the completion of the Master's Thesis pursuant to § 11. <sup>3</sup>Thus the standard period of study for the Master's program will be a total of four semesters.
- (2) <sup>1</sup> The amount of the course work and exam work is based on the amount of classes measured in credits according to the European Credit Transfer System. <sup>2</sup>30 Credits are to be awarded each semester.
- (3) The number of examinations in required and required elective subjects to be completed in the Earth Oriented Space Science and Technology Master's program according to Appendix 1 is 120 credits.
- (4) <sup>1</sup>A student should register for the subject examinations of the master's examination with sufficient time so that he or she can take the exams by the end of the fourth semester at the latest. <sup>2</sup> Corresponding to § 13 Par. 1 Nr. 1 Letter c of the ADPO, the first attempt of the Master's exam must thereby by the end of the sixth semester be completed. <sup>3</sup>Otherwise the Master's exam is considered taken and not passed.

- (5) <sup>1</sup>A student must complete at least one of the subjects from Appendix 1 in the subjects classified as mandatory by the end of the second semester. <sup>2</sup>Otherwise the final Master's exam is deemed not passed.

## § 4

### Qualification Requirements

- (1) The following qualifications are required for enrollment for the Master's program in Earth Oriented Space Science and Technology:
1. one of the following university degrees:
    - a) an Above Average Bachelor's degree in natural or engineering sciences from a German university or
    - b) an internationally recognised Above Average Bachelor's degree in natural or engineering sciences from an international university or
    - c) an Above Average diploma, Bachelor's or Master's degree in natural or engineering sciences from a German Fachhochschule or
    - d) a degree from a German university of cooperative education ("Berufsakademie") which fulfils a set criteria as decided upon by the Secretary of Culture Conference from September 29, 1995, or an accredited Bachelor or Master degree in one of the fields of studied named in letter a)
    - e) an acquired German "Diplom", "Magister" or Master's degree in natural or engineering sciences or
    - f) a degree obtained from a foreign university equivalent to the degrees described in c and d.
  2. passing of the Assessment of Aptitude for the Master's program in Earth Oriented Space Science and Technology according to appendix 2,
  3. sufficient knowledge of English language. For those students whose native language is not English or whose higher education was not conducted in English, this can be proven by the results of an internationally recognised English language test such as the „Test of English as a Foreign Language“ (TOEFL), the "International English Language Testing System (IELTS) or the "Cambridge Main Suite of English Examinations". Alternatively, one can give proof of sufficient knowledge of English with a good grade (according to at least 10 from 15 points) in English from a German higher education entrance qualification.
- (2) <sup>1</sup>An Above Average result pursuant to subsection 1 no. 1 is awarded when a minimum of Level C was obtained for the undergraduate degree according to the ECTS Grading System. <sup>2</sup>Examination results which have not been assessed according to the ECTS Grading System will be converted accordingly.
- (3) <sup>1</sup>The comparability of programs as well as the equivalence of degrees acquired from foreign institutions of higher education will be decided upon by the Examination Board in compliance with Art. 82 of Bayerisches Hochschulgesetz [Bavarian Higher Education Act]. <sup>2</sup>The degrees mentioned in subsection 1 no. 1 lit. b must be at least equivalent to a Bachelor's Degree in natural or engineering sciences from the Technische Universität München. <sup>3</sup>In connection with admission to the Master's program, the Examination Board may consult the Zentralstelle für

ausländisches Bildungswesen [Central Office for Foreign Education] and may grant admission to the program subject to the student's passing of additional examinations.

## **§ 5 Examination Board**

<sup>1</sup>The competent body for any decisions regarding examination issues pursuant to § 5 of ADPO is the Master's Examination Board for Earth Oriented Space Science and Technology.

<sup>2</sup>The Master's Examination Board (Examination Board) consists of 3 members. <sup>3</sup>Two representatives of the faculty of Civil and Geodetic Engineering and one representative of the faculty of Mechanical Engineering will be members of the Examination Board.

## **§ 6 Acceptance of Examination Results**

- (1) <sup>1</sup>Examination results from a university program will as a rule be recognized unless they are not equivalent.  
<sup>2</sup>The Examination Board in consultation with the examiner in charge will decide upon the acceptance of examination results.
- (2) <sup>1</sup>Examination results are deemed equivalent if they correspond in essence to those of the Master's Program in Earth Oriented Space Science and Technology at the Technische Universität München with regard to content, scope and requirements. <sup>2</sup>Whereby the assessment thereof shall not be a schematic comparison, but rather an overall consideration and assessment.
- (3) Examination results will be accepted only if the majority of the work for the Earth Oriented Space Science and Technology program is done at the Technische Universität München.
- (4) A written "Diplomarbeit" (Diploma thesis) of a relevant topic from a university and within a scientific university program is recognized as a Master's Thesis.
- (5) If the equivalent is not given, the Examination Board can consult the "Zentralstelle für ausländisches Bildungswesen" (central office for foreign education) and request the filing of the additional test.

## **§ 7 Ongoing Examination Procedure**

- (1) The subject examinations will generally be taken along with the coursework.
- (2) <sup>1</sup>Subject examinations will be held either in writing or orally in the form of several examinations or as one final examination. <sup>2</sup>The examiners in charge of the respective subject, in coordination with the Examination Board, will decide in which manner a subject examination will be administered. <sup>3</sup>The student must be appropriately informed of both the type and duration of the

examination at least 14 days prior to the examination, and in no event later than 14 days before the end of classes for that term.

<sup>4</sup>Oral individual examinations will last at least 20 and not more than 60 minutes, written examinations at least 60 and no more than 180 minutes. <sup>5</sup>Oral group examinations will last at least 15 minutes for each candidate.

- (3) <sup>1</sup>The credits listed in Appendix 1 will be allocated to each examination subject as appropriate; the assessment of these credits must comply with § 3 subsection 2. <sup>2</sup>These credits reflect the workload that a student will encounter when enrolled in classes in this particular subject. <sup>3</sup>The credits are deemed achieved if the respective subject examination has received at least the grade of „Sufficient“ (4.0).
- (4) Through a student’s petition and agreement with the examiner, exams can be held in the German language.
- (5) Examinations will as a rule take place within the first three weeks after the end of classes for a given term.

## § 8

### Admission to and Registration for the Master’s Examination

- (1) Upon matriculation in the Master’s program in Earth Oriented Space Science and Technology, a student is deemed admitted to the subject examinations of the Master’s Examination.  
Registration
- (2) A student is deemed registered for those ongoing examinations in the required subjects of the Master’s Program in Earth Oriented Space Science and Technology that are a part of the classes stipulated in the curriculum for that semester of the program.

## § 9

### Scope and Repetition of the Master’s Examination

- (1) The Master’s Examination consists of:
  - 1. The subject examinations pursuant to subsection 2.
  - 2. The Master’s Thesis pursuant to § 11.
  - 3. The Master’s Colloquium according to § 12.
- (2) <sup>1</sup>The subject exams are listed in Appendix 1. <sup>2</sup>Along with the named mandatory subjects in Appendix 1 are required elective subjects amounting to 24 credits (20 semester weekly hours) to be chosen from Modules 1 to 3 according to Appendix 1. <sup>3</sup>From this, there are 18 credits (15 semester weekly hours) to be chosen from a main specialization Module as well as 6 credits (5 semester weekly hours) to be chosen from one of the other two Modules.
- (3) <sup>1</sup>A subject exam is passed if it has been graded with at least the grade „sufficient“ (4.0). <sup>2</sup>A Module is passed if all subject exams that belong to the Module have been given at least the grade „sufficient“ (4,0) and if the required coursework as laid out in Appendix 1 is assessed as „successful“.

- (4) <sup>1</sup>A subject examination that was not passed may be repeated once at the next possible date. <sup>2</sup>A repeat examination must be offered every semester. <sup>3</sup>In coordination with the Examination Board duration and manner of the repeat examination can be defined different from duration and manner of the original examination. <sup>4</sup>Here §7 paragraph 2 must be followed.
- (5) <sup>1</sup>If a repeat examination is failed, the subject examination receives the final classification of “Not Passed”. <sup>2</sup>A second repetition is possible once and in only one subject.
- (6) In the event of failure to appear at an examination, the subject examination is deemed taken and not passed unless conclusive grounds are given pursuant to § 13 of ADPO.
- (7) <sup>1</sup>If the Examination Board accepts the grounds that have been furnished for failure to appear at examinations, the examinations must be taken on the next possible date to the extent that these grounds do not preclude this. <sup>2</sup>§ 13 subsection 3 sentence 2 of ADPO shall remain unaffected.

## **§ 10**

### **Course Work**

In the Master’s program in Earth Oriented Space Science and Technology there will be no evaluation of course work.

## **§ 11**

### **Master’s Thesis**

- (1) As part of the Master’s Examination, each candidate must write a Master’s Thesis.
- (2) Work on the Master’s Thesis must commence immediately after successful completion of the subject examination.
- (3) <sup>1</sup>The period of time between topic selection and submission of the completed Master’s Thesis must not exceed 6 months. <sup>2</sup>Upon a student’s written request, the period of time for writing the Master’s Thesis may, in especially justified cases, be extended by a maximum of 3 months, subject to the approval of the Examination Board and the agreement of the person who proposed the topic of the Master’s Thesis.
- (4) <sup>1</sup>The Master’s Thesis should be written in the English language. <sup>2</sup>The Master’s Examination Board may permit that the Thesis be written in a language other than English if it can be guaranteed that there will be expert assessment of the Thesis in that other language pursuant to § 12 subsection 10 of ADPO. <sup>3</sup>In this case an English summary of the results must be enclosed.

- (5) <sup>1</sup>The Master's Thesis is deemed successfully completed if it was graded at least "Sufficient" (4.0). <sup>2</sup>The Master's Thesis will be normally assessed by the supervisor. <sup>3</sup>If the Master's Thesis is deemed Not Passed by the supervisor, it must be assessed by a second examiner. <sup>4</sup>The grade for the Master's Thesis will be calculated as an unweighted arithmetic mean of the individual grades awarded by the examiners and will be adjusted to the grading scale of § 16 subsections 1 and 2 of the ADPO, whereby the average is rounded from the scale's grades to the lowest interval. <sup>5</sup>In the case of having the same interval for two grades on the scale, the grade is to be rounded to the next best grade. <sup>6</sup>24 credits will be awarded for a passed Master's Thesis.
- (6) If the Master's Thesis is failed, it may be repeated once with a new subject.

## **§ 12**

### **Master's Colloquium**

- (1) <sup>1</sup>A student is deemed registered for the Master's Colloquium, if he/she has achieved a minimum of 90 credits in the Master's Program and has successfully completed the Master's Thesis. <sup>2</sup>The examination should take place no later than two months after the registration date specified in sentence 1.
- (2) The examiners for the Master's Colloquium should be the same as for the Master's Thesis.
- (3) The Master's Colloquium is to be held in the German or the English language, according to the student's request.
- (4) <sup>1</sup>The Master's Colloquium will as a rule last 60 minutes. <sup>2</sup>The student has approx. 30 minutes to present his/her Master's Thesis. <sup>3</sup>This will be followed by a disputation that, based on the subject of the Master's Thesis, will extend to the broader discipline to which the Master's Thesis belongs.
- (5) The Master's Colloquium is deemed successfully completed if it receives at least the grade of "Sufficient" (4.0).
- (6) For the Master' Colloquium 6 credits will be awarded.

## **§ 13**

### **Assessment of the Master's Examination**

- (1) The Master's Examination is deemed passed if all subject examinations were passed and the Master's Thesis as well as the Master's Colloquium received at least a grade of "Sufficient" (4.0).
- (2) <sup>1</sup>The overall grade for the Master's Examination will be calculated as the weighted grade average of the subject examinations according to § 9, of the Master's Thesis and of the

Master's Colloquium. <sup>2</sup>The grade weights of the individual examination results correspond to the awarded credits.

<sup>3</sup>The overall assessment is expressed by the rating pursuant to § 16 of ADPO.

## **§ 14**

### **Degree Certificate, Master's Diploma, Diploma Supplement**

- (1) If the Master's Examination is passed, a certificate/degee is issued that contains the master's thesis grade and topic as well as the cumulative grade.<sup>1)</sup>
- (2) <sup>1</sup>Together with the degree certificate an instrument which documents the awarding of the academic degree "Master of Science" (M.Sc.) is bestowed upon the graduate. <sup>2</sup>The Master's Diploma will be signed by the President of the Technische Universität München, the Degree Certificate by the chairperson of the Master's Examination Board or his/her proxy. <sup>3</sup>The date to be entered on the Degree Certificate is the day when all examination requirements have been fulfilled.
- (3) In addition an English language Diploma Supplement will be bestowed with a grade transcript containing the date that the degree is issued. The transcript will contain all passed Modules and their respective examinations and finally the awarded credits and examination grades. The Diploma Supplement will be signed by the appointed Examination Board.

## **§ 15**

### **Date of Enforcement<sup>2)</sup>**

1. These examination regulations shall be enforced as of May 1<sup>st</sup>, 2005.
2. They apply to all students who begin their studies at the Technische Universität München as of the Winter Semester 2005/06

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<sup>1</sup>) This rule applies to students as of Winter Semester 2007/08

<sup>2</sup>) This regulation applies to the date of enforcement of the Amendment from the original version from April 10th, 2006. The point of date of enforcement is due to the respective amendments.

## **Appendix 1: Examination Subjects<sup>1)</sup>**

No.	Name of Subject	Sem.	SWS	Credits
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### **Required Subjects:**

1	Introduction to Earth System Science	1	4	6
2	Introduction to Satellite Navigation	1	3	4
3	Spacecraft Technology 1	1	3	4
4	Orbit Mechanics 1	1	2	3
5	Approximation Methods	1	2	3
6	Computational Fluid Dynamics	1	2	3
7	Signal Processing	1	3	4
8	Information Technology 1	1	2	3
9	Introduction to Image Processing, Photogrammetry, Remote Sensing and GIS	2	5	8
10	Orbit Mechanics 2	2	2	3
11	Spacecraft Technology 2	2	3	4
12	Orbit and Attitude Control	2	2	3
13	Estimation Theory	2	2	3
14	Electrodynamics	2	2	3
15	Information Technology 2	2	2	3
16	Seminar	2	2	3
17	Ground and User Segment	3	2	3
18	Project	3	2	3

### **Required Elective Subjects:**

#### **Modul 1 (Earth System Science from Space)**

1	Atmosphere and Ocean	3	4	6
2	Geophysical Fluids and Solid Earth	3	4	6
3	Geodynamics	3	4	6

#### **Modul 2 (Remote Sensing)**

1	Photogrammetry	3	4	6
2	Remote Sensing	3	4	6
3	Geo-Information	3	4	6

#### **Modul 3 (Navigation)**

1	Precise GNSS	3	4	6
2	Advanced Aspects of Navigation Technology	3	4	6
3	Sensor Integration and Signal Analysis	3	4	6

<sup>1)</sup> Appendix 1 is valid for students as of Winter Semester 2007/08. Appendix 1 is also valid for students who in Winter Semester 2007/08 are in their third semester.

<sup>1</sup>The Examination Board may decide to change one Required Elective Subjects per Module.

<sup>2</sup>Changes must be made known in a suitable manner to students at the latest by the beginning of the semester.

<sup>3</sup>Through petition and an exception made by the Examination Board, a student can, as an alternative to the above mentioned Required Elective Subjects, choose a subject-relevant class in the area of an examination subject from the entire TUM's and Ludwig-Maximilian University's lecture offerings.

## **Appendix 2: Aptitude Assessment Test [Eignungsfeststellungsverfahren]**

### **Aptitude Assessment for the Master's Program in Earth Oriented Space Science and Technology at the Technische Universität München**

#### **1. Purpose**

Eligibility for the Master's Program in Earth Oriented Space Science and Technology, in addition to the requirements pursuant to § 4 subsection 1 no(s). 1 and 3 requires proof of aptitude pursuant to § 4 subsection 1 no. 2 in accordance with the following provisions. The special qualifications and skills of the candidates should correspond to the Earth Oriented Space Science and Technology profession. Individual aptitude parameters are:

- 1.1 Ability to do research work, basic research and methodological work
- 1.2 Specialized knowledge in the necessary foundations of science and engineering.

#### **2. Aptitude Assessment Process**

- 2.1 The aptitude assessment test will be administered annually by the Faculty of Civil Engineering and Surveying.
- 2.2 Applications for admission to the aptitude assessment test must be filed with the Dean or Studiendekan of the Faculty not later than May 31 for the Winter Semester, using the forms issued by the Faculty. Documentation for no. 2.3.2 may be filed later: for the Winter Semester by August 15.
- 2.3 The application must include:
  - 2.3.1 Curriculum vitae formatted as a table;
  - 2.3.2 Certification of a degree obtained from an institution of higher education in accordance with § 4;
  - 2.3.3 A written statement of the reason for choosing Earth Oriented Space Science and Technology program at the Technische Universität München in which the candidate explains those specific abilities and interests that make him/her particularly qualified for the Earth Oriented Space Science and Technology Master's Program at the Technische Universität München. This statement may consist of no more than 2 DIN A4 pages; further criteria are provided in the aptitude parameters listed in no. 1 sentence 3.

- 2.3.4 A letter of recommendation from two university faculty members who participated in the candidate's final examination;
  - 2.3.5 A written essay, in English or in German, 500-700 words in length. The chairperson of the commission may provide one topic or a selection of several topics for this essay and the candidates must be informed of the topic/s not later than May 15;
  - 2.3.7 A declaration that the candidate wrote both the statement of the reasons for choosing the program and the essay independently and without outside help, and that he/she has clearly identified any ideas taken from outside sources;
- 2.4 For candidates who received a Bachelor's or Diplom Degree from the Technische Universität München there is no need to enclose the documentation specified in no. 2.3.2 with the application.

### **3. Aptitude Assessment Commission**

- 3.1 The aptitude assessment test will be administered by a commission that, as a rule, will consist of the Studiendekan in charge of the Earth Oriented Space Science and Technology Master's program, and at least two members of the university faculty and at least one research associate. At least half of the commission members must be university faculty. A representative of the student body will be a part of the commission, in an advisory capacity (exception: continuing education programs).
- 3.2 The members of the commission will be appointed by the Faculty Council in consultation with the Studiendekan. At least one faculty member will be appointed as deputy member of the commission. As a rule, the commission will be chaired by the Studiendekan. Procedural regulations will be in accordance with Art. 48 of BayHSchG as last amended.

### **4. Admission to the Aptitude Assessment Process**

- 4.1 Admission to the aptitude assessment process requires that all documentation specified in no. 2.3 has been submitted in a timely fashion and that all documentation must be complete.
- 4.2 Applicants who have fulfilled the requirements will be tested orally according to no. 5.
- 4.3 Applicants who are not admitted will receive a notification specifying the reasons and providing advice on legal options.

### **5. The Aptitude Assessment Process**

- 5.1 First stage of the Aptitude Assessment process
- 5.1.1 The commission will assess, on the basis of the submitted written application documents, whether or not an applicant has an aptitude for a program, pursuant to no. 1 (First stage of the Aptitude Assessment process). For this purpose the candidate's

documentation will be reviewed and independently evaluated by two members of the commission. The commission will then determine, on the basis of the application documents, whether or not the applicant, judging from his/her proven qualifications and documented specific abilities and skills, is suitable for the program in question. The commission will grade the documentation on a scale from 0 to 15 points, 0 being the worst and 15 being the best possible result.

5.1.2 The applicant's points total will be calculated on the basis of the arithmetic average of the individual grades. Decimal places must be rounded up.

5.1.3 Applicants who have achieved 9 points will receive confirmation that they have passed the aptitude assessment test. Unsuitable applicants with an overall grade of fewer than 5 points will receive a rejection notice, signed by the university administration and specifying the reasons for the rejection and providing advice on available legal options. Signatory power may be delegated to the chairperson of the commission.

## 5.2 Second stage of the Aptitude Assessment process

5.2.1 The remaining applicants will be invited for an aptitude assessment interview (Second stage of Aptitude Assessment Process)

5.2.2 Interview appointments will be announced at least one week in advance. Time slots for interviews must be scheduled before expiration of the application deadline. The interview appointment must be kept by the applicant. If the applicant is unable to attend an aptitude assessment interview due to reasons beyond his/her control, a later appointment may be scheduled upon a student's well-grounded request, but no later than two weeks before the beginning of classes.

5.2.3 The aptitude assessment interview is to be held individually for each candidate. The interview lasts at least 20 but not more than 30 minutes for each candidate and should reveal whether or not the candidate may be expected to attain the goals of the program in question independently, responsibly, and in a scholarly manner. The aptitude assessment interview covers the applicant's motivation for the program in Earth Oriented Space Science and Technology and the aptitude parameters listed in no. 1. Any subject-specific academic knowledge which is to be taught in the Master's program in Earth Oriented Space Science and Technology will not affect the decision. In the interview, the applicant must support the impression that he/she is suitable for the program in question.

5.2.4 The aptitude assessment interview will be conducted by at least two members of the commission. Each member will grade the result of the interview on a scale from 0 to 15, 0 being the worst and 15 being the best possible result.

5.2.5 The applicant's points total will be calculated on the basis of the arithmetic average of the individual grades as specified in 5.2.3. Decimal places must be rounded up. Applicants with 9 or more points will be deemed suitable.

- 5.2.6 The applicant will be notified of the result of the aptitude assessment test in a letter signed by the university administration. Signatory power may be delegated to the chairperson of the commission. A rejection must specify the reasons and provide advice on legal options.
- 5.2.7 Admissions to the Master's program in Earth Oriented Space Science and Technology shall apply to all subsequent applications for this program.

## **6. Record**

For the first and second stage of the aptitude assessment process, a record must be kept showing the date, duration and location of the assessment, the names of the commission members, the applicant's name, and the decision of the members of the commission as well as the complete results. This record must contain the essential reasons for the decision and the topics discussed at the interview held with the applicants; these reasons and topics may be recorded in note form.

## **7. Repetition**

Applicants who have failed the aptitude assessment test for the Master's program in Earth Oriented Space Science and Technology may register for one repetition of the Aptitude Assessment Test.

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