

Subject Description Form

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| Subject Code | LSGI3322 |
| Subject Title | Satellite Positioning Systems |
| Credit Value | 3 |
| Level | 3 |
| Pre-requisite | LSGI3349 Geodesy |
| Objectives | This subject focuses on the satellite-based modern surveying and positioning technologies, error sources, their operations, and their use in geomatics profession. |
| Intended Learning Outcomes | <p>Upon completion of the subject, students will be able to:</p> <ol style="list-style-type: none"> 1. Describe the basics of the current space based modern surveying technologies (L2) 2. Compare, explain, relate, apply and integrate the principle of satellite positioning technologies that used in their professional practice (L3 and L4) |
| Subject Synopsis/ Indicative Syllabus | <p>A. GNSS History of GPS, GLONASS, Beidou, and GALILEO.</p> <p>B. Reference Frames and WGS84</p> <p>C. GNSS Solutions</p> <ul style="list-style-type: none"> • GNSS signals and observables • Orbit determination and GPS orbit computation • Error sources and their modeling: multipath, cycle slip detection, ionospheric and tropospheric effects, modeling of other errors in GNSS observables. • GNSS calculation: ambiguity resolution and dilution of precision (DOP). <p>D. GNSS Survey Methods</p> <ul style="list-style-type: none"> • GNSS pseudorange surveying and carrier phase surveying • Static surveys and real-time-kinematic (RTK) surveys • Precise Point Positioning (PPP), single baseline surveying and network surveying <p>E. Adjustment of GNSS Data Observation equations and adjustment with observed baseline vectors.</p> <p>F. Advanced Space-borne Geodetic Methods</p> |

| | <ul style="list-style-type: none"> • Satellite altimetry, satellite laser ranging, lunar laser ranging, very long baseline interferometry. • New space geodesy missions. • Applications of space-born technologies in solving recent global scientific problems. | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|--|--|-----------------------------------|-------------|--|---------|----------------|---------|-----------------------------|--|---------|---------|-----------|---------|--|--|----------------------|--------|---|---|--|--|--|--|------------------------|--------|---|---|--|--|--|--|-------|-------|--|--|--|--|--|--|
| Teaching/Learning Methodology | Students are exposed to the concepts through lectures and extensive reading of reference materials. | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Assessment Methods in Alignment with Intended Learning Outcomes | <table border="1"> <thead> <tr> <th rowspan="2">Specific assessment methods/tasks</th> <th rowspan="2">% weighting</th> <th colspan="6">Intended subject learning outcomes to be assessed (Please tick as appropriate)</th> </tr> <tr> <th>1</th> <th>2</th> <th></th> <th></th> <th></th> <th></th> </tr> </thead> <tbody> <tr> <td>1. Interim tests (2)</td> <td>20, 25</td> <td>✓</td> <td>✓</td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>2. Assignment, Project</td> <td>30, 25</td> <td>✓</td> <td>✓</td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>Total</td> <td>100 %</td> <td colspan="6"></td> </tr> </tbody> </table> <p>Explanation of the appropriateness of the assessment methods in assessing the intended learning outcomes:</p> <p><i>Tutorials follow immediately the lectures. During the students are required to write a report summarizing the lecture material and asked to pose questions to be discussed in the subsequent lecture. They are also assigned an article relevant to the lectures and asked to summarize its content in relation to the other subjects. These activities are collected in student portfolios and assessed as assignments. They are also used for monitoring students learning difficulties with immediate feedback. Projects are intended to assess students understanding of the subject material in the context of their theoretical as well as practical aspect of satellite positioning and surveying in geomatics practice. Written tests are designed to monitor student learning outcomes.</i></p> | Specific assessment methods/tasks | % weighting | Intended subject learning outcomes to be assessed (Please tick as appropriate) | | | | | | 1 | 2 | | | | | 1. Interim tests (2) | 20, 25 | ✓ | ✓ | | | | | 2. Assignment, Project | 30, 25 | ✓ | ✓ | | | | | Total | 100 % | | | | | | |
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| Total | 100 % | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Student Study Effort Expected | <table border="1"> <tr> <td colspan="2">Class contact:</td> </tr> <tr> <td>▪ Lectures</td> <td>26 Hrs.</td> </tr> <tr> <td>▪ Laboratories</td> <td>13 Hrs.</td> </tr> <tr> <td colspan="2">Other student study effort:</td> </tr> <tr> <td>▪ Study</td> <td>40 Hrs.</td> </tr> <tr> <td>▪ Project</td> <td>27 Hrs.</td> </tr> </table> | Class contact: | | ▪ Lectures | 26 Hrs. | ▪ Laboratories | 13 Hrs. | Other student study effort: | | ▪ Study | 40 Hrs. | ▪ Project | 27 Hrs. | | | | | | | | | | | | | | | | | | | | | | | | | | |
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| | Total student study effort | 106 Hrs. |
| Reading List and References | <u>References</u> <ol style="list-style-type: none"> 1. Hofmann-Wellenhof, B., Lichtenegger H. & Collins J. (1997). GPS Theory and Practice. Springer-Verlag, Wien, New York. 2. Torge, W (1991) Geodesy. Walter de Gruyter, Berlin New York. 3. Seeber, G (1993) Satellite Geodesy: foundations, methods and applications. Walter de Gruyter, Berlin, New York. 4. Guochang Xu, Yan Xu (2016) GPS : theory, algorithms, and applications 5. Ivan G. Petrovski (2014) GPS, GLONASS, Galileo, and BeiDou for mobile devices 6. Elliott D. Kaplan, C Hegarty (2017), Understanding Global Positioning System/Global Navigation Satellite Systems, Artech House, Third edition. | |