2017

ITS
Institut
Teknologi
Sepuluh Nopember

CURRICULUM 2018-2023

GEOMATICS ENGINEERING
FTSLK - ITS

I. EDUCATION GOALS

The preparation of Curriculum 2018-2023 for Undergraduate Program of Geomatics Engineering Department -FTSLK-ITS is arranged through evaluation and development process of Curriculum 2014 that is adjusted to the needs of the users, SKKNI and referring to KKNI. In addition, the Curriculum 2018-2023 remains concerned with the vision and mission of Geomatics Engineering Department. The Vision of Geomatics Engineering Department of ITS is:

'Become an international education program in the utilization and development of science and survey mapping technology to support geospatial information industry and natural resources management which is environmentally.'

To realize the vision, then arranged a series of missions from Geomatics Engineering Department- ITS as below:

1. Organizes the process of competency-based education and teaching field of geomatics engineering;
2. carry out quality research in the utilization and development of geomatics science and technology to support the dissemination of geospatial information;
3. improve the utilization and management of geospatial information for community and geospatial industry; and
4. establish partnerships strategic with various government and private agencies both national and abroad

Based on the vision and mission of the Department above then educational objectives were set out, as below:

1. To develop students become Bachelors of Geomatics Engineering who **have academic and professional skills** in the application and development of science and technology in geospatial information management field.
2. To create **proficient and skilled** bachelor of Geomatics Engineering in mastership of surveying and mapping technology based on

geospatial information technology in order to support development in information and globalization era.

3. **To develop and disseminate sciences and technology in geospatial information management field** and to use it for the people welfare in order to enrich the national culture.

4. To produce graduates whom able to develop themselves and their career as **professionals, bureaucrats, and entrepreneur**.

II. GRADUATE LEARNING ACHIEVEMENTS

Learning achievement for graduate degree program (S-1) Of Geomatics Engineering Department consists of four aspects, that were **Attitudes, general skills, special skills, and knowledge**. In process attitudes and skills aspect refers to the PERMEN-RISTEKDIKTI No. 44 of 2015 about national standards of higher education (SNPT) and Rector of ITS Regulation No. 17 of 2017 about curriculum Evaluation Guidelines of Institut Teknologi Sepuluh Nopember Surabaya as an additional and identifier with other Colleges. Specific skills and knowledge aspects were set by Kemenristek DIKTI and developed by department of study based on the stakeholder needs, the vision, mission of the Department and the development of academic courses.

A. Attitude

For each graduate from undergraduate program Of Geomatics Engineering-ITS, should have the general attitude as following:

1. Duty to God Almighty and is able to show a religious attitude;
2. Uphold the human values in carrying out tasks based on religion, morals, and ethics;
3. Uphold the human values in carrying out tasks based on religion, morals, and ethics;
4. Act as citizens who are proud and love the motherland, as well as a sense of nationalism has a responsibility to the state and nation;
5. Respect cultural diversity, views, religion, and belief, as well as original findings or opinions of others;
6. Work closely and have the social sensitivity and concern for society and the environment;
7. Obey the law and discipline in the life of society and state;
8. Internalize the values, norms, and academic ethics;

9. Demonstrate an attitude of responsibility for work in the field of his expertise independently;
10. Internalize the spirit of independence, kejuangan, and entrepreneurship;
11. Strive to the maximum to achieve perfect results; and
12. Work to be able to utilize its maximum potential.

B. General Skill

For each graduate from undergraduate program Of Geomatics Engineering-ITS, should have the general skills as following:

1. able to apply logical, critical, systematic, and innovative thinking in the context of the development or implementation of science and technology that cares and implements the value of humanities appropriate to their area of expertise;
2. able to demonstrate independent, quality, and measurable performance;
3. able to examine the implications of the development or implementation of science and technology that concerns and implements the humanities value in accordance with their expertise, scientific method and ethics in order to produce solutions, ideas, designs or art criticisms;
4. able to prepare a scientific description of the results of the above study in the form of a thesis or final project report, and upload it in the college page;
5. able to take decisions appropriately in the context of problem solving in the area of expertise, based on the results of analysis of information and data;
6. able to maintain and develop networks with counselors, colleagues, colleagues both inside and outside the institution;

7. able to take responsibility for the achievement of group work and to supervise and evaluate the completion of work assigned to the worker under his / her responsibility;
8. able to conduct self-evaluation process to work group under their responsibility, and able to manage learning independently; and
9. able to document, store, secure, and rediscover data to ensure validity and prevent plagiarism.
10. able to develop themselves and compete in national and international level;
11. able to implement the principle of sustainability (sustainability) in developing knowledge
12. able to implement information and communication technology in the context of execution of its work; and
13. able to apply entrepreneurship and understand technology-based entrepreneurship.

C. Specific Skills

For each graduate from undergraduate program Of Geomatics Engineering-ITS, should have the specific skills as following :

1. Students are **able to apply** math and science as supporting geodesy and surveying, geodynamics and environment, geospatial, geomarine, and land.
2. Students are **able to understand the basic concepts and development** of geospatial information technology in geodesy and surveying, geodynamics and environmental, geospatial, geomarine, and land.
3. Students are **able to solve the problem** of providing basic and thematic geospatial information related to geodesy and surveying, geodynamics and environment, geospatial, geomarine and land, include the ability to:

a. **Identify, discover, formulate, and analyze the source of problems** in geodesy and surveying, geodynamics and environment, geospatial, geomarine, and land;

b. **Proposes the best solution to solve issues** in the field of geodetics and surveying, geodynamics and environment, geospatial, geomarine and land based on the principles of geospatial information science and technology, taking into consideration economic, security, public safety and environmental sustainability;

c. **Plan and design** the provision of basic and thematic geospatial information using research-based methods in the areas of: geodetic and surveying, geodynamics and environment, geospatial, geomarine, and land;

d. **Managing activities** in survey and mapping (planning schedule, quality, procurement, method, and cost) based on geospatial information science and technology principles taking into account technical standards, performance aspects, reliability, ease of implementation, sustainability, and taking into account economic, safety public, cultural, social and environmental (environmental consideration);

4. Students are **able to identify, select, and utilize** a variety of geospatial data and information sources to support the planning, implementation, monitoring and evaluation of activities in geodesy and surveying, geodynamics and environment, geospatial, geomarine, and land.

5. Students are **able to utilize the knowledge to supervise and control the quality of the process and result** of basic and thematic geospatial information by referring to the rules, norms, standards, guidelines and manuals applicable in the fields of: geodesy and surveying, geodynamics and environment, geospatial, geomarine, and land affairs.

6. Students are **able to implement policies** that are related to the organization of basic and thematic geospatial information.

7. Students are **able to communicate ideas and planning / design result** in both basic and thematic geospatial information in analog or digital format based on the latest geomatical science and technology.

D. Knowledge

For each graduate from undergraduate program Of Geomatics Engineering-ITS, should have the knowledge as following :

1. The concept of natural science, principles, and applications of mathematics in the application of geospatial information in the areas of geodesy and surveying, geodynamics and environment, geospatial, geomarine, and land;
2. Concepts and theories of geodesy and geomatic principles that include geodetic reference systems, positioning, photogrammetry, remote sensing, geographic information systems, cartography, hydrography, and land required in the field of geodesy and surveying, geodynamics and environment, geospatial , geomarine, and land;
3. Principles, methods and application of rules, standards, guidelines and manuals for the provision of basic and thematic geospatial information in geodesy and surveying, geodynamics and environment, geospatial, geomarine, and land affairs;
4. Concepts and principles of environmental conservation;
5. Concepts and principles of occupational health and safety in the laboratory and in the field;
6. Current principles and issues in the economic and socio-cultural field in general;
7. General concepts, principles, and communication techniques for specific purposes;
8. Insight on the development of advanced geospatial information science and technology in the field of geodesy and surveying, geodynamics and environment, geospatial, geomarine, and land.

Table 4.1. Course Structure

CURRICULUM SUBJECT STRUCTURE 2018-2023

Smtr	1	2	3	4	5	6	7	SKS
VIII	Elective - 2	Final Project	Elective - 3	Elective - 4	Additional / Enrichment			
	3	6	2	2	3			16
VII	Elective - 1	Research Metodology	Land Management	Field Work	Management of Survey and	Technopreneurship		
	3	2	3	3	3	2		16
VI	Seabed Imaging and Mapping	Physical Geodesy	Land Administration	Field Camp	Geospatial Information	Wawasan & Aplikasi Teknologi		
	3	3	3	4	4	3		20
V	Hidrographic Survey	Global Navigation Satellite System	Geodesy Control Network	Introduction to Remote Sensing	Digital Photogrammetry	Introduction to Geographic		
	3	3	3	3	3	3		18
IV	Physical Oceanography	Satellite Geodesy	Adjusment Computation	Engineering Survey	Introduction to Photogrammetry	Toponym		
	3	3	3	3	3	3		18
III	Spatial Data Computation and Programming	Statistics and Probability	Transformation System and Map Projection	Advanced Terrestrial Mapping	Spatial Database System	Digital Cartography		
	3	3	4	4	3	3		20
II	Mathematics 2	Physic 2	Chemestry	Basic Terrestrial Mapping	Pancasila	English	Introduction to Earth Science	
	3	3	3	3	2	2	2	18
I	Mathematics 1	Physic 1	Religion	Indonesian	Kewarganegaraan	Cartography	Introduction to Geospatial	
	3	4	2	2	2	3	2	18
							TOTAL SKS	144

Supporting Course

- Basic Science
- National Course
- ITS Course
- Faculty Course
- Department Course
- Elective Course

Laboratory Course

- Geodesy dan Surveying
- Geospacial
- Geomarine
- Geodinamic dan Environment
- Cadastre And Land Policy

LIST OF COURSE GRADUATION PROGRAMS
GEOMATICS ENGINEERING DEPARTMENT
CURRICULUM 2018-2023

No	Code	Course Name	sks
		SEMESTER I	
1	KM184101	Mathematics 1	3
2	SF184101	Physic 1	4
3	UG1849XX	Religion	2
4	UG184913	Civics	2
5	UG184912	Indonesian	2
6	RW184901	Introduction to Geospatial Information	2
7	RM184101	Cartography	3
		Jumlah	18

No	Kode MK	Course Name	sks
		SEMESTER II	
1	KM184201	Mathematics 2	3
2	SF184202	Physic 2	3
3	SK184101	Chemistry 1	3
4	UG184911	Pancasila	2
5	UG184914	English	2
6	RM184202	Introduction to Earth Science	2
7	RM184203	Basic Terrestrial Mapping	3
		Jumlah	18

No	Kode MK	Course Name	sks
		SEMESTER III	
1	RM184304	Spatial Data Computation and Programming	3
2	RM184305	Statistics and Probability	3
3	RM184306	Transformation System and Map Projection	4
4	RM184307	Advanced Terrestrial Mapping	4
5	RM184308	Spatial Database System	3
6	RM184309	Digital Cartography	3
		Jumlah	20

No	Kode MK	Course Name	sks
		SEMESTER IV	
1	RM184410	Physical Oceanography	3
2	RM184411	Satellite Geodesy	3
3	RM184412	Adjusment Computation	3
4	RM184413	Engineering Survey	3
5	RM184414	Introduction to Photogrammetry	3
6	RM184415	Toponym	3
		Jumlah	18

LIST OF COURSE GRADUATION PROGRAMS
GEOMATICS ENGINEERING DEPARTMENT
CURRICULUM 2018-2023

No	Kode MK	Nama Mata Kuliah (MK)	sks
		SEMESTER V	
1	RM184410	Hidrographic Survey	3
2	RM184411	Global Navigation Satellite System Survey	3
3	RM184412	Geodesy Control Network	3
4	RM184413	Introduction to Remote Sensing	3
5	RM184414	Digital Photogrammetry	3
6	RM184415	Introduction to Geographic Information System	3
		Jumlah	18

No	Kode MK	Nama Mata Kuliah (MK)	sks
		SEMESTER VI	
1	RM184622	Seabed Imaging and Mapping	3
2	RM184623	Physical Geodesy	3
3	RM184624	Land Administration	3
4	RM184625	Field Camp	4
5	RM184626	Geospatial Information Analysis	4
6			3
		Jumlah	20

No	Kode MK	Nama Mata Kuliah (MK)	sks
		SEMESTER VII	
1	RM184727	Research Metodology	2
2	RM184728	Land Management	3
3	RM184729	Field Work	2
4	RM184730	Management of Survey and Mapping	3
5		Technopreneurship	3
6		Elective - 1	3
		Jumlah	16

No	Kode MK	Nama Mata Kuliah (MK)	sks
		SEMESTER VIII	
1	RM184831	Final Project	6
2		Elective - 2	3
3		Elective - 3	2
4		Elective - 4	2
5		Additional/Enrichment	3
		Jumlah	16

LIST OF ELECTIVE COURSE

No	Kode MK	Course Name	sks
		Geodesy dan Surveying Laboratory	
1	RM184932	Underground Surveying	2
2	RM184933	Mine Surveying	2
		Geodinamic and Enviroment Laboratory	
3	RM184934	Astro-Geodesy	3
4	RM184935	Altimetry Satellite System	3
5	RM184936	Geodynamic and Deformation	3
6	RM184937	Environmental Geodesy	3
7	RM184938	Geoid Modelling	2
		Geomarine Laboratory	
8	RM184939	Law of the Sea	3
9	RM184940	Ocean and Coastal Management	3
10	RM184941	Seabed Features	3
11	RM184942	Tides and Water Levels	3
12	RM184943	Marine Optic	3
13	RM184944	Hidrographic Data Management	2
14	RM184945	Coastal Processes	2
		Geospatial Laboratory	
15	RM184946	Thematic Geospatial Information	3
16	RM184947	Advanced Geographic Information System	3
17	RM184948	Advanced Remote Sensing	3
18	RM184949	Radargrammetry Application	3
19	RM184950	Close Range Photogrammetry	3
20	RM184951	Hyperspectral Remote Sensing	3
21	RM184952	Information System for Planning	3
22	RM184953	Geospatial Information Infrastructure	2
		Cadastre and Land Policy Laboratory	
23	RM184954	Participatory Mapping	2
24	RM184955	Land Information System	3
25	RM184956	Three Dimensional Cadastre	3
26	RM184957	Boundary Mapping	3
27	RM184958	Marine Cadastre	3
28	RM184959	Land Appraisal and Property Value	2

Tabel 5.1. Daftar Tenaga Pengajar Program Sarjana Teknik

No.	Nama Dosen Tetap***	NIDN**	Tgl. Lahir	Jabatan Akademik	Gelar Akademik	Pendidikan S1, S2, S3 dan Asal Universitas	Bidang Keahlian untuk Setiap Jenjang Pendidikan
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
1	Bangun Muljo Sukojo ***	0027055309	27 Mei 1953	Guru Besar	Prof	Fakultas Teknik Sipil dan Perencanaan, Institut Teknologi Sepuluh Nopember	Penginderaan Jauh
					Dr	S3 – Toulouse 3, France	Teledetection, Ecology Littoral
					DEA	S2 – Toulouse 3, France	Teledetection, Ecology Littoral
					DESS	S2 – Paris 6 France	Teledetection
					Ir	S1 – Institut Teknologi Bandung	Teknik Geodesi
2	Teguh Hariyanto ***	009085910	19 Agustus 1959	Lektor	Dr-Ing	S3 – Die Universitat Hannover, Germany	Photogrammetry
					MSc	S2 – Institut Teknologi Bandung	Teknik Geodesi
					Ir	S1 – Institut Teknologi Bandung	Teknik Geodesi
3	Muhammad Taufik ***	0019095506	19 September 1955	Lektor	Dr	S3 – Republique Francaise Universite de Nice Sophia Antipolis, France	Geoscience
					Ir	S1 – Institut Teknologi Bandung	Teknik Geodesi
4	Yuwono ***	0024015904	24 Januari 1959	Lektor Kepala	MS	S2 – Institut Teknologi Bandung	Advanced Surveying
					Ir	S1 – Institut Teknologi Bandung	Teknik Geodesi

Continuing Table 5.1

No.	Nama Dosen Tetap***	NIDN**	Tgl. Lahir	Jabatan Akademik	Gelar Akademik	Pendidikan S1, S2, S3 dan Asal Universitas	Bidang Keahlian untuk Setiap Jenjang Pendidikan
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
5	Agung Budi Cahyono ***	0020056904	20 Mei 1969	Lektor	DEA	S2 – Universite De La Rochelle, Francaise	Paysage & Environnement
					MSc	S2 – Institut Pertanian Bogor	Forestry Remote Sensing
					ST	S1 – Universitas Gadjah Mada	Teknik Geodesi
6	Eko Yuli Handoko ***	0027077403	27 Juli 1974	Lektor	Tugas Belajar	*S3 – Unversidade Do Porto, Portugal*	Altimetry
					MT	S2 – Institut Teknologi Bandung	Teknik Geodesi
					ST	S1 – Institut Teknologi Bandung	Teknik Geodesi
7	Khomsin***	0005077501	5 Juli 1975	Lektor	MT	S2 – Institut Teknologi Sepuluh Nopember	Manajemen Pantai
					ST	S1 – Institut Teknologi Bandung	Teknik Geodesi
8	Ira Mutiara Anjasmara***	0031127807	31 Desember 1978	Asisten Ahli	PhD	S3 – Curtin University, Australia	Geodesy
					M.Phil	S2 – Curtin University, Australia	Surveying and Mapping
					ST	S1 – Institut Teknologi Bandung	Teknik Geodesi

Continuing Table 5.1

No.	Nama Dosen Tetap***	NIDN**	Tgl. Lahir	Jabatan Akademik	Gelar Akademik	Pendidikan S1, S2, S3 dan Asal Universitas	Bidang Keahlian untuk Setiap Jenjang Pendidikan
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
9	Danar Guruh Pratomo ***	0007058001	7 Mei 1980	Lektor	Tugas Belajar	*S3 – University of New Brunswick , Canada*	Hidrographic Surveys
					MT	S2 – Institut Teknologi Bandung	Teknik Geodesi
					ST	S1 – Institut Teknologi Bandung	Teknik Geodesi
10	Lalu Muhamad Jaelani***	0021128001	21 Desember 1980	Asisten Ahli	PhD	S3 – University of Tsukuba, Jepang	Integrative Environmental Sciences
					MSc	S2 – National Central University, Taiwan	Remote Sensing
					ST	S1 – Institut Teknologi Sepuluh Nopember	Teknik Geodesi
11	Mokhamad Nur Cahyadi ***	0023128101	23 Desember 1981	Lektor	PhD	S3 – Hokaido University, Jepang	Space Geodesy (GPS Ionosphere)
					MSc	S2 – Universitat Stuttgart, Germany	Geodesy Navigation
					ST	S1 – Institut Teknologi Sepuluh Nopember	Teknik Geodesi
12	Hepi Hapsari Handayani***	0012127802	12 Desember 1978	Lektor	MSc	S2 – National Central University, Taiwan	Digital Photogrametry
					ST	S1 – Universitas Gadjah Mada	Teknik Geodesi

Continuing Table 5.1

No.	Nama Dosen Tetap***	NIDN**	Tgl. Lahir	Jabatan Akademik	Gelar Akademik	Pendidikan S1, S2, S3 dan Asal Universitas	Bidang Keahlian untuk Setiap Jenjang Pendidikan
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
13	Yanto Budisusanto***	0013067207	13 Juni 1972	Asisten Ahli	M.Eng	S2 – Universitas Gadjah Mada	Teknik Geodesi/ Geomatika
					ST	S1 – Universitas Gadjah Mada	Teknik Geodesi
14	Akbar Kurniawan	0018058601	18 Mei 1986	Asisten Ahli	MT	S2 – Institut Teknologi Sepuluh Nopember	Teknik Geomatika
					ST	S1 – Institut Teknologi Sepuluh Nopember	Teknik Geomatika
15	Udiana Wahyu Deviantari	0013018701	13 Januari 1987	Dosen Tetap Belum Fungsional	MT	S2 – Institut Teknologi Bandung	Teknik Geodesi dan Geomatika
					ST	S1 – Institut Teknologi Sepuluh Nopember	Teknik Geomatika
16	Meiriska Yusfania	0010058503	10 Mei 1985	Dosen Tetap Belum Fungsional	MT	S2 – Institut Teknologi Bandung	Teknik Geodesi dan Geomatika
					ST	S1 – Institut Teknologi Bandung	Teknik Geodesi dan Geomatika
17	Noorlaila Hayati	0003069001	3 Juni 1990	Dosen Tetap Belum Fungsional	Tugas Belajar	S3 – Technische Universität Braunschweig, Germany	Radar Interferometry
					MT	S2 – Institut Teknologi Sepuluh Nopember	Teknik Geomatika
					ST	S1 – Institut Teknologi Sepuluh Nopember	Teknik Geomatika

Continuing Table 5.1

No.	Nama Dosen Tetap***	NIDN**	Tgl. Lahir	Jabatan Akademik	Gelar Akademik	Pendidikan S1, S2, S3 dan Asal Universitas	Bidang Keahlian untuk Setiap Jenjang Pendidikan
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
18	Husnul Hidayat	0007089001	7 Agustus 1990	Dosen Tetap Belum Fungsional	MT	S2 – Institut Teknologi Sepuluh Nopember	Teknik Geomatika
					ST	S1 – Institut Teknologi Sepuluh Nopember	Teknik Geomatika
19	Cherie Bhekti Pribadi	0011019101	11 Januari 1991	Dosen Tetap Belum Fungsional	MT	S2 – Institut Teknologi Sepuluh Nopember	Teknik Geomatika
					ST	S1 – Institut Teknologi Sepuluh Nopember	Teknik Geomatika
20	Filsa Bioresita	0019079101	19 Juli 1991	Dosen Tetap Belum Fungsional	Tugas Belajar	S3 – Strasbourg University, France	Remote Sensing
					MT	S2 – Institut Teknologi Sepuluh Nopember	Teknik Geomatika
					ST	S1 – Institut Teknologi Sepuluh Nopember	Teknik Geomatika

V. FACILITIES & INFRASTRUCTURE

Facilities and Infrastructure in the implementation of curriculum in Graduate Program of Geomatic Engineering includes:

a. Classrooms and its Properties
b. Courtrooms and its Properties
c. Laboratory
d. Library
e. Software
f. Internet network in Campus

Table V.1 Classrooms and its Properties

No	Room Name	Properties	Capacity
1	GM 101	Computer, LCD, AC, WiFi	150
2	GM 103	Computer, LCD, AC, WiFi	80
3	GM 104	LCD, AC, WiFi	80
4	GM 301	LCD, AC, WiFi	70
5	GM 305 / R. Studio	LCD, AC, WiFi	34

Table V.2 Courtrooms and its Properties

No	Room Name	Properties	Capacity
1	Ruang Sidang 1 Lt 3 Gedung A	TV-LCD, AC, WiFi	10
2	Ruang Sidang 2 Lt 3 Gedung A	TV-LCD, AC, WiFi	10
3	Ruang Sidang 1 Lt 3 Gedung B	TV-LCD, AC, WiFi	10

Table V.3 Laboratory and its Properties

No	Laboratory Name	Main Equipment Type	Number of Units	Average Usage Time (hour/week)
1	Geodesy and Surveying Laboratory	Disto Meter Leica Disto Classic	1	2
		Echosounder HI TARGET	1	10
		G.P.S Geodetic Leica GPS sistem	2	2
		G.P.S Hand Held Garmin	6	2
		G.P.S Map 168 Sounder Garmin	1	2
		GPS Mapper Counter Garmin Montana 650	2	
		Hand Level Ogawa Seiki	36	2
		Tripod Alumunium	15	10
		Prisma Siku	2	2
		Stereoskop Cermin	5	2
		Stereoskop Saku	20	2
		Theodolit	10	40
		Theodolit Laser	1	2
		Theodolit Digital	1	40
		Total Station	5	40
		Waterpass	10	10
		Rambu/Bak Ukur	11	10

		GPS CORS Receiver dan Server	1	40
		Planimeter	11	2
		Stereoscope Tanah	25	1
		Sextant	1	1
		Eyewash Station	2	1
		Curve Tacer	1	1
		Handy Talky	5	6
		Echosounder BATHY 500 MF	1	27
2	Geospasial Laboratory	PC Core i5 4460 (3.2 GHz), memori 4 Gb	1	30
		PC Dual-Core (3 GHz), memori 4 Gb.	1	30
		GPS Hand held	2	4
		Oxygen Meter	1	4
		Current Meter	1	1
		Secchidisk	1	1
		Refractometer	1	1
3	Geomarine Laboratory	Digital echosounder	1	6
		PC HP intel i3	2	27
		PC HP intel i5	2	27
		Current Meter Ogawa Seiki	2	2
		Curve Meter Zenland	1	2

		Dept Recorder Ogawa Seiki	1	1
		G.P.S Hand Held Garmin	1	4
		Handy Talky	2	6
4	Geodynamics and Environment Laboratory	G.P.S Hand Held Garmin	1	2
		Kompas	14	10
		Solar Radiation Meter	1	1
		Altimeter	2	1
		Handy Talky	2	6
		PC AMD	1	20
		PC Intel i5	1	30
5	Cadastre and Land Policy Laboratory	Quadcopter DJI Phantom 1	1	16
		Quadcopter DJI Phantom 2	2	16
		Baterai DJI Phantom 1	4	8
		Baterai DJI Phantom 2	5	8
		Kamera Nikon Coolpix AW130	1	8
		Kamera Canon Powershot SX260 HS	1	10
		Kamera Gopro Hero 3+ Silver Edition	1	10
		Kamera Gopro Hero 3+ Black Edition	1	10
		Gopro underwater housing	2	10
		Mounting Zenmuse AntiJello	1	6

		Mounting Zenmuse HD3D 1	1	6
		FeelWorld FPV	1	10
		Charger Phantom 2	2	10
		Charger Phantom 1	1	10
		Tripod	1	10
		Monopod	1	10
		Toolkit	2	10
		Rompi Survey	4	10
		Pointer	2	10
		Quadcopter DJI Phantom 3 Adv	1	10
		Baterai DJI Phantom 3	1	10
		Charger Phantom 3	1	10
		CPU Lenovo	1	10
		Monitor Lenovo	1	10
		Handy Cam Sony 03 SPP	1	10
		Charger Handy Cam (AC-L15A)	1	10
		Maxell DV Casette	3	10
		LCD Proyektor BenQ	1	10

Table V.4 Recapitulation of the availability of libraries relevant to the field in Master Program of Geomatic Engineering

Reference Type	Number of	Number of
Textbook	402	1127
Accredited national journal	4	24
International Journal	20	
Proceeding	18	31
Thesis	609	650
Dissertation	4	4
TOTAL	**1057**	**1836**

Table V.5 Licensed and open source software is used to support the curriculum

NO	NAME	FUNCTION	STATUS
1	Windows XP	Operating System	Lisence
2	Office 2007	Administration, Finance, Report	Lisence
3	AutoCAD Civil 3D 2008	Digital Mapping	Lisence
4	Carlson Civil Suite 2010	Digital Mapping	Lisence (40 set)
5	ILWIS 3.6	GIS, Applied GIS, Remote Sensing	Open Source
6	GRASS 6.4-01	GIS, Applied GIS	Open Source
7	ArcGIS ArcView 9.3	GIS, Applied GIS	Lisence
8	MapServer 5.6.5	Applied GIS	Open Source
9	ALOVMap 0.57	Applied GIS	Open Source
10	ERDAS Imagine 2010	Remote Sensing, Applied Remote Sensing	Lisence (10 set)

Continuing Table VI.5.

NO	NAME	FUNCTION	STATUS
11	ERDAS ERMAPPER 2010	Remote Sensing, Applied Remote Sensing	Lisence (10 set)
12	LISA	Digital Photogrammetry	Lisense
13	DiMoTep	Digital Photogrammetry	Open Source
14	PHOTOMOD	Digital Photogrammetry	Lisence
15	Visual Studio	Programming	Lisence
16	SKIPro	GPS Data Processing	Lisence
17	Toopcon Tool	GPS Data Processing	Lisence
18	GAMIT	GPS Data Processing	Opensource
19	GIPSY	GPS Data Processing	Opensource
20	ROI_PAC	SAR data processing	Opensource
21	GMT SAR	SAR data processing	Opensource
22	AutoDesk	Vector data processing	Lisence
23	Minitab	Statistic data processing	Lisence
24	ArcGIS 10++	GIS, Applied GIS	Lisence
25	iThenticate	Plagiarism Detection Scientific Publications	Lisence
26	Matlab 2013	Programming	Lisence
27	Mathematica 9	Computation Program	Lisence
28	SUMMIT	Photogrammetry data processing	Lisence

Continuing Table 6.5.

NO	NAME	FUNCTION	STATUS
29	Carlson Civil Suite 2010	Digital Mapping	Lisence
30	BRAT (Basic Radar Altimetry Toolbox)	Altimetry data processing	Open source
31	GMT	Digital Mapping	Open source

VI. LEARNING ASSESMENT

In general, the evaluation of the learning process assumes that all the lecturers can meet the achievement of graduate learning that is charged to each course well. For that reason, the general valuation index given is the value of B as the default value. The general rating index will change if:

(1) The participants' privileges on the implementation of institutional vision values and affective, psychomotoric, and cognitive-creative aspects of the subject's achievement are given a value of $\geq$ B
(2) Behavior against the above features then obtained value $<$ B

As an evaluation instrument, the following elements are proposed for use:

(1) The affective element of the achievement record variable
    a. Contributions (presence, liveliness, roles, initiative, language)
    b. Punctuality
    c. Business
    d. Blended learning
(2) Psychomotor elements of the presentation variable
    a. The assignment report
    b. Exercise report
    c. Practical report
    d. Field report
(3) Cognitive-creative elements
    a. Content of task report and exercise
    b. If necessary, Mid Semester Evaluation (ETS) and End Semester Evaluation (EAS)

Then, the rating rules can be spelled out by:

(1) The value of achievement:
    a. Each element of activity in the lecture has a role in adding or reducing the standard value (a value based on the general assumption of success following the lecture)
    b. Assessment of the elements of the activity is done in such a way as to prevent participants from unnatural, transactional, speculative, or negotiating motives
(2) Report value or (if any) written test:

a. Reports (or written exams) will only be assessed if they meet the stipulated requirements
b. Assessment is given on the quality of presentation and content

Assessment for graduation is determined based on the affective, psychomotor, and cognitive-creative evaluation instruments recorded on the achievement records and results of the report assessment and (if any) written exams.

VII. ENCLOSURE

A. Syllabus

Semester I

SUBJECT	**Subject Name**	**:**	**Earth Sciences**
	Subject Code	**:**	
	Credit	**:**	**2 SKS**
	Semester	**:**	**I**

SUBJECT DESCRIPTION

In this course, students learn about general concept : basic concepts of Earth Science : atmosphere, hydrosphere, lithosphere and biosphere, basic concepts : Geodesy and Geomatics, Geophysic and Meteorology, Geology and Mineralogy, Petroleum and Mining, And Social and Physic Geography Engineering and Geodesy basic concepts : reference ellipsoida, geometric ellipsoida, coordinate system, Geodetic problem solving, coordinate transformation.

GRADE LEARNING ACHIEVEMENTS CHARGED BY SUBJECT

C. Specific Skill

2. Students are able to understand the basic concepts and development of geospatial information technology in geodesy and surveying, geodynamics and environmental, geospatial, geomarine, and land.
3. Students are able to solve the problem of providing basic and thematic geospatial information related to geodesy and surveying, geodynamics and environment, geospatial, geomarine and land, include the ability to:

D. Knowledge

1. The concept of natural science, principles, and applications of mathematics in the application of geospatial information in the

areas of geodesy and surveying, geodynamics and environment, geospatial, geomarine, and land;

2. Concepts and theories of geodesy and geomatic principles that include geodetic reference systems, positioning, photogrammetry, remote sensing, geographic information systems, cartography, hydrography, and land required in the field of geodesy and surveying, geodynamics and environment, geospatial , geomarine, and land;
8. Insight on the development of advanced geospatial information science and technology in the field of geodesy and surveying, geodynamics and environment, geospatial, geomarine, and land.

SUBJECT LEARNING ACHIEVEMENTS

1. Students are able to understand the general concepts : basic concept of Earth Science: atmosphere, hydrosphere, lithosphere and biosphere.
2. Students are able to understand basic concepts: Geodesy and Geomatics, Geophysics and Meteorology, Geology and Mineralogy, Petroleum and Mining Engineering and Social Geography and Physical Engineering.
3. Students are able to understand basic concepts of Geodesy: reference ellipsoida, geometric ellipsoida, coordinate system, Geodetic problem solving, coordinate transformation.
4. Students have knowledge of Geomatics Engineering.
5. Students have knowledge of basic theory and survey methods in Geomatics Engineering.
6. Students have experience to conduct observations in the field related to Geomatics Engineering.
7. Students are able to explain how the process in Geomatics Engineering.
8. Students are able to express their ideas orally and in writing.
9. Students are able to apply the concepts and procedures of science and Geomatics Engineering as one method in geospatial information either work independently or teamwork.

MAIN TOPIC

1. Basic concepts of Earth Science :

a. atmosphere,
b. hydrosphere,
c. lithosphere and
d. biosphere,

2. Basic concepts :
   a. Geodesy and Geomatics Engineering.,
   b. Geophysics and Meteorology Engineering,
   c. Geology and Mineralogy Engineering,
   d. Petroleum and Mining Engineering.
3. Basic concepts of Social and Physical Geography Engineering
4. Basic concepts of Geodesy :
   a. reference ellipsoida,
   b. geometric ellipsoida,
   c. coordinate system,
   d. Geodesy problem solving,
   e. Coordinate transformation.
5. Problems of natural resources, environment, and disaster.

PREREQUISITE

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REFERENCES

1. Bomford. Geodesy. 1975. Oxford University Press.
2. Kervyn, M. Kervyn, F. Goossens, R. Rowland, S. K. and Ernst. G. G. J. 2007. Mapping volcanic terrain using high-resolution and 3D satellite remote sensing. Geological Society, London, Special Publications 283: 5-30
3. Lagios, E. Vassilopoulou, S. Sakkas, V. Dietrich, V. Damiata, B.N. Ganas, A. 2007. Testing satellite and ground thermal imaging of low-temperature fumarolic fields: The dormant Nisyros Volcano (Greece). < http://www.remsenslab.geol.uoa.gr > . dikunjungi pada tanggal 21 Maret 2012, jam 13.30.

4. Richardus, Adler. Map Projections for Geodetic, Cartographers, Geographers. 1972. NHPC. Amsterdam.
5. Turcotte, Donald, Schubert, Gerald. Geodynamics, 2001, Cambridge University Press

SUBJECT			
	Subject Name	**:**	**Cartography**
	Subject Code	**:**	
	Credit	**:**	**3 SKS**
	Semester	**:**	**I**

SUBJECT DESCRIPTION

In this course students will learn about the concept of Cartography covering the definition of Map and history map. Understanding the map in question is the meaning of the map, the classification of the map by nature, kinds and types. After knowing the meaning of map, hence map making procedure taught that is process of mapping consist of: data retrieval, data processing and presentation of data. The data are angles, distances and high differences that will be processed in the form of coordinates and then will be presented or drawn in the form of maps. With the procedure of making a map, then made the task to create a map of the simulation data to be provided. Simulation data is given, because the participants of this course lies in the first semester. The definition of the scale is embedded to create a map, so that the appearance of the map in terms of meticulous, complete and interesting, then studied the design and layout of the map.

GRADE LEARNING ACHIEVEMENTS CHARGED BY SUBJECT

C. Specific Skill

1. Students are able to apply math and science as supporting geodesy and surveying, geodynamics and environment, geospatial, geomarine, and land.
2. Students are able to understand the basic concepts and development of geospatial information technology in geodesy and

surveying, geodynamics and environmental, geospatial, geomarine, and land.

D. Knowledge

1. The concept of natural science, principles, and applications of mathematics in the application of geospatial information in the areas of geodesy and surveying, geodynamics and environment, geospatial, geomarine, and land;
2. Concepts and theories of geodesy and geomatic principles that include geodetic reference systems, positioning, photogrammetry, remote sensing, geographic information systems, cartography, hydrography, and land required in the field of geodesy and surveying, geodynamics and environment, geospatial , geomarine, and land;

SUBJECT LEARNING ACHIEVEMENTS

1. Be able to explain the concept of Cartography, including the meaning of the map, the position of a place and the purpose of cartography.
2. Be able to differ maps circulating in the society.
3. Be able to explain simple map-making procedures.
4. Be able to apply the use of scale and its calculation.
5. Be able to perform coordinate plotting of available data.
6. Be able to design a simple map layout.
7. Be able to create contours of available data.
8. Be able to make map of available data (secondary data).

MAIN TOPIC

1. Cartography concept,
2. Map classification,
3. Map-making procedure,
4. Scale knowledge,
5. Coordinat system,
6. Coordinat plotting,
7. Kind of coordinate,
8. Layout design of the map

PREREQUISITE

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REFERENCES

1. Aziz, Lukman dan Ridwan. 1979. Peta Tematik. Jurusan Teknik Geodesi FTSP ITB. Bandung
2. Yuwono, 2009. Kartografi. Prodi teknik Geomatika ITS. 2009. Surabaya.
3. Villanueva, K.J. 1984. Kartografi. Jurusan Teknik Geodesi FTSP ITB. Bandung .
4. Wolf, Paul, R. 1974 Elementary of Photogrametry
5. Kraak, MJ., Omerling, J. 1996. Cartography Petzation of spatial data Prentice Hall. London

Semester II

SUBJECT	**Subject Name**	**:**	**Principles Of Terrestrial Mapping**
	Subject Code	**:**	
	Credit	**:**	**3 SKS**
	Semester	**:**	**II**

SUBJECT DESCRIPTION

This course explains the basic definition of mapping, the purpose and objective of mapping. Besides, it needs to be explained related to the unit system, because for the purposes of position and elevation count. Hereinafter described the notion of scale, distance, horizontal angle, vertical angle, coordinate system in plane. Usefulness and assortment of equipment such as roll meter, measuring rod, theodolite and waterpass, total station. Method of horizontal positioning and calculation: Point binding method, and Polygon method. Method of vertical positioning and calculation: Waterpass: elongated, transverse, area, Barometric, Trigonometric. Area calculation methods.

GRADE LEARNING ACHIEVEMENTS CHARGED BY SUBJECT

C. Specific Skill

1. Students are able to apply math and science as supporting geodesy and surveying, geodynamics and environment, geospatial, geomarine, and land.
2. Students are able to understand the basic concepts and development of geospatial information technology in geodesy and surveying, geodynamics and environmental, geospatial, geomarine, and land.

D. Knowledge

1. The concept of natural science, principles, and applications of mathematics in the application of geospatial information in the areas of geodesy and surveying, geodynamics and environment, geospatial, geomarine, and land;

2. Concepts and theories of geodesy and geomatic principles that include geodetic reference systems, positioning, photogrammetry, remote sensing, geographic information systems, cartography, hydrography, and land required in the field of geodesy and surveying, geodynamics and environment, geospatial , geomarine, and land;

SUBJECT LEARNING ACHIEVEMENTS

1. Students are able to use survey equipment
2. Students are able to perform the basic horizontal frame measurements and are able to calculate and describe the measurement results in the field
3. Students are able to perform the basic vertical frame measurements and are able to calculate and describe the measurement results in the field
4. Students are able to perform measurements of waterpass and are able to calculate and describe the measurement results in the field
5. Students are able to understand area calculation methods

MAIN TOPIC

1. Basic Definition of Mapping
2. Unit System,
3. Understanding About Scale,
4. Distance,
5. Horizontal Angle,
6. Vertical Angle,
7. Coordinate System
8. Measuring Equipment
9. Positioning Method
10. Horizontal And Vertical
11. Area Calculation

PREREQUISITE

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REFERENCES

1. Francis H. Moffit, Surveying, Intext Educational Publisher
2. Modul ajar Ilmu Ukur Tanah I
3. Modul aajar Ilmu Ukur Tanah II
4. Paul R wolf & Charles D Ghilani, Elementary Surveying, Prentice Hall
5. Phillip Kissam, Surveying for Civil Engineers, McGrw
6. Wolf P & Brinker Russel 1977. Elementary Surveying. Sixth Edition. Toronto

Semester III

SUBJECT	**Subject Name**	**:**	**Spatial Data Computation and Programming**
	Subject Code	**:**	
	Credit	**:**	**3 SKS**
	Semester	**:**	**III**

SUBJECT DESCRIPTION

In this course, students will learn about MATLAB, one of the many programming languages used to perform numerical and mathematical computational analysis, including to process and present spatial data.

GRADE LEARNING ACHIEVEMENTS CHARGED BY SUBJECT

C. Specific Skill

1. Students are able to apply math and science as supporting geodesy and surveying, geodynamics and environment, geospatial, geomarine, and land.
2. Students are able to understand the basic concepts and development of geospatial information technology in geodesy and surveying, geodynamics and environmental, geospatial, geomarine, and land.
7. Students are able to communicate ideas and planning / design result in both basic and thematic geospatial information in analog or digital format based on the latest geomatical science and technology.

D. Knowledge

1. The concept of natural science, principles, and applications of mathematics in the application of geospatial information in the areas of geodesy and surveying, geodynamics and environment, geospatial, geomarine, and land;
2. Concepts and theories of geodesy and geomatic principles that include geodetic reference systems, positioning, photogrammetry, remote sensing, geographic information systems, cartography, hydrography, and land required in the field of geodesy and

surveying, geodynamics and environment, geospatial , geomarine, and land;
8. Insight on the development of advanced geospatial information science and technology in the field of geodesy and surveying, geodynamics and environment, geospatial, geomarine, and land.

SUBJECT LEARNING ACHIEVEMENTS

1. Understanding the concept of natural science, principles, and applications of mathematics in the application of geospatial information in the areas of geodesy and surveying, geodynamics and environment, geospatial, geomarine, and land affairs;
2. Understanding the concepts and theories of geodesy and geomatic principles that include geodetic reference systems, positioning, photogrammetry, remote sensing, geographic information systems, cartography, hydrography, and land required in the field of geodesy and surveying, geodynamics and environment, geospatial , geomarine, and land affairs.

MAIN TOPIC

1. Introduction of Matlab;
2. Vector and Matrix Manipulation;
3. Plot 2d And 3d Data;
4. Matlab Programming;
5. System Equations With Matlab;
6. Data Analysis And Function;
7. Mathematics Problem With Matlab

PREREQUISITE

1. Basic Mathematicals 1 minimum C

REFERENCES

1. Amir Tjolleng, 2017, Pengantar Pemrograman MATLAB, Elex Media Komputindo, Jakarta

2. R.H. Sianipar, 2013, Pemrograman MATLAB Dalam Contoh Dan Penerapan, Informatika
3. R.H. Sianipar, 2017, Matlab Untuk Mahasiswa, Belajar Dari Berbagai Studi Kasus, Andipublisher, Yogyakarta
4. https://www.tutorialspoint.com/matlab/

SUBJECT			
	Subject Name	**:**	**Statistics**
	Subject Code	**:**	
	Credit	**:**	**3 SKS**
	Semester	**:**	**III**

SUBJECT DESCRIPTION

In this course, students will learn about the calculation of statistical data. Method of processing and calculation of statistical data will be discussed in lectures and discussion tasks, so that students are able to understand and implement the calculation of how the selection, calculation and testing of observation data. By testing the data, it can be done analysis to make conclusions.

GRADE LEARNING ACHIEVEMENTS CHARGED BY SUBJECT

C. Specific Skill

1. Students are able to apply math, science, science and technology of geospatial information to create or modify basic and thematic geospatial information on geodesy and surveying, geodynamics and environment, geospatial, geomarine, and land.
3. Students are able to solve the problem of providing basic and thematic geospatial information related to geodesy and surveying, geodynamics and environment, geospatial, geomarine and land, include the ability to:
   b. Proposes the best solution to solve issues in the field of geodetics and surveying, geodynamics and environment, geospatial, geomarine and land based on the principles of geospatial information science and technology, taking into consideration economic, security, public safety and environmental sustainability;

D. Knowledge

2. Concepts and theories of geodesy and geomatic principles that include geodetic reference systems, positioning, photogrammetry, remote sensing, geographic information systems, cartography, hydrography, and land required in the field of geodesy and

surveying, geodynamics and environment, geospatial , geomarine, and land;
6. Current principles and issues in the economic and socio-cultural field in general;
7. General concepts, principles, and communication techniques for specific purposes;
8. Insight on the development of advanced geospatial information science and technology in the field of geodesy and surveying, geodynamics and environment, geospatial, geomarine, and land.

SUBJECT LEARNING ACHIEVEMENTS

1. Students are able to explain the general concept of statistics as well as identify the scale of data from the variable
2. Students are able to practice data presentation in a textile, tabular, and graphical way
3. Students are able to select, calculate and process research data.
4. Students are able to understand the procedures in researching, process and processing of statistical data
5. Students are able to understand the procedure in testing a statistical data
6. Students are able to analyze the test results of a statistical data

MAIN TOPIC

1. Statistics
2. Frequency Distribution
3. Center Value Size
4. Linear and multivariable regression
5. Correlation and covariance
6. Probability
7. Normal Distribution
8. T-student and chi-square distribution
9. Trust interval
10. Average estimation and variance
11. Test Statistics on average and variance

PREREQUISITE

1. Calculus
2. Matrix and Vector Space

REFERENCES

1. Johnson, R.A. and Bhattacharyya, G.K. 2010. Statistics Principles and Metho ds 6th Ed. John Wiley & Sons.
2. Mikhail,E.M., 1976. Analysis and Adjustment of Survey Measurements. Dun Donnelley Publisher New York..
3. Ghilani, C. and Wolf, P.R. 2006. Adjustment Computations: Spatial Data Analysis 4th Ed. John Wiley & Sons.
4. Anjasmara, I.M. 2016. Statistika untuk Geomatika. Jurusan TeknikGeomatika ITS.

SUBJECT			
	Subject Name	**:**	**Advanced Terrestrial Mapping**
	Subject Code	**:**	
	Credit	**:**	**4 SKS**
	Semester	**:**	**III**

SUBJECT DESCRIPTION

In this lecture was introduced about the Understanding of Topographic Mapping including Topographic Maps Implementation. Preparation of the map is preceded by the measurement of Horizontal Frames (Polygons) - Review, intersection and resection. Further introduced about the equipment used, both horizontal and vertical framework. This mapping is calculated by Tachimetri. With tachymetry data also created a contour image on the map. With existing map data, it can be specified for both area and volume count requirements.

GRADE LEARNING ACHIEVEMENTS CHARGED BY SUBJECT

C. Specific Skill

2. Students are able to understand the basic concepts and development of geospatial information technology in geodesy and surveying, geodynamics and environmental, geospatial, geomarine, and land.
4. Students are able to identify, select, and utilize a variety of geospatial data and information sources to support the planning, implementation, monitoring and evaluation of activities in geodesy and surveying, geodynamics and environment, geospatial, geomarine, and land.

D. Knowledge

1. The concept of natural science, principles, and applications of mathematics in the application of geospatial information in the areas of geodesy and surveying, geodynamics and environment, geospatial, geomarine, and land;

SUBJECT LEARNING ACHIEVEMENTS

1. Students are able to plan, measure, process and draw topographic maps
2. Students are able to calculate the area and volume of cut and fill

MAIN TOPIC

1. Definition of Topographic Mapping
2. Horizontal Framework (Polygon, Review)
3. Intersection, Resection
4. Vertical Framework (Leveling-Review),
5. High system,
6. Tachimetri,
7. Contour,
8. Map Imagery,
9. Standard mapping accuracy,
10. Area, Volume,
11. Introduction to Total Station tools.

PREREQUISITE

1. Principles Of Terrestrial Mapping

REFERENCES

1. Edward M. Mikhail dan Gordon Gracie. *Analysis and Adjustment of Survey Measurement*. Van Nostrand Reinhold Company. New York
2. James M. Anderson dan Edward M. Mikhail. *Surveying. Theory and Practice*. Mc Graw Hill. New York
3. Kissam Philip. 1981. Surveying for Cvil Engieering. USA
4. Modul aajar Ilmu Ukur Tanah II
5. Paul R. Wolf dan Charles D. Ghilani. Elementary Surveying. An Introduction to Geomatics
6. Paul R. Wolf dan Charles D. Ghilani. Elementary Surveying. An Introduction to Geomatics. Pearson Education International
7. Tumewu,Lien. 1979. Route Surveying. ITB
8. Yuwono . 2009. Kartografi. Institut teknologi Sepuluh Nopember Surabaya

SUBJECT			
	Subject Name	**:**	**Spatial Database Systems**
	Subject Code	**:**	
	Credit	**:**	**3 SKS**
	Semester	**:**	**III**

SUBJECT DESCRIPTION

In this course, students will learn about the concept of spatial database and its application related to Geomatics science which is discussed in lectures in class. Laboratory activities provide students with experience in creating spatial database systems using one type of SMBDS software (PostgreSQL + PostGIS or others).

In this lecture, will also be presented how to visualize SMBDS using GIS software (Open Jump, QGIS, ArcGIS, AutoCAD or other). Other supporting materials are broadly given an explanation of how to connect

spatial database systems with object-oriented software (VB, Delphi or other) to support the creation of spatial database application interfaces.

GRADE LEARNING ACHIEVEMENTS CHARGED BY SUBJECT

C. Specific Skill

2. Students are able to understand the basic concepts and development of geospatial information technology in geodesy and surveying, geodynamics and environmental, geospatial, geomarine, and land.
3. Students are able to solve the problem of providing basic and thematic geospatial information related to geodesy and surveying, geodynamics and environment, geospatial, geomarine and land, include the ability to:
   a. Identify, discover, formulate, and analyze the source of problems in geodesy and surveying, geodynamics and environment, geospatial, geomarine, and land;
   b. Proposes the best solution to solve issues in the field of geodetics and surveying, geodynamics and environment, geospatial, geomarine and land based on the principles of geospatial information science and technology, taking into consideration economic, security, public safety and environmental sustainability;
7. Students are able to communicate ideas and planning / design result in both basic and thematic geospatial information in analog or digital format based on the latest geomatical science and technology.

D. Knowledge

2. Concepts and theories of geodesy and geomatic principles that include geodetic reference systems, positioning, photogrammetry, remote sensing, geographic information systems, cartography, hydrography, and land required in the field of geodesy and surveying, geodynamics and environment, geospatial , geomarine, and land;
8. Insight on the development of advanced geospatial information science and technology in the field of geodesy and surveying, geodynamics and environment, geospatial, geomarine, and land.

SUBJECT LEARNING ACHIEVEMENTS

1. Students understand the concept of spatial database system.
2. Students understand the ways and methods to build spatial database systems.
3. Students have the experience and ability to create spatial database systems using one of the SMBDS programming languages (PostgreSQL + PostGIS or others).
4. Students have the experience and ability to visualize SMBDS using any of the GIS software (Open Jump, QGIS, ArcGIS, AutoCAD or other).
5. Students know the spatial database application interface using one of the object-oriented programming languages (VB, Delphi or other).
6. Students are able to express their ideas or ideas verbally and in writing

MAIN TOPIC

1. The Concept of Spatial Database,
2. Architecture and rules in Spatial Database,
3. Basic Concepts About Tables
4. Relationship Model
5. Spatial Database Design
6. Algebraic Relation In Table
7. Relational Spatial Database Language
8. Building a Database System and Spatial Database System using one of SMBD and SMBDS software, connecting and visualizing in GIS software (Open Jump, QGIS, ArcGIS, AutoCAD or others).
9. Introducing Spatial Database System application in the field of Geomatics.

PREREQUISITE

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REFERENCES

1. Noname, 2006, Menjadi Seorang Programmer Komputer, Penerbit Andi dan Wahana Komputer, Yogyakarta
2. Fathansyah, 2007, Basis Data, Penerbit CV Informatika, Bandung
3. Sutanta, Edhy, 2004, Sistem Basis Data, Penerbit Graha Ilmu, Yogyakarta
4. Waljiyanto, 2009, Sistem Basis Data, Penerbit Graha Ilmu, Yogyakarta
5. Prahasta, Eddy, 2012, Tutorial PostgreSQL, PostGIS dan PgRouting, Informatika, Bandung

SUBJECT			
	Subject Name	**:**	**Digital Cartography**
	Subject Code	**:**	
	Credit	**:**	**3 SKS**
	Semester	**:**	**III**

SUBJECT DESCRIPTION

This course is intended to enable students to explain and apply the concepts and procedures, the science and techniques of cartography as a method of making maps using computer technology. Basic theory of cartographic elements such as generalization of elements to be presented along with map scale; the selection of symbols and colors for an element of the earth according to the geospatial information to be presented; layout maps laying map contents as well as text such as the selection of types and font sizes will be given so that students will have knowledge on how to create characteristics and design a map with digital technology. Where the ability to process data both in the form of vector and raster will be able to process geospatial data, and able to apply by using digital mapping applications to analyze the application of contour mapping, profile, volume and visualization of maps digitally.

GRADE LEARNING ACHIEVEMENTS CHARGED BY SUBJECT

C. Specific Skill

1. Students are able to apply math and science as supporting geodesy and surveying, geodynamics and environment, geospatial, geomarine, and land.
3. Students are able to solve the problem of providing basic and thematic geospatial information related to geodesy and surveying, geodynamics and environment, geospatial, geomarine and land, include the ability to:
    a. Identify, discover, formulate, and analyze the source of problems in geodesy and surveying, geodynamics and environment, geospatial, geomarine, and land;
    b. Proposes the best solution to solve issues in the field of geodetics and surveying, geodynamics and environment, geospatial, geomarine and land based on the principles of geospatial information science and technology, taking into consideration economic, security, public safety and environmental sustainability;
    c. Plan and design the provision of basic and thematic geospatial information using research-based methods in the areas of: geodetic and surveying, geodynamics and environment, geospatial, geomarine, and land;
    d. Managing activities in survey and mapping (planning schedule, quality, procurement, method, and cost) based on geospatial information science and technology principles taking into account technical standards, performance aspects, reliability, ease of implementation, sustainability, and taking into account economic, safety public, cultural, social and environmental (environmental consideration)
4. Students are able to identify, select, and utilize a variety of geospatial data and information sources to support the planning, implementation, monitoring and evaluation of activities in geodesy and surveying, geodynamics and environment, geospatial, geomarine, and land.

D. Knowledge

1. The concept of natural science, principles, and applications of mathematics in the application of geospatial information in the areas of geodesy and surveying, geodynamics and environment, geospatial, geomarine, and land;
3. Principles, methods and application of rules, standards, guidelines and manuals for the provision of basic and thematic geospatial

information in geodesy and surveying, geodynamics and environment, geospatial, geomarine, and land affairs;
8. Insight on the development of advanced geospatial information science and technology in the field of geodesy and surveying, geodynamics and environment, geospatial, geomarine, and land.

SUBJECT LEARNING ACHIEVEMENTS

1. Students have knowledge of the principal objectives of cartography
2. Students have basic knowledge of cartographic theories and methods of making maps.
3. Students have experience to perform spatial data processing in the form of raster and vector.
4. Students are able to think critically about the use and management of measurement and mapping for planning as well as some life problems based on their understanding of the principles of human resource, tool and cost management processes.
5. Students are able to express their ideas verbally and in writing.

MAIN TOPIC

1. Introduction to Mapping Survey
2. Organization of Surveying and Mapping Works
3. Legislation and Ethics on Mapping
4. TOR / RKS for Surveying and Mapping work
5. Work Document Survey and Mapping
6. Scheduling and Monitoring
7. Control and Quality Assurance Work Mapping Survey
8. Tender Process of Survey and Mapping Work
9. Introduction of K3 aspect in Survey and Mapping activities
10. Budgeting Components
11. Reporting Components

PREREQUISITE

1. Advanced Terrestrial Mapping

REFERENCES

1. Robinson, AH. 1995. Elements Of Cartography. John Willey & Son.
2. Moore,A. & Drecki, I. 2008. Geospatial New Vision. Springer
3. Aditya, Trias, 2007, The National Atlas as Metaphor for Improved Use of a National Geospatial data Infrastructure, Disertasi, Utrecht University, The Netherlands.
4. Hakim, D.M, Sumarno, 2007, Membangun Infrastruktur Data Spasial, Prosiding, Natural Disaster and Environmental Management The 2nd Indonesian Geospatial Technology Exhibition, Jakarta
5. Lo, C.P. 1996, Penginderaan Jauh Terapan, Cetakan Pertama, Universitas Indonesia Press, Jakarta
6. Kraak, M.J., Ormeling, F., 2007, Kartografi Visualisasi Data Geospasial, Edisi kedua, Gadjah Mada University Press, Yogyakarta
7. Ormeling, Ferjan, 2004, Map Use Education and Geovisualisation, Prosiding, 3rd FIG Regioanl Conference, Jakarta

Semester IV

SUBJECT	**Subject Name**	**:**	**Physical Oceanography**
	Subject Code	**:**	
	Credit	**:**	**3 SKS**
	Semester	**:**	**IV**

SUBJECT DESCRIPTION

GRADE LEARNING ACHIEVEMENTS CHARGED BY SUBJECT

C. Specific Skill

1. Students are able to apply math and science as supporting geodesy and surveying, geodynamics and environment, geospatial, geomarine, and land.
2. tudents are able to understand the basic concepts and development of geospatial information technology in geodesy and surveying, geodynamics and environmental, geospatial, geomarine, and land.
3. Students are able to solve the problem of providing basic and thematic geospatial information related to geodesy and surveying, geodynamics and environment, geospatial, geomarine and land, include the ability to:
   a. Identify, discover, formulate, and analyze the source of problems in geodesy and surveying, geodynamics and environment, geospatial, geomarine, and land;
   c. Plan and design the provision of basic and thematic geospatial information using research-based methods in the areas of: geodetic and surveying, geodynamics and environment, geospatial, geomarine, and land;

D. Knowledge

1. The concept of natural science, principles, and applications of mathematics in the application of geospatial information in the areas of geodesy and surveying, geodynamics and environment, geospatial, geomarine, and land;

2. Concepts and theories of geodesy and geomatic principles that include geodetic reference systems, positioning, photogrammetry, remote sensing, geographic information systems, cartography, hydrography, and land required in the field of geodesy and surveying, geodynamics and environment, geospatial , geomarine, and land;
3. Principles, methods and application of rules, standards, guidelines and manuals for the provision of basic and thematic geospatial information in geodesy and surveying, geodynamics and environment, geospatial, geomarine, and land affairs;
8. Insight on the development of advanced geospatial information science and technology in the field of geodesy and surveying, geodynamics and environment, geospatial, geomarine, and land.

SUBJECT LEARNING ACHIEVEMENTS

1. Students are able to apply general concepts about physical parameters at sea such as wind, wave, current, temperature, density, salinity, atmosphere in the field of Geomatics Science

MAIN TOPIC

1. Definition and History of Oceanography,
2. Physical settings,
3. The atmospheric effect on the oceans;
4. Heat balance at sea;
5. Temperature, salinity and density;
6. Wind, current, wave and numerical model.

PREREQUISITE

1. Earth Science
2. Principles of Physics

REFERENCES

1. Stewart, R., 2008. Introduction to Physical Oceanography. Department of Oceanography. Texas A & M University.

2. Mellor, George R. 1996. Introduction to Physical Oceanography. Princeton University. New Jersey

SUBJECT			
	Subject Name	**:**	**Civil Engineering Survey**
	Subject Code	**:**	
	Credit	**:**	**3 SKS**
	Semester	**:**	**IV**

SUBJECT DESCRIPTION

In this lecture will be given basic mathematics that includes geometry and trigonometry of geomatics field for civil engineering application (building and infrastructure building, road geometry, elevation planning and planimetric position, excavation and embankment). The role of geomatics in techniques and methods to support civil engineering applications. To further strengthen the skills of students will be given practical materials in the field in accordance with the subjects and application of civil engineering.

GRADE LEARNING ACHIEVEMENTS CHARGED BY SUBJECT

C. Specific Skill

1. Students are able to apply math and science as supporting geodesy and surveying, geodynamics and environment, geospatial, geomarine, and land.
2. Students are able to understand the basic concepts and development of geospatial information technology in geodesy and surveying, geodynamics and environmental, geospatial, geomarine, and land.
3. Students are able to solve the problem of providing basic and thematic geospatial information related to geodesy and surveying, geodynamics and environment, geospatial, geomarine and land, include the ability to:

a. Identify, discover, formulate, and analyze the source of problems in geodesy and surveying, geodynamics and environment, geospatial, geomarine, and land;
b. Proposes the best solution to solve issues in the field of geodetics and surveying, geodynamics and environment, geospatial, geomarine and land based on the principles of geospatial information science and technology, taking into consideration economic, security, public safety and environmental sustainability;

4. Students are able to identify, select, and utilize a variety of geospatial data and information sources to support the planning, implementation, monitoring and evaluation of activities in geodesy and surveying, geodynamics and environment, geospatial, geomarine, and land.
6. Students are able to implement policies that are related to the organization of basic and thematic geospatial information.
7. Students are able to communicate ideas and planning / design result in both basic and thematic geospatial information in analog or digital format based on the latest geomatical science and technology.

D. Knowledge

1. The concept of natural science, principles, and applications of mathematics in the application of geospatial information in the areas of geodesy and surveying, geodynamics and environment, geospatial, geomarine, and land;
2. Concepts and theories of geodesy and geomatic principles that include geodetic reference systems, positioning, photogrammetry, remote sensing, geographic information systems, cartography, hydrography, and land required in the field of geodesy and surveying, geodynamics and environment, geospatial , geomarine, and land;
5. Concepts and principles of occupational health and safety in the laboratory and in the field;
8. Insight on the development of advanced geospatial information science and technology in the field of geodesy and surveying, geodynamics and environment, geospatial, geomarine, and land.

SUBJECT LEARNING ACHIEVEMENTS

1. Students are able to apply science and technology surveys and mapping to civil engineering (buildings, infrastructure, roads, bridges and land parcels)

MAIN TOPIC

1. The basics of mathematics Geometry and trigonometry,
2. Building height measurement applications
3. Geometry of the highway,
4. Horizontal and vertical alignments
5. Staking Out Horizontal and Vertical alignments,
6. Staking out buildings and plots
7. Measurement and calculation of cut and fill volume

PREREQUISITE

1. Advanced Terrestrial Mapping (minimum D)

REFERENCES

1. Hendriatiningsih. Geometris Jalan Raya & Staking Out ITB. Bandung 1979
2. Hickerson. Route Location And Design. Mc Graw-Hill Book
3. Modul aajar Ilmu Ukur Tanah II
4. Paul R. Wolf dan Charles D. Ghilani. Elementary Surveying. An Introduction to Geomatics
5. Tumewu Liem, Engineering Survey . ITB. Bandung . 1977

SUBJECT			
	Subject Name	**:**	**Principles Of Photogrammetry**
	Subject Code	**:**	
	Credit	**:**	**3 SKS**
	Semester	**:**	**IV**

SUBJECT DESCRIPTION

In this course, students are expected to be able to apply the concept and procedure of photogrammetric science and technique as one of method in large scale mapping for basic and thematic map. In the learning process principles of photogrammetry will be grouped into measurement method (optical concept, mechanical and analytic) and manual interpretation method using method 7 key interpretations, with individual performance as well as in groups in teamwork.

GRADE LEARNING ACHIEVEMENTS CHARGED BY SUBJECT

C. Specific Skill

1. Students are able to apply math and science as supporting geodesy and surveying, geodynamics and environment, geospatial, geomarine, and land..
7. Students are able to communicate ideas and planning / design result in both basic and thematic geospatial information in analog or digital format based on the latest geomatical science and technology.

D. Knowledge

2. Concepts and theories of geodesy and geomatic principles that include geodetic reference systems, positioning, photogrammetry, remote sensing, geographic information systems, cartography, hydrography, and land required in the field of geodesy and surveying, geodynamics and environment, geospatial , geomarine, and land;
3. Principles, methods and application of rules, standards, guidelines and manuals for the provision of basic and thematic geospatial information in geodesy and surveying, geodynamics and environment, geospatial, geomarine, and land affairs;

8. Insight on the development of advanced geospatial information science and technology in the field of geodesy and surveying, geodynamics and environment, geospatial, geomarine, and land.

SUBJECT LEARNING ACHIEVEMENTS

The course is expected to enable students to explain the concept of optical physics such as camera equipment and other equipment to support the concept of stereoscopic, able to explain theoretical and empirical concepts in photogrammetry measurement, able to use the concept of photogrammetry interpretation, analytical photogrammetry in the completion of the orientation process, capable of reporting the results of the experiments and the results of written and oral analysis, capable of using basic equipment Photogrammetry (stereoscopes / parallax bars) for calculating and interpreting aerial photographs, capable of determining photogrammetric method mapping activities by making job requirements, making flying paths, number of photos and able to work independently and work together in teams

MAIN TOPIC

1. Definition and use of Photogrametric Engineering
2. The basic concept of optics for Photogrammetry
3. Metric and non-metric air cameras
4. Planning the shooting path and the number of photos.
5. Interpretation of photogrammetry.
6. Determination of high difference with parallax bars.
7. Inner and outer orientation theory.
8. Air Triangulation Theory.
9. The basic theory of inheritance terms with a single photo and stereo.
10. Photo mosaic and plotting.

PREREQUISITE

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REFERENCES

1. E-learning MK. Fotogrametri. share.its.ac.id
2. Wolf, PR & Dewitt,BA ”Elements of Photogrammetry with Appl. in GIS”, 2004, McGraw-Hill.
3. Cahyono, AB. dan Hapsari, HH. 2006. Petunjuk Praktikum Fotogrametri I, Teknik Geodesi – FTSP, ITS
4. Teguh Hariyanto, 2004, Pengantar Photogrametri, bahan ajar,Teknik Geomatika ITS
5. Kraus K., Photogrammetry, Vol 1 and 2. 4th rev. ed, Ferd. Dümmlers Verlag, 1993
6. G.Konecny, Photogrammetri, 2nd edition, Sprin verlag, 2005.

SUBJECT			
	Subject Name	**:**	**Toponimi**
	Subject Code	**:**	
	Credit	**:**	**3 SKS**
	Semester	**:**	**IV**

SUBJECT DESCRIPTION

In this course, students will study one of the main goals in geodesy that is about the toponimi of the earth's surface. It is expected that through this lecture the students know about the history, naming of a region and the relation of toponimi with other science and other subjects in Geomatika, and how toponimi plays a role in national development. In this lecture also explained the role of International Institute for the determination of Topographic Names and the preparation of Gazetir and the development of spatial data infrastructure of topographical names. From this course is also given knowledge about naming procedures, changes and deletion of topographical names.

GRADE LEARNING ACHIEVEMENTS CHARGED BY SUBJECT

C. Specific Skill

2. Students are able to understand the basic concepts and development of geospatial information technology in geodesy and surveying, geodynamics and environmental, geospatial, geomarine, and land.
7. Students are able to communicate ideas and planning / design result in both basic and thematic geospatial information in analog or digital format based on the latest geomatical science and technology.

D. Knowledge

2. Concepts and theories of geodesy and geomatic principles that include geodetic reference systems, positioning, photogrammetry, remote sensing, geographic information systems, cartography, hydrography, and land required in the field of geodesy and surveying, geodynamics and environment, geospatial , geomarine, and land;

3. Principles, methods and application of rules, standards, guidelines and manuals for the provision of basic and thematic geospatial information in geodesy and surveying, geodynamics and environment, geospatial, geomarine, and land affairs;
6. Current principles and issues in the economic and socio-cultural field in general;
7. General concepts, principles, and communication techniques for specific purposes;

SUBJECT LEARNING ACHIEVEMENTS

1. Students have knowledge about naming and standardization of earth's name (toponimi)
2. Students have knowledge of basic theory and survey methods in naming and standardizing the name of the earth (toponimi)
3. Students have experience to make observations in the field related to the naming and standardization of earth's name (toponimi)
4. Students are able to explain how the process of naming and standardization of earth's name (toponimi)
5. Students are able to express their ideas verbally and in writing.
6. Students are able to apply the concept and procedure of science and technique of Toponimi as one method in geospatial information either work independently or teamwork.

MAIN TOPIC

1. Definition, history and relevance of Toponimi with other sciences;
2. Toponimi's relationships with courses in Geomatic Engineering;
3. State of the art Toponimi at national and international level and the role and function of Toponimi in national development;
4. Toponimi:
   a. Nature,
   b. Toponimi Mountain,
   c. Toponimi Maritim,
   d. Administration (Government: province, district, city etc., Archaeological site area);
5. The Role of International Institutions:
   a. Institutional,

b. Goals and functions;

6. Topographic Names:
   a. Legal basis,
   b. National Authority Topographic / Rupabumi Names,
   c. The Scope of Naming Keyboarding Activities,
   d. Standardization of Maritime Geographic Name,
   e. Nomenclature of Geographical Name of Underwater Element;
7. Scope of Naming Key Occupancy Activity, Gazetir National Elemental Name and Procedure on naming, name change and deletion.

PREREQUISITE

1. Cartography

REFERENCES

1. Department of the Interior. Washington DC US Department of the Interior. *US Geodata: Geographic Names Information System – Data User Guide 6*. USGS. Reston Virginia, 1987
2. IHO (International Hydrographic Organization). *Standardization of Undersea Feature Names.* 3rd Ed. Monaco: International Hydrographic Bureau, 2001.
3. Jacub Rais, *Arti Penting Penamaan Unsur Geografi, Definisi, Kriteria dan Peranan PBB dalam Toponimi, Kasus Nama-Nama Pulau di Indonesia*, ITB Bandung. 2003
4. Kadmon, N. *Toponymy: The Lore, Laws and Language of Geographical Names*. Vantage Press. New York. 2000.
5. Muljo Sukojo, B. *Toponimi* (*Arti dan Peran*). 2012. ITS Press. Surabaya.

Semester V

SUBJECT			
	Subject Name	**:**	**Remote Sensing**
	Subject Code	**:**	
	Credit	**:**	**3 SKS**
	Semester	**:**	**V**

SUBJECT DESCRIPTION

This course covers the processing and utilization of extra-terrestrial spatial data recorded.

GRADE LEARNING ACHIEVEMENTS CHARGED BY SUBJECT

C. Specific Skill

1. Students are able to apply math and science as supporting geodesy and surveying, geodynamics and environment, geospatial, geomarine, and land.
2. Students are able to understand the basic concepts and development of geospatial information technology in geodesy and surveying, geodynamics and environmental, geospatial, geomarine, and land.
3. Students are able to solve the problem of providing basic and thematic geospatial information related to geodesy and surveying, geodynamics and environment, geospatial, geomarine and land, include the ability to:
   c. Plan and design the provision of basic and thematic geospatial information using research-based methods in the areas of: geodetic and surveying, geodynamics and environment, geospatial, geomarine, and land;
   d. Managing activities in survey and mapping (planning schedule, quality, procurement, method, and cost) based on geospatial information science and technology principles taking into account technical standards, performance aspects, reliability, ease of implementation, sustainability, and taking into account economic, safety public, cultural, social and environmental (environmental consideration)

7. Students are able to communicate ideas and planning / design result in both basic and thematic geospatial information in analog or digital format based on the latest geomatical science and technology.

D. Knowledge

1. The concept of natural science, principles, and applications of mathematics in the application of geospatial information in the areas of geodesy and surveying, geodynamics and environment, geospatial, geomarine, and land;
2. Concepts and theories of geodesy and geomatic principles that include geodetic reference systems, positioning, photogrammetry, remote sensing, geographic information systems, cartography, hydrography, and land required in the field of geodesy and surveying, geodynamics and environment, geospatial , geomarine, and land;
3. Principles, methods and application of rules, standards, guidelines and manuals for the provision of basic and thematic geospatial information in geodesy and surveying, geodynamics and environment, geospatial, geomarine, and land affairs;
4. Concepts and principles of environmental conservation;
8. Insight on the development of advanced geospatial information science and technology in the field of geodesy and surveying, geodynamics and environment, geospatial, geomarine, and land.

SUBJECT LEARNING ACHIEVEMENTS

Students understand the history and basic concepts of remote sensing, have skills in processing remote sensing image data including radiometric calibration, geometric correction, interpretation and classification of satellite imagery

MAIN TOPIC

1. Remote Sensing Concept,
2. Geometric Correction,
3. Image Interpretation,
4. Use of Formula,
5. Radiometric Calibration,

6. Use of Software and
7. Image Classification

PREREQUISITE

1. Photogrammetry

REFERENCES

1. Image Analysis, Classification and Change Detection in Remote Sensing: With Originally published: 2014 By Morton J. Canty
2. Physical Principles of Remote Sensing Originally published: 2013 By W. G. Rees
3. Classification Methods for Remotely Sensed Data, Second Edition Originally published: 2009 By Paul Mather, Brandt Tso..
4. Remote sensing, models, and methods for image processing (Book by Robert A. Schowengerdt) Originally published: January 1997 Author: Robert A. Schowengerdt
5. Introduction to Remote Sensing (Book by James B Campbell) Originally published: 1987 Author: James B Campbell
6. Remote Sensing and Image Interpretation (Book by Ralph W. Kiefer and Thomas Lillesand) Originally published: 1979 Authors: Ralph W. Kiefer, Thomas Lillesand

SUBJECT			
	Subject Name	**:**	**Digital Photogrammetry**
	Subject Code	**:**	
	Credit	**:**	**3 SKS**
	Semester	**:**	**V**

SUBJECT DESCRIPTION

In this course, students are expected to be able to apply the concept and procedure of digital photogrammetric science and technique as one of the method in large scale mapping for basic map and thematic digital. In the learning process Digital photogrammetry will be grouped into a method of measurement (digital optical / CCD and CMOS, analytic and digital plotting) and 3D transformation methods with digital plotting equipment and mathematical models, as well as obtaining data and processes for high (Z) using LIDAR technology.

GRADE LEARNING ACHIEVEMENTS CHARGED BY SUBJECT

C. Specific Skill

1. Students are able to apply math and science as supporting geodesy and surveying, geodynamics and environment, geospatial, geomarine, and land.
4. Students are able to identify, select, and utilize a variety of geospatial data and information sources to support the planning, implementation, monitoring and evaluation of activities in geodesy and surveying, geodynamics and environment, geospatial, geomarine, and land.
7. Students are able to communicate ideas and planning / design result in both basic and thematic geospatial information in analog or digital format based on the latest geomatical science and technology.

D. Knowledge

3. Principles, methods and application of rules, standards, guidelines and manuals for the provision of basic and thematic geospatial information in geodesy and surveying, geodynamics and environment, geospatial, geomarine, and land affairs;

8. Insight on the development of advanced geospatial information science and technology in the field of geodesy and surveying, geodynamics and environment, geospatial, geomarine, and land.

SUBJECT LEARNING ACHIEVEMENTS

This course is expected to enable students to explain the concept of electro optical digital physics (CCD / CMOS) such as metric and non metric digital camera equipment and other equipment to support the concept of stereoscopic, able to explain theoretical and empirical concepts in photogrammetry calculation with digital photo data mono and stereo, able to apply the concept of digital photogrammetry in the completion of digital orientation process in the form of 3D mathematical model between photo coordinates and object coordinates (soil) to obtain planimetric and high detail. Know and apply LIDAR Technology concept to get DEM, DSM and contour.

MAIN TOPIC

1. Definition and use of Digital Photogrametric Technique
2. The basic concept of electro optical (CCD and CMOS) for digital cameras
3. Digital camera metrics and nonmetric calibration with IMU
4. Inner and outer orientation theories digitally with 3D mathematical models.
5. Theory and application of digital aerial triangle
6. Theory and application of the model of the condition of inheritance and uniform on digital photos.
7. Theory and application of LIDAR data to get DSM, DTM, DEM.
8. Basic concept of Digital Photogrametry Workstation

PREREQUISITE

1. Principles Of Photogrammetry

REFERENCES

1. Edward, MH,Introduction to Modern Photogrammetry,John Wiley&Sons,2001
2. Fadh Abany,Advanted Photogrametry, Modul Kuliah, 2007
3. Teguh Hariyanto, LIDAR Overview, Modul Kuliah, 2013, Geomatika ITS.
4. G.Konecny, Photogrammetri, 2nd edition, Sprin verlag, 2005.
5. Koerth Sijmons, Introduction on Photogrametry, ITC-Enschede,Holland

SUBJECT			
	Subject Name	**:**	**Geographic Information System**
	Subject Code	**:**	
	Credit	**:**	**3 SKS**
	Semester	**:**	**V**

SUBJECT DESCRIPTION

In this course, students will study one of the main goals in the geographic information system that is the use of computer-based systems to manage geographic data. Basic theory of geographic information systems, components, data formats and methods of spatial data processing will be provided so that students will have knowledge on how to compile, process, analyze, and interpret spatial data in geographic information systems. To understand and gain experience in spatial data preparation, students will be given the task of compiling simple spatial data compiled as attribute data in spatial data. The process of converting spatial data used in geographic information systems will also be provided in this course.

GRADE LEARNING ACHIEVEMENTS CHARGED BY SUBJECT

C. Specific Skill

2. Students are able to understand the basic concepts and development of geospatial information technology in geodesy and surveying, geodynamics and environmental, geospatial, geomarine, and land.
4. Students are able to identify, select, and utilize a variety of geospatial data and information sources to support the planning, implementation, monitoring and evaluation of activities in geodesy and surveying, geodynamics and environment, geospatial, geomarine, and land.
5. Students are able to utilize the knowledge to supervise and control the quality of the process and result of basic and thematic geospatial information by referring to the rules, norms, standards, guidelines and manuals applicable in the fields of: geodesy and surveying, geodynamics and environment, geospatial, geomarine, and land affairs.

D. Knowledge

2. Concepts and theories of geodesy and geomatic principles that include geodetic reference systems, positioning, photogrammetry, remote sensing, geographic information systems, cartography, hydrography, and land required in the field of geodesy and surveying, geodynamics and environment, geospatial , geomarine, and land;
8. Insight on the development of advanced geospatial information science and technology in the field of geodesy and surveying, geodynamics and environment, geospatial, geomarine, and land.

SUBJECT LEARNING ACHIEVEMENTS

1. Students are able to explain the concept and definition of Geographic Information System
2. Students are able to identify Geographic Information System data in spatial data processing
3. Students are able to arrange spatial database in GIS format
4. Students are able to represent spatial data in GIS format.

MAIN TOPIC

1. GIS definitions
2. GIS components
3. Data format
4. Spatial referencing
5. Data conversion
6. Data Structure
7. Spatial database
8. Attribute database

PREREQUISITE

1. Spatial Database Systems
2. Digital Cartography
3. Remote Sensing

REFERENCES

1. Burrough P.A, Principle of GIS for Land Resources Assessment, Oxford, 1998
2. Christopher Jones, GIS and Computer Cartography, Longman England, 1999
3. Green D. and T. Bossomaier, Online GIS and spatial metadata. Taylor & Francis, 2002
4. Aronoff S., Geographic information systems: a management perspective. WDL Publications, 1989.
5. Kang-Tsung Chang, Introduction to Geogpahic Information Systems, Fourth Edition. Singapore. Mc Graw Hill.2008
6. Teguh Hariyanto, Pendahuluan SIG, bahan ajar SIG, ITS Surabaya, 2009.

Semester VI

SUBJECT	**Subject Name**	**:**	**Land Administration**
	Subject Code	**:**	
	Credit	**:**	**3 SKS**
	Semester	**:**	**Vi**

SUBJECT DESCRIPTION

The purpose of this course is to introduce concepts, approaches and systems related to securing land tenure. Land rights, land law in accordance with PMNA no. 3 Year 1997. This course will discuss cadastral survey in accordance with Government Regulation no. 24 year 1997 and connecting the latest scientific knowledge (theory) to the experience and professional needs (practical).

GRADE LEARNING ACHIEVEMENTS CHARGED BY SUBJECT

C. Specific Skill

1. Students are able to apply math and science as supporting geodesy and surveying, geodynamics and environment, geospatial, geomarine, and land.
3. Students are able to solve the problem of providing basic and thematic geospatial information related to geodesy and surveying, geodynamics and environment, geospatial, geomarine and land, include the ability to:
   a. Identify, discover, formulate, and analyze the source of problems in geodesy and surveying, geodynamics and environment, geospatial, geomarine, and land;

D. Knowledge

8. Insight on the development of advanced geospatial information science and technology in the field of geodesy and surveying, geodynamics and environment, geospatial, geomarine, and land.

SUBJECT LEARNING ACHIEVEMENTS

1. Students know and understand the normative legal basis of land registration activities and related matters.
2. Students have knowledge on how to map land registration and its supporters (drawing, field map).
3. Students have experience of making one kind of product of land registration activity such as field map.
4. Students are able to express their ideas verbally and in writing in the field of land

MAIN TOPIC

1. Land Tenure
2. UUPA 1960, General definition of land registration, History of land registration, Development of Land Registration in Indonesia according to its purpose
3. Land Registration System by PMNA / Ka. BPN Number 3 Year 1997
4. Registration System in various countries of the world;
5. Kadastral Survey (PP No.24 of 1997)
6. Fit-for-purpose land administration
7. Complete Systematic Land Registry (PTSL)

PREREQUISITE

1. Spatial Database Systems
2. Digital Cartography
3. Coordinate Systems And Transformations
4. Map Projection

REFERENCES

1.

Semester VII

SUBJECT			
	Subject Name	**:**	**Geospatial Information Analysis**
	Subject Code	**:**	
	Credit	**:**	**4 SKS**
	Semester	**:**	**VII**

SUBJECT DESCRIPTION

In this course, students will study one of the main goals in science and technology in spatial information. Understand extra terrestrial data acquisition technology. knowing the utilization of satellite data and other data. And can conduct comprehensive analysis of geospatial information.

GRADE LEARNING ACHIEVEMENTS CHARGED BY SUBJECT

C. Specific Skill

2. Students are able to understand the basic concepts and development of geospatial information technology in geodesy and surveying, geodynamics and environmental, geospatial, geomarine, and land.
3. Students are able to solve the problem of providing basic and thematic geospatial information related to geodesy and surveying, geodynamics and environment, geospatial, geomarine and land, include the ability to:
   a. dentify, discover, formulate, and analyze the source of problems in geodesy and surveying, geodynamics and environment, geospatial, geomarine, and land;
   b. Proposes the best solution to solve issues in the field of geodetics and surveying, geodynamics and environment, geospatial, geomarine and land based on the principles of geospatial information science and technology, taking into consideration economic, security, public safety and environmental sustainability;

c. Plan and design the provision of basic and thematic geospatial information using research-based methods in the areas of: geodetic and surveying, geodynamics and environment, geospatial, geomarine, and land;

4. Students are able to identify, select, and utilize a variety of geospatial data and information sources to support the planning, implementation, monitoring and evaluation of activities in geodesy and surveying, geodynamics and environment, geospatial, geomarine, and land.
6. Students are able to implement policies that are related to the organization of basic and thematic geospatial information.
7. Students are able to communicate ideas and planning / design result in both basic and thematic geospatial information in analog or digital format based on the latest geomatical science and technology.

D. Knowledge

3. Principles, methods and application of rules, standards, guidelines and manuals for the provision of basic and thematic geospatial information in geodesy and surveying, geodynamics and environment, geospatial, geomarine, and land affairs;
4. Concepts and principles of environmental conservation;
5. Concepts and principles of occupational health and safety in the laboratory and in the field;
6. Current principles and issues in the economic and socio-cultural field in general;
7. General concepts, principles, and communication techniques for specific purposes;
8. Insight on the development of advanced geospatial information science and technology in the field of geodesy and surveying, geodynamics and environment, geospatial, geomarine, and land.

SUBJECT LEARNING ACHIEVEMENTS

1. Students have knowledge of Geospatial Information
2. Students have knowledge of basic theory and survey methods in Geospatial Information
3. Students have experience to conduct field observations related to Geospatial Information

4. Students are able to explain how the Geospatial Information process
5. Students are able to express their ideas verbally and in writing.
6. Students are able to apply the concept and procedure of science and technique of Geospatial Information as one of method in geospatial information either work independently or team work.
7. Students are able to analyze Geospatial Information comprehensively

MAIN TOPIC

1. Definition Geospatial Information
2. Use of Geospatial Information
3. Geospatial Information Capabilities
4. History and Early Development of Geospatial Information
5. The Development of Geospatial Information in Indonesia
6. Implementation of Geospatial Information in Indonesia
7. Geospatial Information Network node
8. Integration of Node Implementation
9. Development of Open Source GI-Based Technology
10. Ina-Geoportal Development
11. Problems and challenges
12. Hardware (Hardware)
13. Software (Software)
14. Data
15. Human
16. Method
17. Geospatial Information Process
18. Terrestrial Spatial Data Source, Photogrammetry and Remote Sensing
19. WebGIS
20. Database Structure
21. Geospatial Information Service (Ina-Geoportal)
22. International Standards (ISO)
23. Land Use Management
24. Inventory of Natural Resources
25. Supervision of Natural Disaster Areas

26. Geospatial Information for Urban and Regional Planning
27. Geospatial Information For Archeology
28. WebGIS implementation

PREREQUISITE

1. Cartography

REFERENCES

1. Aronoff, S. 1989. Geographic Information Systems: A Management Perspective. Ottawa, Canada:WDL Publications.
2. Brovelli, M. A. dan D. Magni . An Archaeological Web Gis Application Based On Mapserver And
3. Burrough, P. A. Dan McDonnell, R. A. 1998. Principles of Geographical Information Systems. New York: Oxford University Press
4. Aronoff, S. 1989. Geographic Information Systems: A Management Perspective. Ottawa, Canada:WDL Publications.
5. Brovelli, M. A. dan D. Magni . An Archaeological Web Gis Application Based On Mapserver And
6. Burrough, P. A. Dan McDonnell, R. A. 1998. Principles of Geographical Information Systems. New York: Oxford University Press
7. Muljo Sukojo, B., 2013. Penginderaan Jauh (Teori dan Terapan), ITS Press Surabaya
8. Muljo Sukojo, B., 2017. Pengantar Informasi Geospasial, Departemen Teknik Geomatika FTSLK ITS Surabaya

SUBJECT			
	Subject Name	**:**	**Management Of Surveying And Mapping**
	Subject Code	**:**	
	Credit	**:**	**3 SKS**
	Semester	**:**	**VI**

SUBJECT DESCRIPTION

This course examines the management of a measurement and mapping work. Methods of collection and type of work are discussed in the classroom along with the task, so that the students have experience in making the type of work and planning by using various mapping methods along with cost estimates based on human resources, equipment and final outcomes of medium and large scale maps. In addition, it is also discussed about the submission of fees, time to obtain and the submission of technical proposals in order to participate in the auction work of government and private.

GRADE LEARNING ACHIEVEMENTS CHARGED BY SUBJECT

C. Specific Skill

1. Students are able to apply math and science as supporting geodesy and surveying, geodynamics and environment, geospatial, geomarine, and land.
2. Students are able to understand the basic concepts and development of geospatial information technology in geodesy and surveying, geodynamics and environmental, geospatial, geomarine, and land.
3. Students are able to solve the problem of providing basic and thematic geospatial information related to geodesy and surveying, geodynamics and environment, geospatial, geomarine and land, include the ability to:
   d. Managing activities in survey and mapping (planning schedule, quality, procurement, method, and cost) based on geospatial information science and technology principles taking into account technical standards, performance aspects, reliability, ease of implementation, sustainability, and taking

into account economic, safety public, cultural, social and environmental (environmental consideration)

D. Knowledge

2. Concepts and theories of geodesy and geomatic principles that include geodetic reference systems, positioning, photogrammetry, remote sensing, geographic information systems, cartography, hydrography, and land required in the field of geodesy and surveying, geodynamics and environment, geospatial , geomarine, and land;
5. Concepts and principles of occupational health and safety in the laboratory and in the field;
6. Current principles and issues in the economic and socio-cultural field in general;

SUBJECT LEARNING ACHIEVEMENTS

1. Students have knowledge of the ultimate goal of project management science.
2. Students have knowledge of basic theory and project measurement methods.
3. Students have experience to perform financing calculations in mapping work.
4. Students are able to think critically about the use and management of measurement and mapping for planning as well as some life problems based on their understanding of the principles of human resource, tool and cost management processes.
5. Students are able to express their ideas verbally and in writing.

MAIN TOPIC

1. Introduction to Mapping Survey
2. Organization of Surveying and Mapping Works
3. Legislation and Ethics on Mapping
4. TOR / RKS for Surveying and Mapping work
5. Work Document Survey and Mapping
6. Scheduling and Monitoring
7. Control and Quality Assurance Work Mapping Survey

8. Tender Process of Survey and Mapping Work
9. Introduction of SHE aspect in Survey and Mapping activities
10. Budgeting Components
11. Reporting Components

PREREQUISITE

1. Field Work

REFERENCES

1. A.A. Karaini. Pengantar Manajemen Proyek. 1994.
2. Arief Rahman, Seri Diktat Kuliah Tata Laksana Proyek.1999
3. IAMPI. Ikatan Ahli Manajemen Proyek Indonesia. Https://www.iampi.org
4. Manajemen Proyek, Konsep dan Implementasi. Budi Santosa.
5. Kuliah Manajemen Media, Subhan Afifi. Https://www.slideshare.net/subhanafifi/prinsip-dasar-manajemen.

Optional Subject

Geodynamic and Environmental Laboratory

SUBJECT	**Subject Name**	**:**	**Satellite Altimetry**
	Subject Code	**:**	
	Credit	**:**	**3 SKS**
	Semester	**:**	**Optional Subject**

SUBJECT DESCRIPTION

In this course, students will study one of satellite satellite geodesy altimetry satellite. Satellite altimetry is a method of measuring sea level and its variations using radar altimeter. The basic concept of satellite geodesy in

general and satellite altimetry in Specific will be given so that students will have knowledge of the principle of measuring sea level using altimetry satellites. In addition, some correction and bias related to data processing in sea level anomaly (SLA) calculations are also submitted. To better understand the knowledge of altimetry satellites, students will be given the task to perform calculations and data processing and analysis in the determination of sea level and its variations. Satellite altimetry applications that are related to ocean phenomena will also be given in this lecture. Students will be critically invited about the utilization of altimetry satellite technology in the purposes of survey and mapping.

GRADE LEARNING ACHIEVEMENTS CHARGED BY SUBJECT

C. Specific Skill

1. Students are able to apply math and science as supporting geodesy and surveying, geodynamics and environment, geospatial, geomarine, and land.
2. Students are able to understand the basic concepts and development of geospatial information technology in geodesy and surveying, geodynamics and environmental, geospatial, geomarine, and land.
3. Students are able to solve the problem of providing basic and thematic geospatial information related to geodesy and surveying, geodynamics and environment, geospatial, geomarine and land, include the ability to:
   a. Identify, discover, formulate, and analyze the source of problems in geodesy and surveying, geodynamics and environment, geospatial, geomarine, and land;
   b. Proposes the best solution to solve issues in the field of geodetics and surveying, geodynamics and environment, geospatial, geomarine and land based on the principles of geospatial information science and technology, taking into consideration economic, security, public safety and environmental sustainability;
   c. Plan and design the provision of basic and thematic geospatial information using research-based methods in the areas of: geodetic and surveying, geodynamics and environment, geospatial, geomarine, and land;
4. Students are able to identify, select, and utilize a variety of geospatial data and information sources to support the planning,

implementation, monitoring and evaluation of activities in geodesy and surveying, geodynamics and environment, geospatial, geomarine, and land.

D. Knowledge

3. Principles, methods and application of rules, standards, guidelines and manuals for the provision of basic and thematic geospatial information in geodesy and surveying, geodynamics and environment, geospatial, geomarine, and land affairs;
8. Insight on the development of advanced geospatial information science and technology in the field of geodesy and surveying, geodynamics and environment, geospatial, geomarine, and land.

SUBJECT LEARNING ACHIEVEMENTS

1. Students have knowledge of altimetry satellites
2. Students have knowledge of basic theory and measurement methods to determine sea level using altimetry satellites.
3. Students have experience to perform simple data processing to determine sea level using altimetry satellite.
4. Students are able to explain sea level and its variations and influence in global and regional marine phenomena.
5. Students are able to think critically about the use of altimetry satellites for practical use in the fields of geodesy, geophysics, marine based on their understanding of the concept of determining sea level based on altimetry satellites.
6. Students are able to express their ideas verbally and in writing.

MAIN TOPIC

1. Introduction of altimetry satellites
2. The basic principle of altimeter
3. Corrections and biases:
   a. Atmosphere: troposphere (dry and wet components) and ionosphere
   b. Sea state bias
   c. Geophysical effects: Tides and dynamic atmospheric
4. Mean sea surface model

5. Analysis of sea level anomaly (SLA): along-tracks and crossovers
6. Satellite altimetry applications in the fields: geodesy & geophysics, oceanography, etc.

PREREQUISITE

1. Satellite Geodesy
2. Hydrographic Survey

REFERENCES

1. Cipollini, P., J. Benveniste, F. Birol, M. J. Fernandes, E. Obligis, M. Passaro, P. T. Strub, G. Valladeau, S. Vignudelli and J. Wilkin (2017). Satellite altimetry in coastal regions. *Satellite Altimetry Over Oceans and Land Surfaces*. D. Stammer and A. Cazenave, CRC Press.
2. Church, J. A., P. U. Clark, A. Cazenave, J. M. Gregory, S. Jevrejeva, A. Levermann, M. A. Merrifield, G. A. Milne, R. S. Nerem, P. D. Nunn, A. J. Payne, W. T. Pfeffer, D. Stammer and A. S. Unnikrishnan. 2013. Sea Level Change. *Climate Change 2013: The Physical Science Basis. Contribution of Working Group I to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change.* T. F. Stocker, D. Qin, G.-K. Plattner, M. Tignor, S.K. Allen, J. Boschung, A. Nauels, Y. Xia, V. Bex and P.M. Midgley. Cambridge, United Kingdom and New York, NY, USA, Cambridge University Press**:** 1137-1216.
3. Fu, L.L. and Cazenave, A. 2001. *Satellite Altimetry and Earth Sciences: A Handbook of Techniques and Applications*, Academic Press, San Diego
4. Vignudelli, S., et al. 2011. "Satellite Altimetry: Sailing Closer to the Coast." 217-238.
5. Vignudelli, S., Kostianoy, A. G., Cipollini, P. and Benveniste, J. , 2011. *Coastal Altimetry*, Berlin Heidelberg, Springer-Verlag

Geomarine Laboratory

S U	**Subject**	**:**	**Law of The Sea**

	Code	**:**	
	Credits	**:**	**2 SKS**
	Semester	**:**	**Optional Subject**

SUBJECT DESCRIPTION

GRADE LEARNING ACHIEVEMENTS CHARGED BY SUBJECT

C. Special Skill

2. Students are able to understand the basic concepts and development of geospatial information technology in geodesy and surveying, geodynamics and environmental, geospatial, geomarine, and land.
3. Students are able to solve the problem of providing basic and thematic geospatial information related to geodesy and surveying, geodynamics and environment, geospatial, geomarine and land, include the ability to:
   a. Identify, discover, formulate, and analyze the source of problems in geodesy and surveying, geodynamics and environment, geospatial, geomarine, and land;
   b. Proposes the best solution to solve issues in the field of geodetics and surveying, geodynamics and environment, geospatial, geomarine and land based on the principles of geospatial information science and technology, taking into consideration economic, security, public safety and environmental sustainability;
   c. Plan and design the provision of basic and thematic geospatial information using research-based methods in the areas of: geodetic and surveying, geodynamics and environment, geospatial, geomarine, and land;
4. Students are able to identify, select, and utilize a variety of geospatial data and information sources to support the planning, implementation, monitoring and evaluation of activities in geodesy and surveying, geodynamics and environment, geospatial, geomarine, and land.
6. Students are able to implement policies that are related to the organization of basic and thematic geospatial information.

D. Knowledge

2. Concepts and theories of geodesy and geomatic principles that include geodetic reference systems, positioning, photogrammetry, remote sensing, geographic information systems, cartography, hydrography, and land required in the field of geodesy and surveying, geodynamics and environment, geospatial , geomarine, and land;
3. Principles, methods and application of rules, standards, guidelines and manuals for the provision of basic and thematic geospatial information in geodesy and surveying, geodynamics and environment, geospatial, geomarine, and land affairs;
8. Insight on the development of advanced geospatial information science and technology in the field of geodesy and surveying, geodynamics and environment, geospatial, geomarine, and land.

SUBJECT LEARNING ACHIEVEMENTS

Students are able to understand and apply the Geomatics science to international and national marine law: determination of normal baseline, straight baseline, baseline of islands, determination of international and national sea borders.

MAIN TOPIC

1. History of the Law of the Sea,
2. Review of Coordinate References,
3. Baseline,
4. Geodesy Aspects of the Law of the Sea, Territorial Sea, Additional Zone, Islands State, Exclusive Economic Zone, Continental Shelf,
5. International Sea Boundary Dispute,
6. The Law of the National Sea,
7. Regional Sea Boundary Disputes,
8. The Islands Region

PREREQUISITE

1. Hidrographic Survey
2. Digital Cartography
3. Coordinate Systems And Transformations

REFERENCES

1. United Nations. 1982. United Convention on the Law of the Sea.
2. Windari, R. 2009. Hukum Laut Zona-Zona Maritim Sesuai UNCLOS 1982 dan Konvensi-Konvensi Bidang Maritim. Jakarta: Bakorkamla.
3. International Hydrographic Bearau. 2006. A Manual on Technical Aspects of The United Conventions on the Law of The Saw. 1982. Monaco
4. United Nations. 1989. The Law of the Sea: Baseline: An examination of the relevant Provisions of United Convention on the Law of the Sea.USA
5. Undang-undang No. 23 Tahun 2014 tentang Pemerintah Daerah.
6. Undang-undang No. 32 Tahun 2004 tentang Pemerintah Daerah.
7. Permendagri No. 76 Tahun 2012 tentang Pedoman Penegasan Batas Daerah

SUBJECT	**Subject Name**	**:**	**COASTAL AND MARINE MANAGEMENT**
	Subject Code	**:**	**RG141450**
	Credit	**:**	**3 SKS**
	Semester	**:**	**Optional Subject**

SUBJECT DESCRIPTION

This course describes the basic law, basic concept of management, utilization, and development of coastal and marine areas in an integrated and sustainable. The basic theoretical of the concept of management, utilization, and development of coastal and marine areas , so the students will have knowledge on how to manage up to develop coastal and marine areas and can provide analysis related to the solution of the problems of the coastal and marine areas. To understand and gain experience in coastal and marine area management, students will be given the task of monitoring the coastal and marine areas including analysis of

management activities, utilization, development, and problems in the coastal and marine areas.

GRADE LEARNING ACHIEVEMENTS CHARGED BY SUBJECT

C. Special Skill

2. Students are able to understand the basic concepts and development of geospatial information technology in geodesy and surveying, geodynamics and environmental, geospatial, geomarine, and land.
3. Students are able to solve the problem of providing basic and thematic geospatial information related to geodesy and surveying, geodynamics and environment, geospatial, geomarine and land, include the ability to:

D. Knowledge

1. The concept of natural science, principles, and applications of mathematics in the application of geospatial information in the areas of geodesy and surveying, geodynamics and environment, geospatial, geomarine, and land;
2. Concepts and theories of geodesy and geomatic principles that include geodetic reference systems, positioning, photogrammetry, remote sensing, geographic information systems, cartography, hydrography, and land required in the field of geodesy and surveying, geodynamics and environment, geospatial , geomarine, and land;
8. Insight on the development of advanced geospatial information science and technology in the field of geodesy and surveying, geodynamics and environment, geospatial, geomarine, and land.

SUBJECT LEARNING ACHIEVEMENTS

1. Students are able to explain the concept and definition of management, utilization, and development of coastal and marine areas in an integrated and sustainable manner.
2. Students know the zoning for the management of coastal and marine areas.
3. Students are able to explain the concept of coastal water rights and small island islands.
4. Students are able to analyze the sediment transpot in coastal waters and small islands.

MAIN TOPIC

1. Legal aspec, principles and objectives of coastal and marine area management
2. The basic concept of coastal and marine management processes
3. Zoning for coastal and marine area management
4. Potential and problems of coastal and ocean area development
5. The process of sediment transpot in coastal areas and small islands
6. Development of coastal waters and small islands

PREREQUISITE

1. Geographic Information System
2. Geographic Survey

REFERENCES

1. Dahuri, R., Jacub Rais, Sapta Putra Ginting, dan M.J. Sitepu. 2001. Pengelolaan Sumberdaya Wilayah Pesisir dan Lautan secara Terpadu. PT Pradnya Paramita, Jakarta

SUBJECT	**Subject Name**	**:**	**Coastal Process**
	Subject Code	**:**	
	Credit	**:**	**2 SKS**

	Semester : 7

SUBJECT DESCRIPTION
GRADE LEARNING ACHIEVEMENTS CHARGED BY SUBJECT
SUBJECT LEARNING ACHIEVEMENTS
Students are able to understand and apply the materials contained in the coastal processes related to the field of Geomatic Science, especially Hydrographic Survey.
MAIN TOPIC
1. Definition of Beach and Beach Process, 2. Coastal Geomorphology, 3. Wave Sea Theory, Generator 4. Waves, 5. Sea Tidal, 6. Sea Level Change, Current, 7. Sediment transport, 8. Coastline Configuration, 9. Beach Profile, 10. Coastal Building Structure.
PREREQUISITE
1. Hidrographic Survey 2. Physical Oceanography
REFERENCES
1. Paul D. Komar., 1976. Beach Processes and Sedimentation., Prentice Hall Inc. New Jersey 2. Stewart, R., 2008. Introduction to Physical Oceano

3. graphy. Department of Oceanography. Texas A & M University.Mellor, George R. 1996. Introduction to Physical Oceanography. Princeton University. New Jersey
4. Bambang Triadmodjo. 2008. Teknik Pantai. Beta Offset. Yogyakarta

Laboratorium Geospasial

SUBJECT	**Subject Name**	**:**	**Applied GIS**
	Subject Code	**:**	
	Credit	**:**	**3 SKS**
	Semester	**:**	**Optional Subject**

SUBJECT DESCRIPTION

In this course, students will study one of the main objectives in Applied GIS, the use of GIS in geographic data and analytical methods for vector and raster formatted and attribute data. The basic theory of application of geographic information systems and systems of analysis, data formats and methods of processing raster data and formats in various applied fields of planning, industry, environment, disaster will be provided so that students will have knowledge on how to compile, process, analyze, apply spatial data and attributes in geographic information systems. In order to understand and gain experience in spatial data preparation, students will be given the task of analyzing spatial data used for their application in these four fields and can be in the form of WEB GIS.

GRADE LEARNING ACHIEVEMENTS CHARGED BY SUBJECT

C. Special Skills

3. Students are able to solve the problem of providing basic and thematic geospatial information related to geodesy and surveying, geodynamics and environment, geospatial, geomarine and land, include the ability to:

5. Students are able to utilize the knowledge to supervise and control the quality of the process and result of basic and thematic geospatial information by referring to the rules, norms, standards, guidelines and manuals applicable in the fields of: geodesy and surveying, geodynamics and environment, geospatial, geomarine, and land affairs.

D. Knowledge

2. Concepts and theories of geodesy and geomatic principles that include geodetic reference systems, positioning, photogrammetry, remote sensing, geographic information systems, cartography, hydrography, and land required in the field of geodesy and surveying, geodynamics and environment, geospatial , geomarine, and land;

SUBJECT LEARNING ACHIEVEMENTS

1. Students are able to explain the concept of analysis in Geographic Information System
2. Students are able to identify the Geographic Information System data required for application in the areas of planning, industry, environment and disaster.
3. Students are able to arrange spatial and non-spatial databases for the applied field,
4. Students are able to represent the results of GIS analysis in the applied field, and can be in the form of WEBGIS.Mahasiswa mampu menjelaskan konsep analisa dalam Sistem Informasi Geografis
5. Students are able to identify Geographic Information System data needed for application in planning, industry, environment and disaster.
6. Students are able to prepare spatial and nonspasial databases for the applied field,
7. Students are able to represent the results of GIS analysis in the applied field, and can be in the form of WEBGIS.

MAIN TOPIC

1. The Concepts and definitions of spatial data in GIS
2. Data Processing Process and Spatial Analysis Model with GIS
3. Identification of parameters data on planning, industry, environment and disaster.
4. Preparation of database for parameters of planning, industry, environment and disaster.
5. Model Database analysis for field parameters of planning, industry, environment and disaster.
6. Presentation of data analysis results for planning, industry, environment and disaster.
7. WEB GIS concepts, definitions and applications

PREREQUISITE

1. Geographic Information System
2. Remote Sensing
3. Digital Photogrammetry .

REFERENCES

1. Burrough P.A, Principle of GIS for Land Resources Assessment, Oxford, 1998

2. Christopher Jones, GIS and Computer Cartography, Longman England, 1999
3. Green D. and T. Bossomaier, Online GIS and spatial metadata. Taylor & Francis, 2002
4. Aronoff S., Geographic information systems: a management perspective. WDL Publications, 1989.
5. Kang-Tsung Chang, Introduction to Geogpahic Information Systems, Fourth Edition. Singapore. Mc Graw Hill.2008

SUBJECT			
	Subject Name	**:**	**Applied Remote Sensing**
	Subject Code	**:**	
	Credits	**:**	**3 SKS**
	Semester	**:**	**VII**

SUBJECT DESCRIPTION

This course covers the processing and advanced use of extra-terrestrial spatial data that was recorded by satellite rides

GRADE LEARNING ACHIEVEMENTS CHARGED BY SUBJECT

C. Special Skill

1. Students are able to apply math and science as supporting geodesy and surveying, geodynamics and environment, geospatial, geomarine, and land.
2. Students are able to understand the basic concepts and development of geospatial information technology in geodesy and surveying, geodynamics and environmental, geospatial, geomarine, and land.
3. Students are able to solve the problem of providing basic and thematic geospatial information related to geodesy and surveying, geodynamics and environment, geospatial, geomarine and land, include the ability to:
   a. Identify, discover, formulate, and analyze the source of problems in geodesy and surveying, geodynamics and environment, geospatial, geomarine, and land;
   b. Proposes the best solution to solve issues in the field of geodetics and surveying, geodynamics and environment, geospatial, geomarine and land based on the principles of geospatial information science and technology, taking into consideration economic, security, public safety and environmental sustainability;
   c. Plan and design the provision of basic and thematic geospatial information using research-based methods in the areas of: geodetic and surveying, geodynamics and environment, geospatial, geomarine, and land;

d. Managing activities in survey and mapping (planning schedule, quality, procurement, method, and cost) based on geospatial information science and technology principles taking into account technical standards, performance aspects, reliability, ease of implementation, sustainability, and taking into account economic, safety public, cultural, social and environmental (environmental consideration)

5. Students are able to utilize the knowledge to supervise and control the quality of the process and result of basic and thematic geospatial information by referring to the rules, norms, standards, guidelines and manuals applicable in the fields of: geodesy and surveying, geodynamics and environment, geospatial, geomarine, and land affairs.
7. Students are able to communicate ideas and planning / design result in both basic and thematic geospatial information in analog or digital format based on the latest geomatical science and technology.

D. Knowledge

1. The concept of natural science, principles, and applications of mathematics in the application of geospatial information in the areas of geodesy and surveying, geodynamics and environment, geospatial, geomarine, and land;
3. Principles, methods and application of rules, standards, guidelines and manuals for the provision of basic and thematic geospatial information in geodesy and surveying, geodynamics and environment, geospatial, geomarine, and land affairs;
4. Concepts and principles of environmental conservation;
8. Insight on the development of advanced geospatial information science and technology in the field of geodesy and surveying, geodynamics and environment, geospatial, geomarine, and land.

SUBJECT LEARNING ACHIEVEMENTS

1. Knowing and understanding the application of remote sensing technology
2. Knowing and able to process remote sensing image data for various purposes
3. Can do advanced satellite image processing and interpretation

MAIN TOPIC

1. Atmospheric Correction,
2. Image Processing for aquatic Studies,
3. Image Processing for Mainland Studies and
4. Image Processing for Atmospheric Studies

PREREQUISITE

1. Remote Sensing

REFERENCES

1. Weng, Qihao, ed. *Remote Sensing for Sustainability*. CRC Press, 2016.
2. Lillesand, Thomas, Ralph W. Kiefer, and Jonathan Chipman. Remote sensing and image interpretation. John Wiley & Sons, 2014.
3. Martin, Seelye. *An introduction to ocean remote sensing*. Cambridge University Press, 2014.
4. Canty, Morton J. *Image analysis, classification and change detection in remote sensing: with algorithms for ENVI/IDL and Python*. Crc Press, 2014.
5. Barrett, Eric C. *Introduction to environmental remote sensing*. Routledge, 2013.
6. Weng, Qihao, ed. *Remote sensing of impervious surfaces*. CRC Press, 2007.
7. Stephens, Graeme L. *Remote sensing of the lower atmosphere*. Vol. 1994. New York: Oxford University Press, 1994.

SUBJECT			
	Subject Name	**:**	**RADARGRAMETRY**
	Subject Code	**:**	
	Credit	**:**	**3 SKS**
	Semester	**:**	**Optional Subject**

SUBJECT DESCRIPTION

This course will give students science and technique in studying one of the mapping technology that is Radar. The basic concept of Radar will be introduced and in subsequent discussions also about the components / equipment and systems of Radar and its utilization primarily for the process of acquisition, identification, frequency and polarization of Radar data. Methods of retrieval, data types and mathematical equations in Radar are discussed in lectures, discussions and presentations in the classroom. In this lecture to understand and gain experience in processing Radar image also InSAR, will also be submitted to the case study student about the utilization of data from Radar and simple processing with radar programming method for mapping.

GRADE LEARNING ACHIEVEMENTS CHARGED BY SUBJECT

C. Specific Skill

1. Students are able to apply math and science as supporting geodesy and surveying, geodynamics and environment, geospatial, geomarine, and land.
2. Students are able to understand the basic concepts and development of geospatial information technology in geodesy and surveying, geodynamics and environmental, geospatial, geomarine, and land.
3. Students are able to solve the problem of providing basic and thematic geospatial information related to geodesy and surveying, geodynamics and environment, geospatial, geomarine and land, include the ability to:
   a. Identify, discover, formulate, and analyze the source of problems in geodesy and surveying, geodynamics and environment, geospatial, geomarine, and land;
4. Students are able to identify, select, and utilize a variety of geospatial data and information sources to support the planning,

implementation, monitoring and evaluation of activities in geodesy and surveying, geodynamics and environment, geospatial, geomarine, and land.

D. Knowledge

1. The concept of natural science, principles, and applications of mathematics in the application of geospatial information in the areas of geodesy and surveying, geodynamics and environment, geospatial, geomarine, and land;
3. Principles, methods and application of rules, standards, guidelines and manuals for the provision of basic and thematic geospatial information in geodesy and surveying, geodynamics and environment, geospatial, geomarine, and land affairs;
7. General concepts, principles, and communication techniques for specific purposes;
8. Insight on the development of advanced geospatial information science and technology in the field of geodesy and surveying, geodynamics and environment, geospatial, geomarine, and land.

SUBJECT LEARNING ACHIEVEMENTS

1. Students have knowledge of the main purpose of active remote sensing.
2. Students have knowledge of the basic theories and methods of image processing.
3. Students have experience to perform simple Radar image analysis.
4. Students are able to think critically about the use and management of measurement and mapping for planning as well as some life problems based on their understanding of the principles of human resource, tool and cost management processes.
5. Students are able to express their ideas or ideas verbally and in writing.

MAIN TOPIC

1. Radar Concepts and Definition
2. Radar Systems and Equipment
3. The Basic Radar Equation

4. Radar Frequency and Polarization
5. Radar Data Processing
6. SAR and RAR
7. Radar Interferometry
8. Radar application for mapping

PREREQUISITE

Digital Photogrammetry
Remote Sensing

REFERENCES

1. Robert M. O'Donnell, Radar Fundamental. Lincoln Lab - MIT USA
2. Merrill I Skolni, 2008, Introduction to Radar Systems, McGraw-Hill international editions
3. Radargrammetric Image Processing. 1990. Franz W. Leberl.
4. SAR Guide Book. www.sarmap.ch.
5. E-Learning RADAR. SAREdu. https://saredu.dlr.de/

SUBJECT			
	Subject Name	**:**	**Close Range Photogrammetry**
	Subject Code	**:**	
	Credit	**:**	**3 SKS**
	Semester	**:**	**Optional Subject**

SUBJECT DESCRIPTION

In this course, students will learn about the definitions, components and systems of close-range photogrammetry and their further utilization. Methods of taking, data types and mathematical models are discussed in lectures in the classroom and in the laboratory, so that students have experience of collecting and processing data from the principle of close photogrammetry. In this lecture, we will present case studies on the use of data from close-up photogrammetry for both topographic and non-topographic applications. In addition in this lecture also discussed about the development of new technologies in photogrammetry such as

structure from motion, photogrammetric computer vision, and visual navigation.

GRADE LEARNING ACHIEVEMENTS CHARGED BY SUBJECT

C. Specific Skill

2. Students are able to understand the basic concepts and development of geospatial information technology in geodesy and surveying, geodynamics and environmental, geospatial, geomarine, and land.
3. Students are able to solve the problem of providing basic and thematic geospatial information related to geodesy and surveying, geodynamics and environment, geospatial, geomarine and land, include the ability to:
   a. Identify, discover, formulate, and analyze the source of problems in geodesy and surveying, geodynamics and environment, geospatial, geomarine, and land;
   b. Proposes the best solution to solve issues in the field of geodetics and surveying, geodynamics and environment, geospatial, geomarine and land based on the principles of geospatial information science and technology, taking into consideration economic, security, public safety and environmental sustainability;
7. Students are able to communicate ideas and planning / design result in both basic and thematic geospatial information in analog or digital format based on the latest geomatical science and technology.

D. Knowledge

2. Concepts and theories of geodesy and geomatic principles that include geodetic reference systems, positioning, photogrammetry, remote sensing, geographic information systems, cartography, hydrography, and land required in the field of geodesy and surveying, geodynamics and environment, geospatial , geomarine, and land;
8. Insight on the development of advanced geospatial information science and technology in the field of geodesy and surveying, geodynamics and environment, geospatial, geomarine, and land.

SUBJECT LEARNING ACHIEVEMENTS

1. Students are able to think critically about the use of distance photogrammetry techniques for some life problems based on their understanding of principles, processes and applications.
2. Students have knowledge on how to use close photogrammetric data for topographic and non-topographical areas.
3. Students have experience working on one or more types of products or projects with close-range photogrammetry methods as well as testing and analyzing the results of their applications

MAIN TOPIC

1. Introduction of Close Range Photogrammetry;
2. Review of Analytic Photogrammetry;
3. Distortion And Camera Calibration;
4. Use of Metric and Nonmetric Cameras;
5. Close Range Photogrammetry Applications For Architecture, Archeology, Medicine, and Industry;
6. 3D Modeling,
7. Multiview 3D Reconstruction;
8. Structure From Motion And
9. Photogrammetric Computer Vision

PREREQUISITE

Principle of Photogrammetry
Digital Photogrammetry

REFERENCES

1. Wolf, P. R. dan Dewitt, B. A. 2004. Elements of Photogrammetry with Application in GIS. New Jersey: McGraw Hill

SUB	Subject Name	:	Information System For Planning

	Subject Code	**:**	**RG141447**
	Credit	**:**	**2 SKS**
	Semester	**:**	**-**

SUBJECT DESCRIPTION

This course explains about basic planning concept, planning process and planning information system. Basic theory on the planning component, the concept of spatial function in the area of spatial plans will be provided so that students will understand how to make information system that related to urban planning. To understand and gain experience in planning information systems, students will be given the task of identifying the application of planning information system in spatial planning.

GRADE LEARNING ACHIEVEMENTS CHARGED BY SUBJECT

SUBJECT LEARNING ACHIEVEMENTS

1. Students are able to explain about planning, planning process and information system for planning.
2. Students are able to explain planning component type.
3. Students are able to explain spatial planning concept.
4. Students are able to identify the application of planning information system in spatial planning area.

MAIN TOPIC

1. Planning concept
2. Planning component
3. Spatial arrangement concept
4. Area spatial planing
5. Information System For Planning

PREREQUISITE
Geographic Information System
REFERENCES
1. Cassidy, Anita. 2006. Information System Strategic Planning. Auerbach Publications, France.

Cadastre and Land Policy Laboratory

SUBJECT	**Subject Name**	**:**	**LAND INFORMATION SYSTEM**
	Subject Code	**:**	
	Credit	**:**	**3 SKS**
	Semester	**:**	**Optional Subject**

SUBJECT DESCRIPTION
In this course, students will learn about the utilization of information systems for the land sector. Collection methods and data types discussed in the lecture in the classroom and in the laboratory, so that students have the experience to collect, process and analyze and use information systems specially Land Information. In this case will be done also the relationship of Land Information System with Land Management and Land Administration. In addition, also discussed about the data conversion planning data from hardcopy into a soft copy data along the topology-based selection method based on the type of data. In this lecture, we will also present case studies on spatial and non spatial data utilization in the field of land as data types make a spatial and non spatial database system and utilization of data analysis method of land sector.
GRADE LEARNING ACHIEVEMENTS CHARGED BY SUBJECT
C. Special Skills

1. Students are able to apply math and science as supporting geodesy and surveying, geodynamics and environment, geospatial, geomarine, and land.
3. Students are able to solve the problem of providing basic and thematic geospatial information related to geodesy and surveying, geodynamics and environment, geospatial, geomarine and land, include the ability to:
4. Students are able to identify, select, and utilize a variety of geospatial data and information sources to support the planning, implementation, monitoring and evaluation of activities in geodesy and surveying, geodynamics and environment, geospatial, geomarine, and land.

D. Knowledge

2. Concepts and theories of geodesy and geomatic principles that include geodetic reference systems, positioning, photogrammetry, remote sensing, geographic information systems, cartography, hydrography, and land required in the field of geodesy and surveying, geodynamics and environment, geospatial , geomarine, and land;
3. Principles, methods and application of rules, standards, guidelines and manuals for the provision of basic and thematic geospatial information in geodesy and surveying, geodynamics and environment, geospatial, geomarine, and land affairs;
7. General concepts, principles, and communication techniques for specific purposes;
8. Insight on the development of advanced geospatial information science and technology in the field of geodesy and surveying, geodynamics and environment, geospatial, geomarine, and land.

SUBJECT LEARNING ACHIEVEMENTS

1. Students understand about the fundamental purpose of information systems science.
2. Students understand about basic theory and methods of information system for land
3. Students have experience to make simple applications for land.
4. Students are able to think critically about the utilization and management of measurement and mapping for planning as well as some life problems based on their understanding of human resource principles, tool and cost management processes.
5. Students are able to express their ideas or ideas verbally and in writing.

MAIN TOPIC

1. Concept of Land Information System
2. Relationship of Land Information System with Land Management and Land Administration
3. The role of data and information in decision making
4. Types of spatial data of land
5. Types of textual data of land
6. Database Theory, Database Model Theory, LADM
7. Method of Designing IS (Information System)
8. IS Application for Land
9. Examples and demos of some SIP applications

PREREQUISITE

GIS, Land Management, Land Administration

REFERENCES

1. Aronoff, S, 1989. "Geographic Information System : A Management Perspective". WDL Publications, Ottawa, Canada
2. Burrough, P.A & McDonnel, R.A, 1998. "Principles of Geographical Information System". Oxford University Press Inc, New York

3. Burrough, P.A, 1996. “Principles of Geographical Information System For Land Resources Assessment”. Oxford University Press Inc, New Yor
4. Budi Harsono, Hukum Agraria Indonesia, Himpunan Peraturan-peraturan Hukum Tanah, Jembatan, Jakarta, 1986.
5. Hermanses,R., Pendaftaran Tanah di Indonesia, Jembatan, Jakarta.

SUBJECT			
	Subject Name	**:**	**Mapping and Legal Boundary**
	Subject Code	**:**	
	Credit	**:**	**3 SKS**
	Semester	**:**	**VII (Optional)**

SUBJECT DESCRIPTION

In this course, students will be introduced to the concept and definition of territorial boundaries, which contains the historical perspective in the determination of territorial boundaries. land based territorial boundary on legal basis and historical argumentation or agreement. Territorial boundary management covers boundaries between districts, provinces, and countries based on existing rules. For maritime boundaries, including legal basis and historical argumentation, Treaty / agreement, and maritime boundary management. Maritime boundary disputes and settlements include the causes of maritime boundary disputes, limits and alternative dispute resolution in addition to delimitation: Joint Development Zones and other Co-operation Mechanisms. Geomatics Applications in the Determination and Confirmation of the Boundaries and future challenges for Indonesia.

GRADE LEARNING ACHIEVEMENTS CHANGED BY SUBJECT

C. Special skill

2. Students are able to understand the basic concepts and development of geospatial information technology in geodesy and surveying, geodynamics and environmental, geospatial, geomarine, and land.

3. Students are able to solve the problem of providing basic and thematic geospatial information related to geodesy and surveying, geodynamics and environment, geospatial, geomarine and land, include the ability to:
    a. Identify, discover, formulate, and analyze the source of problems in geodesy and surveying, geodynamics and environment, geospatial, geomarine, and land;
    b. Proposes the best solution to solve issues in the field of geodetics and surveying, geodynamics and environment, geospatial, geomarine and land based on the principles of geospatial information science and technology, taking into consideration economic, security, public safety and environmental sustainability;
    c. Plan and design the provision of basic and thematic geospatial information using research-based methods in the areas of: geodetic and surveying, geodynamics and environment, geospatial, geomarine, and land;
    d. Managing activities in survey and mapping (planning schedule, quality, procurement, method, and cost) based on geospatial information science and technology principles taking into account technical standards, performance aspects, reliability, ease of implementation, sustainability, and taking into account economic, safety public, cultural, social and environmental (environmental consideration)
4. Students are able to identify, select, and utilize a variety of geospatial data and information sources to support the planning, implementation, monitoring and evaluation of activities in geodesy and surveying, geodynamics and environment, geospatial, geomarine, and land.

D. Knowledge

2. Concepts and theories of geodesy and geomatic principles that include geodetic reference systems, positioning, photogrammetry, remote sensing, geographic information systems, cartography, hydrography, and land required in the field of geodesy and surveying, geodynamics and environment, geospatial , geomarine, and land;
7. General concepts, principles, and communication techniques for specific purposes;

SUBJECT LEARNING ACHIEVEMENTS

1. Students are able to understand and explain the legal aspects involved in the determination and affirmation of territorial boundaries.
2. Students are able to apply Geomatics technology in the determination and affirmation of territorial boundaries.
3. Students are able to express their ideas or ideas orally and in writing
4. Students are able to think critically about utilization of geodesy technology for some boundary problem based on their understanding of rules or provisions that apply

MAIN TOPIC

1. The concept and definition of boundaries and territories,
2. Determination of Boundaries on Land,
3. Confirmation of the Boundary in the Land,
4. Determination of Sea Boundaries,
5. Maritime Boundary Dispute and Settlement,
6. Limits on Regional Marine Management,
7. Geomatical Applications in Determination and Confirmation of Territory Limits, and Future Challenges for Indonesia.

PREREQUISITE

Advanced Terrestrial Mapping

REFERENCE

1. Abidin, 2001, "Beberapan Pemikiran Tentang Penetapan dan Penegasan Batas di Laut", *Geo-Informatika*, Vol. 8 No. 2-3, November 2001.
2. Amhar, Patmasari, dan Kencana, 2001, "Aspek-aspek Pemetaan Batas Wilayah Sebuah Tinjauan Komprehensif", *Geo-Informatika*, Vol. 8 No. 1, Agustus 2001.
3. Churchill, R. and Lowe, A. (1999). The Law of the Sea, Manchester University Press
4. Cole, George. M. (1997). Water Boundaries
5. Evans, Malcolm D. (1988). Relevant Circumstances and Maritime Delimitation, Clarendon Press - Oxford

6. International Hydrographic Organization (2006). A Manual on Technical Aspects of the United Convention on the Law of the Sea, Special Publication No 51, 4th edition, Monaco
7. Legault, L. and Hankey, B. (1993). Method Oppositeness and Adjacency
8. Proportionality in Maritime Boundary Delimitation. Charney, J.I. and Alexander, L.M. (eds) International Maritime Boundaries, Vol. I, Martinus Nijhoff, Dordrecht, pp. 203-241
9. Sutisna, S., 2004, Pandang Wilayah Perbatasan Indonesia
10. Permendagri No. 1/2006 tentang Pedoman Penegasan Batas Daerah