المملكة العربية السعودية
المؤسسة العامة للتدريب التقني والمهني
الإدارة العامة لتصميم وتطوير المناهج

الكليات التقنية

CURRICULUM

FOR

Department:

Civil & Architectural Technology

Major:

Surveying Technology

Program Description:

This program of Geomatics Surveying is designed so as to meet the training needs of the local labor market, following professional International standards set for Surveying Engineering Technology. Training in this program includes general skills in English, physics, statistical methods, mathematics and professional ethics, methods of human communication, interaction skills, project management, Quality management and leadership. It also includes training on computer programing as well as specialized skills in the field of Geomatics, such as: Geodesy, theory of errors and adjustment, map projections and making, advance topics in GIS, spatial databases, mine surveying, hydrographic surveying, surveying applications by computer software, remote sensing and digital photogrammetry. In this training program the trainees spend (1612) training hours in college in addition to (420) hours of training in the labor market as a cooperative program.

The graduates of this program will be given a bachelor degree in "Surveying". Graduates of this program must demonstrate:

1- The ability to analyze, design, and implement surveying projects, GIS data, remote sensing applications.

2- The ability to apply project management techniques to surveying projects.

3- The ability to utilize statistics/probability, transform methods, discrete mathematics, or applied differential equations in handling with surveying process.

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Seventh Trimester								
	Course Code	Course Name	Prereq	No. of Units				
				CRH	L	P	T	CTH
1	ISL 305	Islamic studies (3)		2	2	0	0	2
2	MAT 325	Mathematics (3)		4	3	2	1	6
3	PHY 325	Physics (2)		4	3	2	0	5
4	CMT 385	Advanced Computer Applications		2	0	4	0	4
5	ENG 305	English language (1)		2	2	0	2	4
6	SRV 375	Geodesy		3	2	2	0	4
Total				17	12	10	3	25
L = Lecture Hours, P = Workshop/Laboratory Hours, T = Tutorial Hours								

Eighth Trimester								
	Course Code	Course Name	Prereq	No. of Units				
				CRH	L	P	T	CTH
1	ARB 305	Arabic (2)		2	2	0	0	2
2	MAT 326	Mathematics (4)		4	3	2	1	6
3	ENG 306	English language (2)		2	2	0	2	4
4	CMT 325	Computer Programming		3	2	2	0	4
5	SRV 355	Map Making & Projections		2	2	0	0	2
6	SRV 376	Geographic Information Systems (2)		3	2	2	0	4
7	SRV 356	Survey Applications		2	2	0	0	0
Total				18	15	6	3	22
L = Lecture Hours, P = Workshop/Laboratory Hours, T = Tutorial Hours								

Ninth Trimester								
	Course Code	Course Name	Prereq	No. of Units				
				CRH	L	P	T	CTH
1	ENG 307	English language (3)		2	2	0	2	4
2	GMS 335	Introduction to Management & Leadership		2	2	0	2	4
3	GMS 336	Communication Skills		2	2	0	2	4
4	SRV 378	Spatial Databases	CMT 325	3	2	2	0	4
5	SRV 377	Remote Sensing		3	2	2	0	4
6	SRV 379	Digital Photogrammetry		3	2	2	0	4
Total				15	12	6	6	24
L = Lecture Hours, P = Workshop/Laboratory Hours, T = Tutorial Hours								

Tenth Trimester								
	Course Code	Course Name	Prereq	No. of Units				
				CRH	L	P	T	CTH
1	ENG 308	English language (4)		2	2	0	2	4
2	GMS 437	Management of Engineering Projects		3	3	0	2	5
3	SAT 425	Statistics & Engineering Probabilities		4	3	2	1	6
4	SRV 485	Computer Survey Applications		2	0	4	0	4
5	SRV 435	Highway Engineering		3	2	2	0	4
6	SRV 495	Project (1)		2	0	4	0	4
Total				16	10	12	5	27
L = Lecture Hours, P = Workshop/Laboratory Hours, T = Tutorial Hours								

Eleventh Trimester								
	Course Code	Course Name	Prereq	No. of Units				
				CRH	L	P	T	CTH
1	ENG 309	English language (5)		2	2	0	2	4
2	GMS 438	Quality Tools & Applications		3	3	0	2	5
3	GMS 439	Engineering Economy		2	2	0	0	2
4	SRV 456	Theory of Errors & Observation Adjustment		3	3	0	2	5
5	SRV 475	Geographic Information Systems (3)		3	2	2	0	4
6	SRV 496	Project (2)	SRV 495	2	0	4	0	4
Total				15	12	6	6	24
L = Lecture Hours, P = Workshop/Laboratory Hours, T = Tutorial Hours								

Twelfth Trimester								
	Course Code	Course Name	Prereq	No. of Units				
				CRH	L	P	T	CTH
1	SRV 499	Co-operating Training	Pass all Courses	4				
Total				85	61	40	23	124
The total training hours (124X13) + 420				2032				
L = Lecture Hours, P = Workshop/Laboratory Hours, T = Tutorial Hours								

Brief description

SRV 375 Geodesy:

This course is designed in order to provide students with knowledge ofand skills of applying principles, instrumentation, data analysis methods, and visualization products associated with the science of geodesy which is concerned with the study of the shape and size of the earth in the geometric sense as well as with the form of the equipotential surfaces of the gravity potential.

SRV 355 Map Making & Projections:

The Map Making course is designed since it is the art, science and engineering of map making, and it has been one of the fundamental components in the geospatial technology. This course provides in-depth discussions on the cartographic theories, principles and process of designing and making maps for visualizing spatial information. It will introduce how to practically make different kinds of maps by integrating theoretical understanding with mapping practice using latest version of ArcGIS software. All major thematic maps will be studied in the classroom and practiced in the computer lab. In addition, every student will be expected to do a mapping project as the final class project.

SRV 376 Geographic Information Systems(2):

This course covers techniques for the statistical analysis of spatial data. The course covers issues in characterizing spatial data, methods and problems in spatial data sampling, techniques for visualizing, exploring and modeling spatial data.

SRV 356 Survey Applications:

This course is designed in order to provide students with knowledge ofand skills of applying principles, instrumentation, data analysis methods, and visualization products associated with two important surveying activities which are hydrographic surveying and mining surveying.

SRV 378 Spatial Databases:

This course covers basic concepts of a Spatial Database, including understanding what schemas and views are. Topics will cover also spatial data modeling, query language indexes and access methods.

SRV 377 Remote Sensing:

The course aims to cover the fundamental physical and technical concepts and applications of remote sensing for the Environment. The course will have a lecture/labs format with emphasis on interpretation of satellite data.

SRV 379 Digital Photogrammetry:

This Course is the second part of photogrammetry topics. This course aims at providing trainee with essential and basic skills to deal with digital aerial photographs, and digital photogrammetry systems for drawing digital survey maps form digital aerial stereographs, and forming digital terrain models (DTMs).

In this course, trainee practices and operates digital photogrammetry computer software and will use it to perform different photogrammetry operations which includes; inner orientation, relative orientation, absolute orientation, aerial triangulation, establish digital survey maps, and form digital terrain models.

SRV 485 Computer Survey Applications:

This course aims at providing trainee chance to practice and gain more skills through performing some projects using computer programs to draw cadastral and contour maps and print them with different scales. Also use computer programs to construct longitudinal and cross section from contour map and extract the cut and fill volumes. Also use computer programs to level piece oflandand compute quantities considering designed level is horizontal and with certain slope.

SRV 435 Highway Engineering:

The course is presented in 2 strands. The first strand is concerned with the fundamentals of highway and pavement engineering. It introduces the design process of roads and intersections, including horizontal and vertical alignment design, cross-sections and earthworks. The second half of this strand deals with pavement design and evaluation. Topics include: pavement composition, pavement materials, asphalt mix design, the pavement thickness design, and defects in Flexible pavements andfailures in Rigid pavements. The second strand is presents briefly bridges classification and construction methods.

SRV 495 Project(1):

This course is the first part of applied project. Trainee gets the chance to get knowledge about executable projects within capacity of trainee. Also Trainee reviews some maps and reports of already executed projects.

Trainee should select a project in coordination with his supervisor. The selected project should meet some standards such as: allows trainee to apply what he already have of skills and experiences during his study. Also Trainee should be able to use available supplies such as computer labs, survey systems and software, modern instruments to collect data, process and adjust data, compute final coordinates and draw maps at required scale.

SRV456 Theory of Errors & Observation Adjustment:

This course is designed for the purpose of examining the nature of measurements, statistical analysis of random errors in measurements, propagation of errors, survey standards and design specifications, development of coordinate geometry and trigonometric solutions of plane surveying problems, analysis of errors and mistakes inindirect measurement.

SRV 475 Geographic Information Systems(3):

This course will describe new services which become widely distributed through world today sush as Distributed GIS ,Web Mapping ,Location Based Services.

SRV 496 Project(2):

This course is the second part of applied project. Trainee gets the chance to practice using most advanced systems to execute projects. Also Trainee applies his experiences in carrying out some engineering and surveying projects.

Trainee should select a project in coordination with his supervisor. The selected project should meet some standards such as: allows trainee to apply what he already has of skills and experiences during his study. Also Trainee should be able to use available supplies such as computer labs, survey systems and software, modern instruments to collect data, process and adjust data, compute final coordinates and draw maps at required scale, compute volumes of cut and fill from contour maps an longitudinal and cross sections, also use available software of Remote sensing, and geographic information systems, digital photogrammetry.

Courses description

Department	General Study	**Major**	All Majors
Course Name	Arabic 2	**Course Code**	ARB 305
Prerequisites		**Credit Hours** ***(L,W,T)***	2 (2,0,0)

Course description :

This course concentrates on improving the advance skills of arabic composition of technical colleges students according to their needs and knowledge. It enables them to acquire enough knowledge of types of writing in Arabic. It also gives the theoretical description and practical training of the basic types : summarizing, report, and adminstrative message,..etc. The course also intends to introduce dictative and grammatic subjects to solve the problems of writing and the common mistakes in composition with training on them to change them to acquired linguistic experiences.

Topics :

- Building elements of the text.
- Types of functional writing.
- Types of technical writing.
- Writing mistakes.

Textbook :

كتاب: " التحرير الكتابي" للمؤلفين : د. حمدان الزهراني، د. فهد اللهيبي، د. سعد المطرفي . دار النشر :دار حافظ بجدة

Department	General Study	Major	All Majors
Course Name	Islamic Culture 3	Course Code	ISL 305
Prerequisites		Credit Hours *(L,W,T)*	2 (2,0,0)

Course description :

This course covers principle areas of Islam and Contemporary Issues such as islam systems (the aims of Islam, profession in Islam , and human right) considering to the determination of the general objectives of profession conception , the purposes, and the principles that islam brought, concentrating on what distinguishes islam in its organization with respect to its completeness, its detailing, and its linking between the purposes of sharia and what it brought as a social and economic system

Topics :

- Introduction to assets approach Sunnis.
- profession in Islam.
- Human Right in Islam.
- Suspicious cases in Human Right and response.

Textbook :

المدخل الى الثقافة الإسلامية – جامعة الملك سعود

Department	General Study	Major	All Majors
Course Name	Advance Computer Applications	Course Code	CMT 385
Prerequisites		Credit Hours *(L,W,T)*	2 (0,4,0)

Course description :

This course designed to give the student an advance skill of the Microsoft Word, Microsoft Excel and Microsoft Project. The student has to know how to use the advance option and create a professional document.

Topics :

- Microsoft Word : Use advance option and inset it inside the document
- Microsoft Excel : Use the high level option with workbooks
- Microsoft Project : Give a brief knowledge about how the student use the Microsoft Project

Experiments: if applicable it will support the theoretical topics.

References :

- Microsoft MOS

Detailed of practicals Contents			
Week No	**Contents**	**material**	**Hours**
1	Create new documents apply templates	Microsoft Word	**4**
2	Inserting special characters (©, ™, £) Configure AutoCorrect Options Inserting Special Characters Using AutoCorrect Disabling AutoCorrect		**4**
3	Record simple macros Assign shortcut keys Manage macro security		**4**
4	Create new workbooks using templates Select a Template from the New Tab Search for Additional Templates	Microsoft Excel	**4**
5	Display dates and times with functions Summarize data with functions Use a financial function Use formulas to create subtotals Uncover formula errors		**4**
6	Demonstrate how to apply the SUM function Demonstrate how to apply the COUNT function Demonstrate how to apply the AVERAGE function Demonstrate how to apply the MIN and MAX functions		**4**
7	Import files Set data validation Create outlines Collapse groups of data in outlines Filter records Change the sort order Remove duplicates Manage macro security		**4**
8	Navigate in Microsoft Project Create a Project Schedule Define Project Calendars Enter Tasks and Task Details Organize Tasks into Phases Link Tasks Document Tasks	Microsoft Project	**4**

	Review the Project Schedule's Duration		
9	Establish people resources Establish equipment resources Establish material resources Establish cost resources Establish resource pay rates Adjust resource working times Add resource notes	Microsoft Project	**4**
10	Assign work resources to tasks Add more work resource assignments to tasks Assign material resources to tasks Assign cost resources to tasks		**4**
11	Apply a task calendar to an individual task Change task types Split a task Establish recurring tasks Apply task constraints Review the project's critical path View resource allocations over time		**4**

Department	General Study	**Major**	All Majors
Course Name	Computer Programming	**Course Code**	CMT 325
Prerequisites		**Credit Hours** *(L,W,T)*	3 (2,2,0)

Course description :

The main purpose of this course is to help the trainees increase their programming and problem solving skills.

This course should provide trainees with basic Knowledge of C++-Programming, regarding syntax and applied practice, with a focus on object-oriented design principles.

Topics :

- Problem-Solving and Introduction programs and C++.
- Elementary programming.
- Selections.
- Mathematical Functions, Characters, and Strings.
- Loops.
- Functions.
- Arrays.
- Objects and classes.

Experiments: if applicable it will support the theoretical topics.

References :

- Y. Daniel Liang, Introduction to Programming with C++, 3/E.
- Gary J. Bronson, C++ for Engineers and Scientists, 3/E.

Detailed of Theoretical Contents			
	Contents	**Week no.**	**Hours**
1	**Problem-Solving and Introduction programs and C++:** - Algorithms and Flowchart. - Understand software development cycle. - Realize the fundamental of C ++.	**1**	**2**
2	**Elementary programming :** - Study basic data types, their declarations and initializations. - Characters, and Strings. - Use variables to store data.	**2**	**4**
3	**Selections :** - Implement selection control using if and switch statements - Combine conditions using logical operators - Write expressions using the conditional operator. - Format output using stream manipulators. - Examine the rules governing operator precedence and operator associativity .	**1**	**2**
4	**Loops:** - Write loops using do-while, while and for statements. - Control a loop with the user confirmation or a sentinel value. - Write nested loops. - Learn the techniques for minimizing numerical errors. - Implement program control with break and continue .	**1**	**2**
5	**Function basics:** - Mathematical Functions. - Define and invoke different types of functions. - Use function prototypes for function headers. - Know how to pass arguments. - Create header files for reusing functions. - Develop functions for various tasks - Develop applications using C++ functions .	**2**	**4**
6	**Advanced function feature:** - Experience advanced topics on pass-by-value, pass-by-reference. - Understand the difference between them. - Determine the scope of local and global variables. - Define functions with default arguments. - Improve runtime efficiency by using inline functions .	**1**	**2**
7	**Arrays** : - Understand the necessity of an array in programming. - Know how to declare and initialize an array.	**2**	**4**

	- Program common array operations. - Develop and invoke functions with array arguments. - Process string using C-strings .		
8	**Objects and classes:** - Describe objects and classes. - Create objects using constructors. - Distinguish between instance and static variables and functions. - Access data fields and invoke functions using the object member access operator. - Declare private data fields for data field encapsulation and make classes easy to maintain .	**2**	**4**
9	**Files and streams:** - Learn ifstream, ofstream, and fstream classes for processing and manipulating files. - Read and write data using the getline, get and put functions. - Study functions to test file existence and the end of a file. - Open a file for both input and output to update files .	**1**	**2**
Textbook:	Y. Daniel Liang, Introduction to Programming with C++, 3/E**.** Gary J. Bronson, C++ for Engineers and Scientists, 3/E.		

Detailed of practical Contents			
	Contents	**Week no.**	**Hours**
1	Algorithms and draw flowchart exercises.	**1**	**2**
2	Develop a simple C++ program for console output using Visual C++. Read input from keyboard. Program with assignment statements and expressions familiar with C++ documentation, programming style. Experience various errors and debug logic errors .	**2**	**4**
3	Training on Selections statements.	**1**	**2**
4	Training on looping statements.	**1**	**2**
5	Training on functions.	**3**	**6**
6	Training on Arrays .	**2**	**4**
8	Training on Objects and classes.	**2**	**4**
9	Training on Files and streams.	**1**	**2**
Textbook:	Y. Daniel Liang, Introduction to Programming with C++, 3/E.		

Department	All Departments	**Major**	All Majors
Course Name	English 1	**Course Code**	ENG 305
Prerequisites		**Credit Hours** *(L,W,T)*	2 (2,0,2)

Course description :

English 1 is reading course. It is about improving and empowering Student's reading. Through exposure to different types of reading and approach to reading, the learners learn the strategies and practice for strengthening comprehension skills, building vocabulary, and test preparation.

Topics :

- Reading for Pleasure:

lets students select their own reading materials to practice new strategies and broaden their vocabulary.

- Reading Comprehension Skills:

covers skimming, scanning, recognizing topics and main ideas, understanding sentences, and making inferences.

- Thinking Skills:

involves targeted practice in inference and analytic skills.

- Reading Faster:

helps students develop speed and flexibility in reading with high interest, short fiction and non-fiction selections.

- Reading Faster texts (which includes different types of reading) Fiction, Biography, Non-fiction

Experiments :if applicable it will support the theoretical topics.

References :

- Skillful Reading: A Text and Workbook for Students of English as a Second Language
  by Amy L. Sonka , Elizabeth Whalley.
- Practice Makes Perfect Intermediate English Reading and Comprehension
  byDiane Engelhardt
- NorthStar: Reading and Writing, Level 2, 3rd Edition

by Natasha Haugnes, Beth Maher

Detailed of Theoretical Contents			
	Contents	**Week no.**	**Hours**
1	Part 1- Extensive Reading	1	2
2	Part 2- Vocabulary Learning and Building	2-3	4
3	Part 3- Comprehension Skills	4	2
4	Previewing	5	2
5	Scanning	6	2
6	Making Inferences	7	2
7	Focusing on the Topic	8	2
8	Understanding Paragraphs	9	2
9	Identifying the Pattern	10	2
10	Thinking in English	11	2
11	Summarizing	12	2
12	Final Assessment	13	2
Textbook:	Reading Power 2 (4th Edition) [Paperback] Linda Jeffries, Beatrice S. Mikulecky Pearson Education ESL; •ISBN-10: 0138143889 •ISBN-13: 978-0138143886		

Department	All Departments	**Major**	All Majors
Course Name	English 2	**Course Code**	ENG 306
Prerequisites	English 1	**Credit Hours** *(L,W,T)*	2 (2,0,2)

Course description :

English 2 *is a reading course for intermediate students of English. It builds on high-interest, authentic reading passages that serve as springboards for reading skills development, vocabulary building, Language analysis, and thought-provoking discussions and writing.*

Topics :

- Usingcontext
- Skimming
- Topicvs.Mainidea
- Inferencing
- Using headings
- Usingheadings
- Usingcontext
- Reading Instructionalmaterials
- Findingdetails
- Main ideas
- Usingexamples

Experiments: if applicable it will support the theoretical topics.

References :

- Select Readings: Student Book Upper-Intermediate
by Linda Lee

- Academic Reading
by Kathleen T. McWhorter, Brette M Sember

Detailed of Theoretical Contents			
	Content	**Week no.**	**Hours**
1	Father teaches son a lesson	1	4
2	How to work In groups with classmates	2	4
3	An exchange student in the US	3	4
4	Disability leads to Success	4	4
5	The art of good speech making	5	4
6	The art of good speech making	6	4
7	An interview with Bill Gates about the future	7	4
8	Applying for effectively in	8	4
9	Spanish siesta tradition	9	4
10	How can the public be 'helped to understand I science?	10	4
11	Ways that geniuses think	11	4
Textbook:	Select readings intermediate by Linda Lee and Erik Gundersen. OXTORD UNIVERSITY PRESS ISBN 0-19-437475-0		

Department	All Departments	**Major**	All Majors
Course Name	English 3	**Course Code**	ELC 307
Prerequisites	English 2	**Credit Hours** *(L,W,T)*	2 (2,0,2)

Course description :

English 3 *is writing course. Itis an intermediate course for English language. It helps students to master the standard organisational patterns of the paragraph and the basic concepts of essay writing. It integrates the study of rhetorical patterns and the writing process with extensive practice in sentence structure and mechanics.*

Topics :

- Paragraph Format
- Narrative Paragraphs
- Paragraph Structure
- Descriptive Paragraphs
- logical Division of ideas
- ProcessParagraphs
- Comparison/ContrastParagraphs
- DefinitionParagraphs
- EssayOrganization
- Opinion Essays

Experiments: if applicable it will support the theoretical topics.

References :

- First Steps in Academic Writing , by Ann Hogue
- Academic Writing Student's Book , by Dorothy Zemach and Lisa Rumisek

Detailed of Theoretical Contents			
	Content	**Week**	**Hours**
1	Definition Paragraphs Paragraph 1: Paragraph 2: Sentence Structure Appositives and Adjective Clauses Appositives Adjective Clauses Complex Sentences with Adjective Clauses Subject Pronouns: who, which, that Object Pronouns: whom, which, that, and 0 (no pronoun) Clauses with when	1	4
2	Tim order Time Order Signal Sentence Structure Compound Sentences Coordinating Conjunctions Punctuation Three Comma Rules The Writing Process Freewriting Model: Freewriting	1	4
3	Three Parts of a Paragraph A Hawaiian Wedding The Topic Sentence Supporting Sentences The Concluding Sentence Punctuation Apostrophes The Writing Process Outlining Detailed Outlining	2	8
4	Model: Descriptive Paragraph Spatial Order Spatial Order Signals Topic Sentences for Descriptive Paragraphs Supporting Sentences for Descriptive Paragraphs Model: Descriptive Details Paragraph Unity Sentence Structure Model: Compound Sentences Compound Sentences Varying Sentence Openings Clustering	1	4

5	Logical Division of Ideas Paragraph Logical Division of Ideas Coherence Using Nouns and Pronouns Consistently Transition Signals Run-Ons and Comma Splices	1	4
6	Process Paragraph Time Order Time Order Signals Clauses and Complex Sentences Clauses Complex Sentences Subordinators	2	8
7	Comparison/Contrast Paragraphs Paragraph 1: Right Brain/Left Brain Paragraph 2: Two Job Applicants Block Organization Point-by-Point Organization Comparison/Contrast Signals Comparison Signals Contrast Signals	1	4

8	Definition Paragraphs Paragraph 1: Paragraph 2: Sentence Structure Appositives and Adjective Clauses Appositives Adjective Clauses Complex Sentences with Adjective Clauses Subject Pronouns: who, which, that Object Pronouns: whom, which, that, and 0 (no pronoun) Clauses with when	1	4
9	Three Parts of an Essay Essay Structure The Introductory Paragraph Body Paragraphs The Concluding Paragraph Transitions Between Paragraphs Essay Outlining Essay Outline Planning an Essay Step 1 Prewriting 162 Step 2 Organizing Step 2A Group Ideas Logically Step 2B Make an Outline	2	8
10	Opinion Essay The Right to Die Organization The Introductory Paragraph Bogy Paragraphs The Concluding Paragraph Developing Supporting Details Quotations Rules for Using and Punctuating Quotations Statistics	1	4

Department	All Departments	**Major**	All Majors
Course Name	English 4	**Course Code**	ENG 308
Prerequisites	English 3	**Credit Hours** *(L,W,T)*	2 (2,0,2)

Course description :

English 4 *is a writing course .It* covers transactional writing versus academic writing, producing informative and persuasive documents through process writing, developing analytical writing techniques, constructing technical reports, and writing letters, memos, email and related forms. In addition, it addresses the task of formulating resumes and cover letters for employment.

Topics :

- Description of a mechanism
- Description of a process
- Proposals
- Feasibility report
- Laboratory report
- Business communications
- Resume and coverletters

References :

- Writing Academic English

by Alice Oshima, Ann Hogue

- Cambridge Academic English

By Martin Hewings, Michael McCarthy

Detailed of Theoretical Contents			
	Contents	**Week**	**Hours**
1	Ethical Considerations	1	2
2	Technical Definition		2
3	Descriptions of a Mechanism	2	2
4	Descriptions of a Process		2
5	Proposals	3	4
6	Progress Reports	4	4
7	Feasibility and Recommendation Reports	5	4
8	Laboratory and Project Reports	6	2
9	Instructions and Manuals		2
10	Research Reports	7	4
11	Abstracts and Summaries	8	2
12	Grammar, Style, and Punctuation		2
13	Documentation	9	4
14	Visuals	10	2
15	Electronic Publishing		2
16	Presentations and Briefings	11	4
17	Business Communications	12	4
18	Resumes, Cover Letters, and Interviews	13	2
Textbook:	Pocket Book of Technical Writing, 3rd,By Finkelstein, L., McGraw Hill, USA, 2008		

Department	All Departments	**Major**	All Majors
Course Name	English 5	**Course Code**	ENG 309
Prerequisites	English 4	**Credit Hours** *(L,W,T)*	2 (2,0,2)

Course description :

English 5 is a communication skill course. It is a course designed to develop students' oral, written, and interpersonal communication skills essential for life and work. Students will learn communication principles, strategies, and methods through discussions, exercises, and examples. They will be trained in how to communicate clearly and effectively in various social, business, and intercultural situations. In addition, they will learn and practice verbal, nonverbal, and electronic communication.

Topics :

- Whatis Communication؟
- Effective ListeningSkills
- Verbal Communication
- Communicating Over the Phone
- Nonverbal Communication
- Written Communication
- CommunicatingElectronically

Experiments: if applicable it will support the theoretical topics.

References :

- Guide to Presentations , by Lynn Russell, Mary Munter
- Technical Communication , by Mike Markel

Detailed of Theoretical Contents			
	Content	**Week**	**Hours**
1	Good Communication Skills Lead to Success Different Forms of Communication Communication Is a Learned Activity Communication in the Workplace	1	4
2	What Is Listening? Listening to Learn Listening to Evaluate Listening Effectively Listening at Work	1	4
3	Your Voice Is a Tool Good Grammar Counts Starting a Conversation Ending a Conversation Speaking to Different Audiences Verbal Communication in the Workplace	2	8
4	Effective Phone Communication Using the Telephone Directory Long-Distance, Toll-Free, and Other Calls Phone Communication in the Workplace Using a Cell Phone	1	4
	Body Action Body Language How Culture Affects Nonverbal Communication	2	8
	Why Is Writing Important? Personal Letters Business Letters Business Memos Thank-You Notes Invitations	2	8
	Communicating with E-mail Just Fax It to Me Instant Messaging Text Messaging How Technology Is Changing Workplace Communication	3	12

Department	General Study	**Major**	All Majors
Course Name	Physics (2)	**Course Code**	PHY325
Prerequisites	General physics	**Credit Hours** *(L,W,T)*	4(3,2,0)

Course description :

The course enables students to gain theoretical and practical background in physics. The course includes the development of skills and understanding of basic principles of Physical measurements .The student has to know the basic notions of the electric circuits and basic electronic devices like resistors and transistors, the measurement of characteristics of electric signals and the use of basic instrumentation and to know how to analyze any electric circuit using the different methods of analysis.. Also this course is designed to give the student a basic knowledgein the theory of electricity, electrostatics and magnetism.

Topics :

- PhysicalMeasurements
- Direct-Current Circuits and Resistance
- AlternatingCurrent Circuit (AC Circuit)
- Electrostatics
- The magnetic field
- Faraday'slow of electromagnetic induction

Experiments: if applicable it will support the theoretical topics.

References :

- Microelectronics Digital and Analog Circuits and Systems – Jacob mill man- ISPN 0-07-042327. Update edition.
- Physics Principal and Problems- Robert B. Clark, Patrick Kenealy> ISBN 0-02826721-4.

Detailed of Theoretical Contents			
Chapter	**Contents**	**Week no.**	**Hours**
1	**Physical Measurements :** International System of Units, Base units, Derived Quantities, Derived units, Systems of units, Prefixes, Conversion between units, Fundamental Dimension, Derived dimension Dimensional Analysis, Dimensionally Homogeneous Equations, Examples and Problems.	**1-2**	**6**
2	**Direct-Current Circuits and Resistance:** Electric Current, Resistance and Ohm's Law, Energy and Power in Electric Circuits, Joule's Low, Resistors in Series and Parallel Kirchhoff's Rules, Circuits Containing Capacitors, Capacitors connected in series, Capacitors connected in parallel, RC Circuits, RC charging circuit, RC discharging circuit, Ammeters and Voltmeters, Examples and Problems	**3- 4 - 5**	**9**
3	**Alternating Current Circuit (AC Circuit):** AC source, Resistors in an AC circuit, rms current, rms voltage, Capacitors in an AC circuit, The capacitive reactance $X_{C,}$ Inductors in an AC circuit, The inductive reactance $X_{L,}$ The RLC series circuit, The impedance Z, The phase angle, The maximum voltages across the elements, Power in an AC circuit, Resonance in a series RLC circuit, The resonance frequency, The transformer, Examples and Problems	**6- 7 - 8**	**9**
4	**Electrostatics:** electric charge, Coulomb's low, The electric field due to a point charge, The electric potential due to a point charge, stored energy in a capacitor, dielectric materiel in capacitor, examples and problems	**9- 10**	**6**

5	**The magnetic field:** Magnetic field and magnetic field lines, Ampere's low: magnetic field due to a long straight wire, a circular conductor, a solenoid, Hall effect, Discovering of the electron and measuring e/m, The magnetic force, Examples and Problems **Faraday's low of electromagnetic induction**	**11- 12- 13**	**9**
Textbook:	1- Fundamentals of physics (extended edition) David Halliday Robert Resnick Gearal Walker John Wiley and Son , INC , ISBN -0 - 471 – 57578-x. Fifth edition -1997 2- Foundations Of Physics for Technology Colleges and universities freshmen . Dr. Marwan A. Alfahha Third edition 2012		

Detailed of practicals Contents			
	Contents	**Week no.**	**Hours**
1	Electric Components/Measurements and Instruments	**1**	**2**
		2	**2**
2	Current-Voltage (I-V) characteristics Evaluation of two unknown resistances R_1 and R_2	**3**	**2**
		4	**2**
3	Evaluate the equivalent resistance of some resistors connected in series and in parallel.	**5**	**2**
		6	**2**
4	RC circuit :Charging and discharging a capacitor when switching DC on and off	**7**	**2**
		8	**2**
5	Oscillator and oscilloscope	**9**	**2**
		10	**2**
6	Determination of the specific charge of the electron	**11**	**2**
		12	**2**
7	Study of the deflection of electron in a magnetic field into a circular orbit	**13**	**2**
Textbook:			

Department	General Study	**Major**	All Majors
Course Name	Mathematics (3) Linear Algebra	**Course Code**	MAT 325
Prerequisites	General Math	**Credit Hours** *(L,W,T)*	4 (3,2,1)

Course description :

This course is designed to give the student a basic knowledge of the Complex numbers and its operations. The student has to know the basic notions of vector spaces and how to solve any linear systems of equations using Gauss-Jordan Elimination. Also this course is designed to give the student an introduction to the first and second order linear differential equations and to solve initial value problem by Laplace Transforms.

Topics :

- ComplexNumber
- Vectorsspaces
- Linearsystems of equations
- Introduction to differentialequation
- Laplace Transform

Experiments: if applicable it will support the theoretical topics.

References :

- C. Edward and D.Penny, Elementary Linear Algebra.
- John Auer, Linear Algebra with application
- Albert L.Rabenstion, elementarydifferentialequationwithLinearAlgebra

Detailed of Theoretical Contents			
	Contents	**Week no.**	**Hours**
1	Complex Number: Operation on complex number- Demoiver theorem- Solution of a quadratic equation	**1-2-3**	**18**
2	Vector spaces: Basic notions of vectors spaces- subspaces- Linear combination, linear independent, basis and dimension of vector spaces	**4-5-6**	**18**
3	Linear systems of equations: Gauss-Jordan elimination- Elementary row operations- reduced row echelon form- Solution of linear system by gauss- Jordan elimination	**7-8**	**12**
4	Introduction to differential equations: Some first order of differential equation-Second order linear differential equation	**9-10-11**	**18**
5	Laplace transforms: Solving initial value problem by Laplace transform	**12-13**	**12**
Textbook:	**C.Edward and D. penny, Elementary Linear Algebra**		

Department	General Study	**Major**	All Majors
Course Name	Mathematics (4) Discrete and Numerical Analysis	**Course Code**	MAT 326
Prerequisites	General Math	**Credit Hours** *(L,W,T)*	4 (3,2,1)

Course description :

This course is designed to give the student a basic knowledge of the Sequences and the Numerical series. The student has to know the basic notions of the numerical method and how to solve any linear or non linear equations using Newton-Raphson method . Also this course is designed to learning the student how to apply the Linear and Quadratic Lagrange interpolation and the Rectangular and Trapezoidal method for numerical integration. Further,this course gives to the students an introduction to Fourier series and Fourier transform.

Topics :

- Sequences
- NumericalSeries
- NumericalMethod
- Computer compilation
- Fourier Analysis

Experiments: if applicable it will support the theoretical topics.

References :

- C. Woodford,Chris Phillips, Numerical Methods with Worked Examples.
- T. W. Körner, Fourier analysis
- PremKythe,Dongming Wei, An Introduction to Linear and Nonlinear Finite Element Analysis

Detailed of Theoretical Contents			
	Contents	**Week no.**	**Hours**
1	Sequences: Some important limits-Convergence and divergence - Monotonocity and boundedness of sequences.	**1-2-3**	**18**
2	Numerical Series: Convergence and divergence series- some usual series (Harmonic, Geometric and P-series)- Positive series (integral, ratio tests)- Positive series: Integral, ratio, root and comparison tests. Power series: Interval of convergence- representation of function. Maclaurin and Taylor series.	**4-5-6**	**18**
3	Numerical Method: Newton-Raphson method for solving linear or nonlinear equations. Interpolation: Linear and quadratic Lagrange interpolation. Numerical integration: Rectangular and Trapezoidal method. Some Application on MATLAB	**7-8-9-10**	**18**
4	Fourier Analysis: Fourier seris- Fourier transform	**11-12-13**	**9**
Textbook:	Keith E. Hirst,Keith Edwin Hirst, Numbers, Sequences and Series		

Department	General Study	Major	All Majors
Course Name	Engineering statistics and probability	Course Code	STA 425
Prerequisites	General Math	Credit Hours *(L,W,T)*	4 (3,2,1)

Course description :

This course is designed for students majoring in engineering of technology. Topics include: probability, random variables, discrete and continuous probability distributions, statistical process control, and parameters estimation.

Topics :

- Introduction to ProbabilityVectorsspaces
- Random variable and Probability Distributions
- SomeDiscreteProbability Distribution
- SomeContinuousProbability Distribution
- Introduction to statistics
- Parameter Estimation

Experiments: if applicable it will support the theoretical topics.

References :

- Ross, S. ,*A First Course in Probability*, Fifth Edition
- Devore, Jay L., *Probability and Statistics for Engineering and the Sciences*, Eighth Edition

Detailed of Theoretical Contents			
	Contents	**Week no.**	**Hours**
1	Introduction to Probability: Random Experiment - Sample space – Event – Counting Sample space – Probability of an Event - The Axioms of Probability – Conditional Probability – Independent Events	**1-2-3**	**18**
2	Random variable and Probability Distributions: Concept of a Random Variable - Discrete Probability Distribution-Continuous Probability Distribution - Mean and Variance of a Random Variable	**4-5-6**	**18**
3	Some Discrete Probability Distribution: Bernoulli Trials – Binomial Distribution – Poisson Distribution	**7-8**	**12**
4	Some Continuous Probability Distribution: Continuous Uniform Distribution – Normal Distribution – Exponential Distribution	**9-10-11**	**18**
5	Introduction to statistics and Parameter Estimation: Sampling Theory – Sample Distribution Function – Samples and Statistics – Methods of Estimation (Point , Interval) – Confidence Interval	**12-13**	**12**
Textbook:			

Department	General Study	Major	All Majors
Course Name	Introduction to management & leadership	Course Code	GMS 335
Prerequisites		Credit Hours *(L,W,T)*	2 (2,0,2)

Course description :

This course prepares students with a comprehensive introduction to effective management principles and conduct. It aims at providing students with an introduction to contemporary management concepts and skills, and encourages students to put these concepts and skills into practice. This course is an introduction to the management function. It will focus on the theory and fundamental concepts of management including planning, organization, leadership, and control. This class will review the evolution of management thought, function and practice and will stress current approaches and emerging concepts.

Topics :

- introduction to management
- integrativemanagerial issues
- Planning
- Organizing
- Leading
- controlling

Experiments : if applicable it will support the theoretical topics.

References :

- Robbins, Stephen P, and Coulter, Mary. (2012) Management, 11th Edition, Prentice Hall

Detailed of Theoretical Contents			
	Contents	**Week no.**	**Hours**
1	Effective Management for Managers Today - Introduction to Management and Organizations. Management Yesterday and Today. Organizational Culture and Environment: The Constraints. Social Responsibility and Managerial Ethics.	**4**	**8**
2	Management Functions and Techniques - Decision-Making: The Essence of the Manager's Job. Foundations of Planning, planning tools and techniques. Organizational Structure and Design. Human.	**3**	**6**
3	Resource Management. Managing Change and Innovation. Understanding Groups and Teams. Leadership skills. Foundations of Control. Operations and Supply Chain Management.	**2**	**4**
4	Contemporary Management Competencies - Time Management Skills. Effective Communication Skills. Problem Solving Skills. Crisis Management	**4**	**8**
Textbook:	Robbins, Stephen P, and Coulter, Mary. (2012) Management, 11th Edition, Prentice Hall		

Department	General Study	Major	All Majors
Course Name	Communication Skills	Course Code	GMS 336
Prerequisites		Credit Hours *(L,W,T)*	2 (2,0,2)

Course description :

This course is intended to provide the studentswithplainunderstandingofthekeysubjects, matters andideaseducativein the field of communication studies.

Topics :

- Communication Today.
- Reports and proposals.
- Nonverbal communication.
- Interpersonalskills
- Interpersonalskills
- Negotiationskills
- Conflict management
- Intercultural communication
- Organizational communication
- Public communication
- Team communication

Experiments: if applicable it will support the theoretical topics.

References:

- Communicating in the 21st Century, 3rd edition By Baden Eunson 2011 1149 pages ISBN: 978-1-742- 16617-9 John Wiley & Sons Limited Inc.

Detailed of practical's Contents			
	Contents	**Week no.**	**Hours**
1	Communication Today. Letters, emails and memos.	**1**	**2**
2	Reports and proposals. Academic writing the essay.	**2**	**2**
3	Nonverbal communication.	**3**	**2**
4	Interpersonal skills: 1- Emotional intelligence , Self- talk and	**4**	**2**
5	Interpersonal skills: 2- Listening, questioning and feed-back.	**5**	**2**
6	Negotiation skills	**6**	**2**
7	Conflict management *** Mid-term Exam	**7**	**2**
8	Intercultural communication	**8**	**2**
9	Organizational communication	**9**	**2**
10	Public communication	**10**	**2**
11	Team communication	**11**	**2**
Textbook:	Communicating in the 21st Century, 3rd edition By Baden Eunson 2011 1149 pages ISBN: 978-1-742- 16617-9 John Wiley & Sons Limited Inc.		

Detailed of Theoretical Contents			
	Contents	**Week no.**	**Hours**
1	Communicating in meetings	**12**	**2**
2	Employment communication and social media. *** Final Exam.	**13**	**2**
Textbook:	Communicating in the 21st Century, 3rd edition By Baden Eunson 2011 1149 pages ISBN: 978-1-742- 16617-9 John Wiley & Sons Limited Inc.		

Department	General Study	Major	All Majors
Course Name	Engineering Project Management	Course Code	GMS 437
Prerequisites		Credit Hours *(L,W,T)*	(3,0,2)3

Course description :

The Engineering Project Management Course is intended to help meet the requirements of industry by educating undergraduate engineering students to understand engineering projects, project organizations and project management methods. Students completing this course will be able to work effectively in multidisciplinary engineering projects immediately after completion and to advance more rapidly within the project management organization and profession. The management of projects entails technical knowledge, engineering skills and management skills.

Topics :

- Introduction to project management
- Organizational influences and project life cycle.
- Project management processes
- Project integration management
- Project scope management.
- Project time management
- Project cost management.
- Project quality management
- Project humanresource management.
- Project communications management.
- Project risk management
- Project procurement management.
- Project stakeholder management

Experiments: if applicable it will support the theoretical topics.

References :

- A Guide to the Project Management Body of Knowledge (PMBOK® Guide), Fifth Edition, Project Management Institute , Project Management Institute © 2013

Detailed of Theoretical Contents			
	Contents	**Week no.**	**Hours**
1	1. Introduction to Project Management 1.1 History of Project Management 1.2 What is a Project? 1.2.1. The Relationships among Portfolios, Programs, and Projects. 1.3 What is Project Management? 1.4 Relationships among Portfolio Management, Program Management, Project Management, and Organizational Project Management 1.4.1 Program Management 1.4.2 Portfolio Management 1.4.3 Projects and Strategic Planning. 1.4.4 Project Management Office 1.5 Relationship between Project Management, Operations Management, and Organizational Strategy. 1.5.1 Operations and Project Management 1.5.2 Organizations and Project Management 1.6 Business Value 1.7 Role of the Project Manager 1.7.1 Responsibilities and Competencies of the Project Manager. 1.7.2 Interpersonal Skills of a Project Manager 1.8 Project Management Body of Knowledge	**1**	**3**

2	2. ORGANIZATIONAL INFLUENCES AND PROJECT LIFE CYCLE. 2.1 Organizational Influences on Project Management. 2.1.1 Organizational Cultures and Styles 2.1.2 Organizational Communications 2.1.3 Organizational Structures. 2.1.4 Organizational Process Assets. 2.1.5 Enterprise Environmental Factors 2.2 Project Stakeholders and Governance. 2.2.1 Project Stakeholders. 2.2.2 Project Governance. 2.2.3 Project Success. 2.3 Project Team 2.3.1 Composition of Project Teams 2.4 Project Life Cycle. 2.4.1 Characteristics of the Project Life Cycle 2.4.2 Project Phases.	**2**	**3**
3	3. PROJECT MANAGEMENT PROCESSES 3.1 Common Project Management Process Interactions. 3.2 Project Management Process Groups 3.3 Initiating Process Group 3.4 Planning Process Group 3.5 Executing Process Group 3.6 Monitoring and Controlling Process Group 3.7 Closing Process Group 3.8 Project Information	**3**	**3**

	3.9 Role of the Knowledge Areas		
4	4. PROJECT INTEGRATION MANAGEMENT 4.1 Develop Project Charter 4.2 Develop Project Management Plan. 4.3 Direct and Manage Project Work 4.4 Monitor and Control Project Work 4.5 Perform Integrated Change Control 4.6 Close Project or Phase	**4**	**3**
5	5. PROJECT SCOPE MANAGEMENT. 5.1 Plan Scope Management. 5.2 Collect Requirements 5.3 Define Scope 5.4 Create WBS 5.5 Validate Scope. 5.6 Control Scope	**5**	**3**
6	6. PROJECT TIME MANAGEMENT 6.1 Plan Schedule Management 6.2 Define Activities. 6.3 Sequence Activities. 6.4 Estimate Activity Resources. 6.5 Estimate Activity Durations. 6.6 Develop Schedule 6.7 Control Schedule.	**6**	**3**
7	7. PROJECT COST MANAGEMENT. 7.1 Plan Cost Management. 7.2 Estimate Costs.	**7**	**3**

	7.3 Determine Budget 7.4 Control Costs.		
8	8. PROJECT QUALITY MANAGEMENT 8.1 Plan Quality Management. 8.2 Perform Quality Assurance. 8.3 Control Quality.	**8**	**3**
9	9. PROJECT HUMAN RESOURCE MANAGEMENT. 9.1 Plan Human Resource Management. 9.2 Acquire Project Team 9.3 Develop Project Team 9.4 Manage Project Team	**9**	**3**
10	10. PROJECT COMMUNICATIONS MANAGEMENT. 10.1 Plan Communications Management. 10.2 Manage Communications. 10.3 Control Communications.	**10**	**3**
11	11. PROJECT RISK MANAGEMENT 11.1 Plan Risk Management. 11.2 Identify Risks. 11.3 Perform Qualitative Risk Analysis 11.4 Perform Quantitative Risk Analysis 11.5 Plan Risk Responses. 11.6 Control Risks.	**11**	**3**
12	12. PROJECT PROCUREMENT MANAGEMENT. 12.1 Plan Procurement Management. 12.2 Conduct Procurements	**12**	**3**

	12.3 Control Procurements. 12.4 Close Procurements		
13	13. PROJECT STAKEHOLDER MANAGEMENT 13.1 Identify Stakeholders 13.2 Plan Stakeholder Management. 13.3 Manage Stakeholder Engagement 13.4 Control Stakeholder Engagement.	**13**	**3**
Textbook:	A Guide to the Project Management Body of Knowledge (PMBOK® Guide), Fifth Edition, Project Management Institute, Project Management Institute © 2013.		

Detailed of Tatorial Contents			
	Contents	**Week no.**	**Hours**
1	Workshop: Forming Project Team and Project Selection	**1**	**2**
2	Workshop: Defining Project Business Case	**2**	**2**
3	Workshop: Developing Project Charter	**3**	**2**
4	Workshop: Project Configuration & Integration	**4**	**2**
5	Workshop: Collect Project Requirements, Creating Project Scope Statement, and Developing Project WBS	**5**	**2**
6	Workshop: Developing Project Schedule Using Project Management Tools	**6**	**2**
7	Workshop: Developing Project Budget and Cash flow	**7**	**2**
8	Workshop: Developing Project Quality Management Plan	**8**	**2**
9	Workshop: Developing Project HR Management Plan	**9**	**2**
10	Workshop: Developing Project Communications Management Plan	**10**	**2**
11	Workshop: Developing Project Risk Management Plan	**11**	**2**
12	Workshop: Developing Project Procurement Management Plan	**12**	**2**
13	Workshop: Developing Project Stakeholders Management Plan	**13**	**2**
Textbook:	A guide to the project management body of knowledge (pmbok® guide), fifth edition, project management institute, project management institute © 2013.		

Department	General Study	Major	All Majors
Course Name	Quality Tools and Applications	Course Code	GMS 438
Prerequisites		Credit Hours *(L,W,T)*	3 (3,0,2)

Course description :

This course gives the student basic foundation knowledge on Quality Management and its Tools and Applications, this course has been design to help the student to understand the quality concept as a major successful factor for the competitiveness at any sector.

By the end of this course, the student should know when, why and how to apply the quality concepts and tools successfully on his workplace.

Topics :

- Quality Management as a Concept
- Quality Management as a Culture
- Quality Management as a Strategic Planning
- Overview on Quality Management Tools
- ProblemsSolving and DecisionsMaking
- Optimizing and ControllingProcesses
- Implementing the Quality Management

Experiments:if applicable it will support the theoretical topics.

References :

- Introduction to Total Quality Management for Production, Processing and Services. (Sixth Edition)
- By David L. Goetsch and Stanley B. Davis

Detailed of Theoretical Contents			
	Contents	**Week no.**	**Hours**
1	Quality Management as a Concept: - How Quality is defined. - 8 principles of Total Quality Management. - Customer Satisfaction.	**1-3**	**15**
2	Quality Management as a Culture: - Understanding the quality culture VS. the traditional culture - Change management	**4-5**	**10**
3	Quality Management as a Strategic Planning: - Developing Plan (vision, mission and objectives) - Execution Plan (action plan, operations, KPIs)	**6-7**	**10**
4	Overview on Quality Management Tools: - The basic 7 tools for quality management	**8**	**5**
5	Problems Solving and Decisions Making: - Root Cause analysis techniques. - Decision making support techniques.	**9-10**	**10**
6	Optimizing and Controlling Processes: - Statistical Process Control (SPC) applications. - Control Charts.	**11-12**	**10**
7	Implementing the Quality Management: - Plan, Do, Check, Act (implementation project)	**13**	**5**
Textbook:	Quality Management Introduction to Total Quality Management for Production, Processing and Services. (Sixth Edition) By David L. Goetsch and Stanley B. Davis		

Department	General Study	Major	All Majors
Course Name	Engineering Economy	Course Code	GMS 439
Prerequisites		Credit Hours *(L,W,T)*	(2,0,2)2

Course description :

This course covers the basics of economic analysis from an engineering perspective. The concepts and techniques required to facilitate the evaluation and comparison of investment opportunities on an economic basis are presented, along with the corresponding Excel spreadsheet functions. Topics include: foundations of engineering economy, nominal and effective interest rates, engineering economy factors, present worth analysis, annual worth analysis, rate of return analysis, benefit/cost analysis and public sector economics, breakeven and payback analysis, and depreciation methods.

Topics:

- Foundations of Engineering Economy
- Engineering Economy Factor
- Nominal and Effective Interest Rates
- Present Worth (PW) Analysis
- Annual Worth (AW) Analysis
- Rate of Return (ROR) Analysis
- Benefit /Cost (B/C) Analysis and Public Sector Economics
- Breakeven and PaybackAnalysis

Experiments: if applicable it will support the theoretical topics.

References :

- William G. Sullivan, Elin M. Wicks, and C. Patrick Koelling, "Engineering Economy", 15th Edition, Printice Hall, ISBN 978-0132554909.
- Jerald J. Thuesen and W. J. Fabrycky, " Engineering Economy", 9th Edition, Printice Hall, ISBN 978-0130281289.

Details of Theoretical Contents			
	Contents	**Week no.**	**Hours**
1	**Foundations of Engineering Economy**: - Engineering economics: description and role in decision making process. - How to perform an Engineering Economy study. - Interest rate and rate of return. - Engineering economy terminology and symbols. - Cash flows: estimation and diagramming. - Economic Equivalence. - Simple and compound interests. - Meaning and use of Minimum Attractive Rate of Return (MARR). - Spreadsheets use in engineering economy.	**1-2**	**4**
2	**Engineering Economy Factors**: - Deriving and using the following factors: F/P, P/F, P/A, A/P, F/A, A/F, P/G, and A/G. - Linear interpolation of factors values. - Combining factors (Calculations pertaining to Shifted uniform series and randomly placed single amounts).	**3-4**	**4**
3	**Nominal and Effective Interest Rates**: - Difference between nominal and effective interest rates. - Calculating the effective interest rate. - Equivalence calculations under single and series cash flows in the case where payment and compounding periods are unequal.	**5**	**2**
4	**Present Worth (PW) Analysis**: - Formulating alternatives. - PW analysis of equal- life alternatives. - PW analysis of different- life alternatives. - Future worth analysis.	**6-7**	**3**
5	**Annual Worth (AW) Analysis**: - Advantages and uses of AW analysis. - Calculation of Capital Recovery (CR) and AW values. - Evaluating alternatives by AW analysis.	**8**	**2**

6	**Rate of Return (ROR) Analysis**: - Interpretation of a ROR value. - ROR calculation using a PW or AW relation. - Using ROR analysis to evaluate a single project. - Special considerations when using the ROR method. - Incremental ROR analysis and the issue of inconsistent rankings. - Using incremental ROR analysis to compare two alternatives. - Using incremental ROR analysis to compare several alternatives .	**9-10**	**5**
7	**Benefit /Cost (B/C) Analysis and Public Sector Economics**: - The fundamental differences between public and private sector projects. - B/C analysis for a single project.	**11**	**2**
8	**Breakeven and Payback Analysis**: - Breakeven analysis for a single project. - Payback analysis.	**12**	**2**
9	**Depreciation Methods**: - Definition of asset depreciation. - The Straight Line (SL) method. - The Declining Balance (DB) method. - The unit-of -production (UOP) method.	**13**	**2**
Textbook:	Leland Blank and Anthony Tarquin.," Engineering Economy", **7**th Edition, McGraw-Hill , ISBN 978 – 0073376301.		

Department	Civil & Architectural Technology	**Major**	Surveying Technology
Course Name	Geodesy	**Course Code**	SRV 375
Prerequisites		**Credit Hours** (L,W,T)	3 *(2,2,0)*

Course description :

This course is designed in order to provide students with knowledge ofand skills of applying principles, instrumentation, data analysis methods, and visualization products associated with the science of geodesy which is concerned with the study of the shape and size of the earth in the geometric sense as well as with the form of the equipotential surfaces of the gravity potential.

Topics:

- Reductions And Computations For Plane Surveying Map Projections
- Geographic Coordinates And Reference Ellipsoids Height systems
- Geodetic Coordinate Systems
- Distances, Angles and Point Positioning
- Map Projections
- Gravity, Geopotential, and The Geoid
- Height Systems and Vertical Datums
- Tides
- Earth and its Deformation in Time
- Adjustment Of Level Nets

Experiments: if applicable it will support the course topics.

References:

- Geodesy, Jürgen MüllerandWolfgangTorge, 2012, de Gruyter Textbook

Details of Theoretical Contents			
	Contents	**Week no.**	**Hours**
	Introduction: - Definition and brief history of geodesy - The three main areas of geodesy: Geometry, Rotation , Gravity - Physical geodesy and the need for gravity field modeling - Applications of geodesy in Earth science - Applications of geodesy in engineering	**1**	**2**
	Reductions And Computations For Plane Surveying: - Absolute versus Relative Positions - Plane Angles - Mathematical Tools - The Inverse Problem in the Plane - Reductions for Plane Surveying - The Direct Problem in the Plane	**2-3**	**4**
	Geographic Coordinates And Reference Ellipsoids: - The Need for Geodetic Surveying - Reference Ellipsoids - Earth rotation, precession, nutation, polar motion - Latitude and Longitude - Types of Latitudes	**4**	**2**
	Geodetic Coordinate Systems: - Earth-Centered, Earth-Fixed Geocentric Cartesian (XYZ) - Geodetic Longitude and Latitude, and Ellipsoid Height (LBH) - Local Horizontal Coordinate Systems - Reference Frames and Geodetic Datums - Transformation Formula between reference systems.	**5-6**	**4**

	Distances, Angles and Point Positioning: - Types of Distances - Distance Reductions - North and South - Spherical Trigonometry - Positioning on a Sphere - Grid Angles	**7**	**2**
	Map Projections: - Developable Surfaces - Map Projection Classification - Projection Parameters - Grid Coordinates - Map Projection Systems	**8**	**2**
	Gravity, Geopotential, and The Geoid: - Gravity vectors and gravity potential - The normal potential - The GRS80 and WGS84 - Gravity instrumentation and measurements - Terrestrial gravimetry: Spring and absolute gravity meters - Sea and airborne gravimetry - Satellite gravimetry	**9**	**2**
	Height Systems and Vertical datum: - Spirit leveling and the earth's gravity field - Height from geopotential numbers - Dynamic, normal and orthometric heights - Leveling and optimal combination of ellipsoidal, orthometric and geoidal heights - Vertical datums	**10**	**2**
	Tides: -Tidal Gravitational Attraction and potential - Ocean Tides and Body Tides	**11**	**2**
	Earth and its Deformation in Time: - Types of deformation - Tides - Tectonic deformations - Postglacial rebound - Geodetic observation of deformations	**12**	**2**

	Adjustment Of Level Nets: - Observation Equations - Unweighted Example - Reference Standard Deviation - Weighted Adjustment	**13**	**2**
Textbook:	Introduction to Geometrical and Physical Geodesy: Foundations of Geomatics, Thomas H, Meyer, 2012, Esri Press.		

Department	Civil & Architectural Technology	**Major**	Surveying Technology
Course Name	Map Making & Projections	**Course Code**	SRV 355
Prerequisites		**Credit Hours** (L,W,T)	2 (2,0,0)

Course description :

The Map Making course is designed since it is the art, science and engineering of map making, and it has been one of the fundamental components in the geospatial technology. This course provides in-depth discussions on the cartographic theories, principles and process of designing and making maps for visualizing spatial information. It will introduce how to practically make different kinds of maps by integrating theoretical understanding with mapping practice using latest version of ArcGIS software. All major thematic maps will be studied in the classroom and practiced in the computer lab. In addition, every student will be expected to do a mapping project as the final class project.

Topics :

The purpose of this course is to develop student's skills in map use and analysis as well as to develop his map-making skills by applying cartographic theory to computer cartographic software. The computer and associated peripherals (the graphics screen, printers and plotters) replace the pen and drafting board as the means to map productions. Through a series of lectures and lab exercises, student will not only develop his cartographic skills, but also become comfortable working in a computer environment. On successful completion of this course, student will be able to be a map maker and will have the sufficient knowledge concerning the fundamental components of the geospatial technology.

Experiments: if applicable it will support the course topics.

References :

1. Map Use and Analysis. (Campbell 2012)

2. Thematic Cartography and Geographic Visualization (Slocum et al. 2011)

3. ArcGIS™ version 10 or 10.1 from ESRI, User's Guide

Details of Theoretical Contents			
	Contents	**Week no.**	**Hours**
	Introduction to Thematic Mapping: - Map Definition - Definition of Cartography - Geographic Cartography - Kinds of Maps - Map Scale - Modern Views of Map Communication - Cartography and Geographic Information Systems - Cartographic Abstraction and Generalization - Selection - Classification - Simplification - Symbolization - Map Design -Definition of Map Design -Ethics in Cartography	**1**	**2**
	Basic Geodesy, Coordinate Systems, and Scale: - Basic Geodesy: The Size and Shape of the Earth - Coordinate Geometry for the Cartographer - The Geographic Grid - Principal Geometric Relationships of the Earth's Geographic Grid *-Linear* *-Angular* *-Azimuth* *- Area* *-Points* *-Circles on the Grid* - Scale Concept: Scale and Line Generation	**2**	**2**
	Map Projections: -The map Projection Process -Developable Surfaces -Projection Parameters -Azimuthal projection -Cylindrical projection -Conic projection -Mathematical projection	**3**	**2**

	-Equal Area projection -Conformal Mapping -Equidistance Mapping -Minimum Error Projections -Deformation and its Distribution Over the Projection -Standard Lines and Points, Scale Factor -World Projections -Mathematical, Equivalent Projections -Minimum Error Projections -Cylindrical Projections -Projected Coordinate Systems -National (Saudi) Plane Coordinate System -Universal Transverse Mercator (UTM) System		
	The Nature of Geographic Data and the Selection of Thematic Map Symbols: -The Nature of Data -Data Characteristics -Location *-Point Data* *-Line Data* *-Area Data* -Form -Qualitative/Quantitative Context -Spatial Context -Attribute Context -Time -Data Transformations -Scale -Form -Boundary Changes -Data Measurement -Nominal -Ordinal - Interval -Ratio -Data: Thematic Map Relationships -Map Symbols -Visual Variables -Size -Shape -Orientation -Texture -Saturation and Value -Cartographic Error -Source Error	**4**	**1**

	- Processing Error - Cartographic Design Error		
	Descriptive statistics and Data Classification: -Overview of a Data Sheet -Ratio, Proportion, Percent, and Rate -Descriptive Statistics -Data Classification -Selection of the Number of Classes -Data Classification Schemes -Natural Breaks -Nested Means -Mean and Standard Deviations -Equal Interval -Equal Frequency -Arithmetic and Geometric Intervals -User Defined	**4**	**1**
	Mapping Enumeration and Other Areally Aggregated Data: The Choropleth Map: -Selecting the Choropleth technique -Mapping Rationale -Appropriateness of Data -Preliminary Considerations in Choropleth Mapping -Geographic Phenomena -Map Scale -Number and Kinds of Enumeration Units -Data Processing -Data Classification Revisited -Classification Methods Compared -Data Truncation and Outliers - Different Maps from the Same Data -Unclassed Choropleth Maps -Legend Design Symbolization, and Base Map Design -Sources of Map-Reading Error and the Need for Accurate Design Response -Legend Design -Box Shape, Size, Orientation, and Range Placement -Continuous and Noncontiguous Class	**5**	**2**

	Ranges -Class Range Formatting, Legend Titles, and Other Legend – Information -Map Sequences and Animated Maps Considerations -Symbolization for Choropleth Maps - Black and White Mapping -Color Map Symbolization -Bipolar and Bivariate Symbolization -Adding Other Reference Features to the Map		
	The Dot Density Map: -Mapping Technique -Advantages and Disadvantages of Dot Density Mapping -Data Suitability -The Mapping Activity - Size of Enumeration Unit -Dot Value and Size -Dot Placement -Legend Design	**6**	**1**
	From Point to Point: The Proportional Symbol Map: -Conceptual Basis For Proportional Point Symbol Mapping -Selecting Method—Data Suitability - A Variety of Symbol Choices -Two-Dimensional Geometric Symbols -Three-Dimensional Geometric Symbols - Pictorial Symbols - Proportional Symbol Scaling -Absolute and Apparent Magnitude Scaling -Thematic Map Symbols -Absolute Scaling with Circles -Apparent Magnitude Scaling with Circles -The Square Symbol -Range Grading - Proportional Symbol Legend Design	**6**	**1**
	Mapping Geographic Surfaces: -The Nature of Isarithmic And Three Dimensional Mapping -Isarithmic Categories and Terminology	**7**	**2**

	-The Basis of Isarithmic Construction -A Brief History of Isarithmic Mapping -Selecting the Isarithmic Method - Isarithmic Practices -Elements of Isarithmic Mapping -Concepts in Isarithm Placement - Locating Data Points -Concept of Interpolation -Automated Isarithmic Mapping -Gridding Methods of Interpolation -Evaluating Grid Error -The Selection of Isarithmic Intervals -Other Representations of Continuous Surfaces -Shaded Relief Maps -Wireframe and Surface Maps -Communicating Using Multiple Map Displays -Design Aspects For Isarithmic & Continuous Surface Maps - Isolines and Figure-Ground Relationship -Isoline Labels -Legend Design		
	The Cartogram: Value-by-Area Mapping: -The Value y-Area Cartogram Defined - Two Basic Forms Emerge -Contiguous Cartograms -Noncontiguous Cartograms -Mapping Requirements -Data Limitations -Communicating With Cartograms -Recognizing Shapes -Estimating Areas -A Communication Model -Advantages and Disadvantages -Design Strategies Recap—Legends, Inset Maps, and Labeling -Bivariate Cartograms -Cartogram Condtruction - Manual Methods -Automated Solutions	**8**	**2**

	Dynamic Representation: The Resign Of Flow Maps: -The Purpose of Flow Mapping -Quantitative Flow Maps -Data Suitability - Directed and Undirected Flows -The Relevance of Flow Routes -Designing Flow Maps -Map Organization and Figure-Ground -Projection Selection -Essential Design Strategies -Line Scaling and Symbolization -Treatment of Symbols -Legend Design -Innovative Solutions	**9**	**2**
	The Map Design Process And The Elements Of Map Composition: -The Design Process -Design Evaluation -Creativity and Visualization -Graphic Ideation -Experimentation -Map Aesthetics -The Map's Design Elements - Design Levels On The Ma0 - Elements Of Map Composition -Purpose of Map Composition -Planar Organization of the Visual Elements -Balance -Focus of Attention -Internal Organization -Contrast and Design -Line Contrast -Texture Contrast -Value Contrast -Variation of Detail -Color Contrast -Vision Acuities -Visual Acuity -Resolution Acuity -The Special Case Of The Land-Water Contrast -Vignetting for Land-Water Differentiation -Designing Of The Page-Size Map	**10**	**2**
	Making The Map Readable: The Intelligent Use Of Type: -Function Of Map Lettering -The Elements of Type -Typeface Characteristics	**11**	**2**

	-Letterform Components -Typeface Style and Classification -The Personality of Type -The Legibility of Type -Cartographic Requirements -Type Font and Type Families -Type Size -Type Form -Type Width -Type Weight -Type Color -Letter, Word, and Line Spacing -Guidelines For Type Selection And Placement -The Use of Capital and Lowercase Letters -The Placement of Lettering -Point-Symbol Labeling -Linear Feature Labeling -Area Feature Labeling -Placement and Design of Titles and Legends -Scales and North Arrows -Source and Author Information		
	Principles For Color Thematic Maps: -Light And The Color Spectrum -Color Perception -Color Theories -The Desert Island Experiment -Components of Color -Color Models -Color Matching Systems -Subjective Reactions To Color -Color In Cartographic Design -The Functions of Color in Design -Design Strategies for the Use of Color -Developing Figure and Ground -The Use of Color Contrast -Developing Legibility -Color Conventions in Mapping -Color Harmony in Map Design	**12**	**2**
	Map Production Techniques: - Cartography And Digital Printing -Color Model -Desktop Printing -The Map Production Process	**13**	**2**

Textbook:	1. Map Use and Analysis. (Campbell 2012) 2. Thematic Cartography and Geographic Visualization (Slocum et al. 2011) 3. ArcGIS™ version 10 or 10.1 from ESRI, User's Guide

Department	Civil & Architectural Technology	**Major**	Surveying Technology
Course Name	Geographic Information Systems (2)	**Course Code**	SRV 376
Prerequisites		**Credit Hours** *(L,W,T)*	3 *(2,2,0)*

Course description :

This course covers techniques for the statistical analysis of spatial data. The course covers issues in characterizing spatial data, methods and problems in spatial data sampling, techniques for visualizing, exploring and modeling spatial data.

Topics:

- Geographic Information Analysis and Spatial Data
- Fundamental Spatial Concepts
- Point Pattern Analysis
- Lines and Network
- Area Objects and Spatial Autocorrelation
- Describing and Analyzing Fields

Experiments: if applicable it will support the course topics.

References:

Spatial Data Analysis for Geographic Information Science By TaherBuyong

Details of Theoretical Contents			
	Contents	**Week no.**	**Hours**
	Geographic Information Analysis and Spatial Data - Introduction - Spatial data types - Scales for attribute description - GIS analysis, spatial data manipulation and spatial analysis	**1-2**	**4**
	Fundamental Spatial Concepts: - Euclidean space - Set – based geometry of space - Topology - Network spaces - Metric spaces - Endnote and fractal geometry	**3-5**	**6**
	Point Pattern Analysis: - Describing a point pattern - Density – based point pattern measures - Distance – based point pattern measures - Assessing point patterns statistically	**6-7**	**4**
	Lines and Network: - Representing and storing linear entities - Line length - Connection in line data - Statistical analysis of geographical line data	**8-9**	**4**
	Area Objects and Spatial Autocorrelation: - Types of area objects - Geometric properties of areas - Spatial autocorrelation - Other measures of spatial autocorrelation - Local indicators of spatial association	**10-11**	**4**
	Describing and Analyzing Fields: - Introduction - Modeling and storing field data - Spatial interpolation - Derived measures on surfaces	**12-13**	**4**

Textbook:	Geographic Information analysis (by David O'Sullivan and David J. Unwin).

Details of Practical Contents			
	Contents	**Week no.**	**Hours**
	GIS applications	**1-2**	**4**
	Raster analysis	**3-4**	**4**
	Network analysis	**5-6**	**4**
	Univariate statistical analysis	**7-8**	**4**
	Bivariate statistical analysis	**9-10**	**4**
	Arial analysis	**11-12**	**4**
Textbook:			

Department	Civil & Architectural Technology	**Major**	Surveying Technology
Course Name	Survey Applications	**Course Code**	SRV 356
Prerequisites		**Credit Hours** (L,W,T)	2 (2,0,0)

Course description :

This course is designed in order to provide students with knowledge ofand skills of applying principles, instrumentation, data analysis methods, and visualization products associated with two important surveying activities which are hydrographic surveying and mining surveying.

Topics:

- Radio Frequency Propagation and Measurements
- Concepts of Marine Positioning
- Description of Selected Positioning Systems
- Civil Works Applications
- Project Control and Planning
- Positioning Techniques for Offshore Engineering Surveys
- Dredging Surveys
- Costal Engineering Surveys
- Sedimentations Surveys
- Introduction to Mine Survey
- Slope Surveying
- Areas and Volumes
- Problems in Mine Surveying

Experiments: if applicable it will support the course topics.

References:

- 1-Mine Surveying - by V. Borsheh – Komponiets, Mir-Publishers, 1989.
- 2-A Text Book of Advanced Surveying - JawaharLal Sharma, C.B.S. Publishers and Distributors, 1985.

Details of Theoretical Contents			
	Contents	**Week no.**	**Hours**
1	• **Radio Frequency Propagation and Measurements:** -Radio frequency definitions • -Electromagnetic waves-general – alternating current sign - Electromagnetic spectrum • - Ambiguity of carrier measurements • - Radio wave propagation • - Terminology used in radio frequency propagation • - Characteristics of propagation medium • - Propagation velocity and refraction • - Free-space transmission loss • - The atmosphere general • - Troposphere • - Time seeking • - Time scales • - Underwater acoustics - Wave equation - Physics - Wave theory - Ray theory - Acoustic impedance - Intensity and power - Sonar parameters - Sonar equation - Sound in water	**1**	**2**
2	• **Concepts of Marine Positioning:** - Geometry of positioning • - Hyperbolic positioning mode • - Positioning solutions • - Classification of marine positioning systems • - Marine positioning requirements and standards for hydrographic surveys • - International hydrographic • - Organization standards for hydrographic surveys	**2**	**2**
3	**Description of Selected Positioning Systems:** - Optical and laser systems - omega - Loran-c -global positioning system (GPS) • - Speed determination • - Doppler sonar speed log • - Acoustic correlation sonar • - Electromagnetic speed log • - Radio direction finding (RDF) • - Marine radar	**3**	**2**

4	• **Civil Works Applications:** - Civil works program surveying Requirements • - Hydrographic survey applications in civil works activities • - Survey data acquisition • - Initial field data	**4**	**2**
5	**Project Control and Planning:** Horizontal control for navigation and flood control projects • Vertical control for navigation and flood control projects • Tides and tidal datums • Tide stations • Water level reference planes • Leveling frequency • Survey equipments and instrumentation • Survey alignment (cross sections and longitudinal sections) Positioning interval • Depth recording • Drawings of observed positions and depths	**5**	**2**
6	**Positioning Techniques for Offshore Engineering Surveys:** Resection positioning • Triangulation/intersection • Visual positioning methods • Tag line positioning methods • Range-azimuth positioning Methods • Land-base electronic positioning method • Global positioning system Techniques	**6**	**2**
7	• **Dredging Surveys:** Measurement methods and volume computations techniques • Sea disposal monitoring • Volumes of irregular channels and basins	**7**	**2**
8	**Costal Engineering Surveys:** - Bed profiling surveys - Time scales-waves-currents-tides-water level changes - Surveying methods and techniques	**8**	**2**
9	**Sedimentations Surveys:** - Survey techniques - Area capacity computations and curves	**9**	**2**

10	**Introduction to Mine Survey:** - Role and purposes of Mine Surveying in mineral exploration and mining - Difficulties in mine surveying - General requirements of mine surveying - Various methods of settings of underground roadways and curves - Errors in mine surveying: definition, sources, and limits of errors. -Different methods of underground traversing. -Alignment of drives, shafts and gradient control.	**10**	**2**
11	**Slope Surveying:** -Purpose, objectives, instruments and methods of Slope Surveying -Selection of Slope Survey. -Survey in moderate inclinations.	**11**	**2**
12	**Areas and Volumes:** -Measurements of coal stocks and mineral stick piles -Precautions while measuring large stocks of coal.	**12**	**2**
13	**Problems in Mine Surveying:** -Dip, strike, faults, cross drift measure problems. -Determination of rate and direction of full dip of seam. -Direction and amount of dip from bore holes. -Modern Survey techniques.	**13**	**2**
Textbook:	1-Hydrology, C.D. de jong, G. Lachapelle, S. Skone, I.A. Elema, VSSD ISBN: 9040723591 ISBN13: 9789040723599 DDC: 551, 6th Edition, 2006 2- Mine Surveying - Vol. I, II, III, Ghatak, 5th edition, Coal Field Publishers, 1996.		

Department	Civil & Architectural Technology	**Major**	Surveying Technology
Course Name	Spatial Databases	**Course Code**	SRV 378
Prerequisites	CMT 325	**Credit Hours** (L,W,T)	3 (2,2,0)

Course description :

This course covers basic concepts of a Spatial Database, including understanding what schemas and views are. Topics will cover also spatial data modeling, query language indexes and access methods.

Topics:

- Introduction to Databases
- Introduction to Spatial Database
- Spatial Operations
- Network
- Indexes
- Query

Experiments: if applicable it will support the course topics.

References:

- Spatial Database Systems: Design, Implementation and Project Management edited by Albert K. W. Yeung, G. Brent Hall.

Details of Theoretical Contents			
	Contents	**Week no.**	**Hours**
1	**Introduction to Databases:** - Concept - Database features - Common types of database - Database management system - Types of database architectures: - Hierarchical, - Network, - Relational, - Object-oriented and - Deductive. - Relational Model - SQL - Database analysis and design	**1-3**	**6**
2	**Introduction to Spatial Database:** - System architecture - Vector spatial data - Spaghetti model - Topology model	**4-5**	**4**
3	**Spatial Operations:** - Computing with spatial data - Algorithms - Geometric analysis operations - Relationship analysis - Geometry combination	**6-7**	**4**
4	**Network:** - Features - Graphs - Representing graphs - Network operations	**8-9**	**4**

5	**Indexes:** - General structure and access method - Spatial indexes - Spatial axes method - Raster structures - Point object structures - Linear objects - Collections of objects - Spherical data structures	**10-11**	**4**
6	**Query:** - Query evaluation - Spatial join - Query optimization and execution	**12-13**	**4**
Textbook:	1- Spatial Databases with application to GIS (by: Philippe Rigaux, Michel Scholl and Agnes Voisard). 2- GIS a computing perspective (by: Michael Worboys and Matt Duckham).		

Details of Practical Contents			
	Contents	**Week no.**	**Hours**
1	Part1: SQL	**1-3**	**6**
2	Part2: Spatial data	**4-6**	**6**
3	Part3: Spatial analysis	**7-9**	**6**
4	Part4: Network analysis	**10-12**	**6**
Textbook:			

Department	Civil & Architectural Technology	**Major**	Surveying Technology
Course Name	Remote Sensing	**Course Code**	SRV 377
Prerequisites		**Credit Hours** (L,W,T)	3 (2,2,0)

Course description :

The course aims to cover the fundamental physical and technical concepts and applications of remote sensing for the Environment. The course will have a lecture/labs format with emphasis on interpretation of satellite data.

Topics:

- Introduction to Remote Sensing
- Electromagnetic Radiation (EMR)
- Elements of Visual Image Interpretation
- Multispectral Remote Sensing Systems
- Thermal Remote Sensing
- Radar Remote Sensing
- Digital Image Processing – Part I: Basics
- Digital Image Processing – Part II: Image Classification
- In Situ Spectral Reflectance Measurement

Experiments: if applicable it will support the course topics.

Additional Readings and Teaching Aids:

Jensen, J.R. 2007. Remote Sensing of the Environment - an Earth Resource Perspective 2nd ed. Upper Saddle River, NJ, Prentice Hall. 592 pp.

References:

- The Remote Sensing Core Curriculum - http://www.r-s-c-c.org/
- The Remote Sensing Tutorial - http://rst.gsfc.nasa.gov/

Details of Theoretical Contents			
	Contents	**Week no.**	**Hours**
	Introduction to Remote Sensing: -What is Remote sensing? -Types of remote sensing -Basics of remote sensing -The remote sensing process -Image resolution -Brief history of remote sensing	**1**	**2**
	Electromagnetic Radiation (EMR): -EMR basics -Atmospheric interactions -Energy-terrain interactions	**2-3**	**4**
	Elements of Visual Image Interpretation: -Image analysis tasks -Elements of image interpretation -Pseudoscopic Illusion -Data fusion to improve image quality for visual analysis	**4**	**2**
	Multispectral Remote Sensing Systems: -Image acquisition -Digital image basics -Basic multispectral instrument types -Quantization -Spatial resolution	**5-6**	**4**
	Thermal Remote Sensing: -History of thermal remote sensing -Basics of thermal remote sensing -Thermal properties of terrain -Image geometry -Radiometric calibration	**7-8**	**4**

	Radar Remote Sensing: -Introduction to Radar -Radar geometry -Radar resolutions -Synthetic aperture radar (SAR) -Radar backscatter -Polarization	**9-10**	**4**
	Digital Image Processing – Part I: Basics -Visualizing multispectral images -Band math -Kauth-Thomas transformation	**11**	**2**
	Digital Image Processing – Part II: Image Classification -Classification methods -Supervised classification -Unsupervised classification -Thematic map accuracy	**12**	**2**
	In Situ Spectral Reflectance Measurement: -Measuring spectra in the field -Assumptions when collecting field spectra -Field procedures	**13**	**2**
Textbook:	Lillesand, T.M., Kiefer, R.W. and Chipman.J.W. 2008. Remote Sensing and Image Interpretation. 6th ed. New York: John Wiley & Sons. 756 pp.		

Details of Practical Contents			
	Contents	**Week no.**	**Hours**
1	**Introduction to ERDAS Imagine and the Basics of Digital Images:** -Understand Erdas imagine user-interface -Load and open images -Display the image in pan-chromatic, true color or false color. -Zoom and pan images -View and record the digital number (DN) values of image pixels -View the geolocation information about the image and individual pixels -Enhance image brightness and contrast -Display and use histograms to explore the image statistical properties.	**1**	**2**
2	**Georeferencing and Co-Registering an Image:** - Collect GCPs. - Use points of known coordinates. - Use previously georeferenced images.	**2-3**	**4**
3	**Interpretation of Satellite Images:** - Identify features from space imageries or Google earth based on fundamental elements of image interpretation.	**4**	**2**
4	**Visualizing and Analyzing Multispectral Images:** - Collect information about basic properties of major remote sensing systems using the internet - Explore several different types of remote sensing images to determine the most useful bands for discriminating certain type of features and to construct spectral signature curves for different types of geographic features; - Perform band rationing and finally - Visualize multi-spectral imagery using the RGB color model and HSV to RGB transformation technique for assisting visual interpretation.	**5-7**	**6**
5	**Thermal Remote Sensing Data:** - Visually interpret a daytime Landsat thermal image - Calculate the absolute radiance based on the DN values of thermal image	**8-9**	**4**

	- Calculate the effective at-satellite temperature; - Smooth the temperature image using a low-pass filter - Visualize the temperature using pseudocolor and 3D perspective views; and - Interpret and compare daytime and nighttime thermal images.		
6	**Interpreting Radar Images:** - Interpret a series of radar image chips - Visualize the SAR image - Create a 3D perspective view by draping the SAR image on top of a Digital Elevation Model	**10**	**2**
7	**Image Classification:** - Perform supervised classification -Perform unsupervised classification	**11-12**	**4**
8	**Field Spectroscopy:** - Collect spectral signatures in the VIS and NIR of common land cover materials. - Create a spectral library.	**13**	**2**
Textbook:			

Department	Civil & Architectural Technology	**Major**	Surveying Technology
Course Name	Digital Photogrammetry	**Course Code**	SRV 379
Prerequisites		**Credit Hours** (L,W,T)	3 (2,2,0)

Course description :

This Course is the second part of photogrammetry topics. This course aims at providing trainee with essential and basic skills to deal with digital aerial photographs, and digital photogrammetry systems for drawing digital survey maps form digital aerial stereographs, and forming digital terrain models (DTMs).

In this course, trainee practices and operates digital photogrammetry computer software and will use it to perform different photogrammetry operations which includes; inner orientation, relative orientation, absolute orientation, aerial triangulation, establish digital survey maps, and form digital terrain models.

Topics:

- Introduction to Digital Photogrammetry
- Digital Photogrammetry System
- Ground Control for Aerial Photogrammetry
- Digital Photogrammetry Operations
- Aerotriangulation

Experiments: if applicable it will support the course topics.

References:

- Ackerman, F, "Automatic Aero triangulation". (1995)
- Heipke, C," Automation ofinterior, relative, and absolute orientation". (1997)
- Drewniok,C. & Rohr, K," Automatic exterior orientation of aerial images in urban environment". (1996)

Details of Theoretical Contents			
	Contents	**Week no.**	**Hours**
1	**Introduction to Digital Photogrammetry:** - Developing digital photogrammetry. - Digital photographs. - Digital aerial Camera.	**1-2**	**4**
2	**Digital Photogrammetry System:** - Software. - Hardware.	**3-4**	**4**
3	**Ground Control for Aerial Photogrammetry:** - Number and location of control points. -Artificial targets.	**5**	**2**
4	**Digital Photogrammetry Operations:** - Inner orientation. - Relative orientation. - Absolute orientation.	**6-10**	**10**
5	**Aerotriangulation:** - Strip formation and adjustment. - Simultaneous Bundle adjustment.	**11-13**	**6**
Textbook:	Kasser, M & Egels, W," Digital Photogrammetry". (2002)		

Details of Practical Contents			
	Contents	**Week no.**	**Hours**
1	**Know How to Operate Digital Photogrammetry Software:** - Program setup. - Tools of stereovision. - Program operating routines and their functions.	**1-2**	**4**
2	**Digital Inner Orientation of Aerial Photograph:** - Prepare calibration data file. - Prepare digital photographs file of the project area. - Perform digital inner orientation of all photographs.	**3-4**	**4**
3	**Digital Relative Orientation of Aerial Photograph:** - Start the program. - Make necessary digital measurements in overlapped areas of digital photographs. - Perform digital relative orientation to form stereo models, and evaluate results.	**5-6**	**4**
4	**Digital Absolute Orientation of Aerial Model:** - Start the program. - Make necessary digital measurements of control points in digital models areas. - Perform digital absolute orientation to obtain adjusted models, and evaluate results.	**7-8**	**4**
5	**Aerial Triangulation to Adjust Block of Models for Drawing Stage:** - Start the program. - Make necessary digital measurements of tie points in digital models and strips areas. - Perform digital aerial triangulation processing to obtain adjusted block of models, and evaluate results.	**9-10**	**4**
6	**Draw Maps from Adjusted Stereo Models:** - Start the program. - Determine limits of drawing area. - Draw features and objects in the predefined drawing area. - Draw contour lines (form digital elevation model of the predefined drawing area). - Map revision, and drawing check. - Print map.	**11-12**	**6**
Textbook:			

Department	Civil & Architectural Technology	**Major**	Surveying Technology
Course Name	Computer Survey Applications	**Course Code**	SRV 485
Prerequisites		**Credit Hours** (L,W,T)	2 (0,4,0)

Course description :

This course aims at providing trainee chance to practice and gain more skills through performing some projects using computer programs to draw cadastral and contour maps and print them with different scales. Also use computer programs to construct longitudinal and cross section from contour map and extract the cut and fill volumes. Also use computer programs to level piece oflandand compute quantities considering designed level is horizontal and with certain slope.

Topics:

- Draw and Print Complete Cadastral Map
- Draw and Print Complete Contour Map
- Earth Work from Digital Contour Map
- Longitudinal and Cross Sections

Experiments: if applicable it will support the course topics.

References :

- AutoCad user manual.
- MicroStation user manual.
- Available Survey Package user manual.

Details of Practical Contents			
	Contents	**Week no.**	**Hours**
1	**Draw and Print Complete Cadastral Map:** - Using Layers. - Add texts and legends. - Scale. - Plotting and printing.	**1-3**	**12**
2	**Draw and Print Complete Contour Map:** - Using Layers. - Add texts and legends. - Scale - Plotting and printing.	**4-5**	**8**
3	**Earth Work from Digital Contour Map:** **(case: leveling surface is horizontal).** - Average level. - Predefined level (cut case). - Predefined level (fill case).	**6-7**	**8**
4	**Earth Work from Digital Contour Map:** **(case: leveling surface is not horizontal).** - Draw designed surface according to the given Slope. - Define height of cut or fill at designated points. - **C**ompute resulted earth quantities.	**8-9**	**8**
5	**Longitudinal and Cross Sections:** **(use digital contour map and available software)** - Draw longitudinal section. - Select and draw cross section (cut and fill). - Extract cut and fill quantities according to the designed level.	**10-13**	**16**
Textbook:	- AutoCad user manual. - MicroStation user manual. - Available Survey Package user manual.		

Department	Civil & Architectural Technology	**Major**	Surveying Technology
Course Name	Highway Engineering	**Course Code**	SRV 435
Prerequisites		**Credit Hours** *(L,W,T)*	3 *(2,2,0)*

Course description :

The course is presented in 2 strands. The first strand is concerned with the fundamentals of highway and pavement engineering. It introduces the design process of roads and intersections, including horizontal and vertical alignment design, cross-sections and earthworks. The second half of this strand deals with pavement design and evaluation. Topics include: pavement composition, pavement materials, asphalt mix design, the pavement thickness design, and defects in Flexible pavements andfailures in Rigid pavements. The second strand is presents briefly bridges classification and construction methods.

Topics :

- History of Road Construction.
- Highway Development in Saudi Arabia.
- Highway Development Programmers at National Level in Saudi Arabia.
- The Highway planning process and principles of route location.
- Factors controlling Highway alignment.
- Engineering surveys for alignment
- Conventional methods and Modern methods (Remote sensing, GIS and GPS techniques)
- Geometric design of Highways.
- Highways drainage.
- Classification, Improvement and Stabilization of soil and Earthworks for Highways.
- Sources description properties and uses of bituminous binders.
- Asphalt mix design.
- Asphalt plants.
- Design and construction of different Pavement layers.
- Design of rigid Pavements.
- Pavement Management.
- Types of defects in Flexible Pavements.
- Types of Pavement, failures in Rigid Pavements.
- Pavement Evaluation.
- Introduction to Bridges including (briefly): Bridges classification, bridge types and Bridges construction methods.

Experiments: if applicable it will support the course topics.

References:

- Traffic and Highway Engineering, Fourth Edition, Nicholas J. Garber, Lester A. Hoel, University of Virginia. 2009, Cengage Learning, 1120 Birchmount Road, Toronto ON M1K 5G4 Canada
- O'Flaherty, C.A. (ed) Highways: The Location, Design, Construction and Maintenance of Road Pavements. Butterworth Heinemann.
- Design of Highway Bridges, Authors: Richard Barker & Jay Puckett, Publisher: Wiley Interscience.

Details of Theoretical Contents			
	Contents	**Week no.**	**Hours**
1	• History of Road Construction. • Highway Development in Saudi Arabia. • Highway Development Programmers at National Level in Saudi Arabia.	**1**	**2**
2	The Highway planning process and principles of route location.	**2**	**2**
3	• Factors controlling Highway alignment. • Engineering surveys for alignment - Conventional methods and Modern methods (Remote sensing, GIS and GPS techniques)	**3**	**2**
4	Geometric design of Highways.	**4-5**	**4**
5	Highways drainage.	**6**	**2**
6	Classification, Improvement and Stabilization of soil and Earthworks for Highways.	**7**	**2**
7	• Sources description properties and uses of bituminous binders. • Asphalt mix design. • Asphalt plants.	**8-9**	**4**
8	Design and construction of different Pavement layers.	**10**	**2**
9	• Design of rigid Pavements. • Pavement Management.	**11**	**2**
10	• Types of defects in Flexible Pavements. • Types of Pavement, failures in Rigid Pavements. • Pavement Evaluation.	**12**	**2**
11	**Introduction to Bridges including (briefly):** Bridges classification, bridge types and Bridges construction methods.	**13**	
Textbook:			

Details of Practical Contents			
	Contents	**Week no.**	**Hours**
1	Method for Effect of Heat and Air on a Moving Film of Asphalt	**1**	**2**
2	Asphalt mix design according to Marshal Method.	**2-3**	**4**
3	Quantitative Extraction of Bitumen From Bituminous Paving Mixtures.	**4**	**2**
4	Rotational Viscosity.	**5**	**2**
5	Pressure Aging Vessel.	**6**	**2**
6	Dynamic Shear Rheometer.	**7**	**2**
7	Bending Beam Rheometer.	**8**	**2**
8	Direct Tension test.	**9**	**2**
9	Gyratory Compaction test.	**10**	**2**
10	Asphalt mix design by using E Pave Program (Superpaves Method).	**11-12**	**4**
Textbook:			

Department	Civil & Architectural Technology	**Major**	Surveying Technology
Course Name	Project (1)	**Course Code**	SRV 495
Prerequisites		**Credit Hours** *(L,W,T)*	2 *(0,4,0)*

Course description :

This course is the first part of applied project. Trainee gets the chance to get knowledge about executable projects within capacity of trainee. Also Trainee reviews some maps and reports of already executed projects.

Trainee should select a project in coordination with his supervisor. The selected project should meet some standards such as: allows trainee to apply what he already have of skills and experiences during his study. Also Trainee should be able to use available supplies such as computer labs, survey systems and software, modern instruments to collect data, process and adjust data, compute final coordinates and draw maps at required scale.

Experiments: if applicable it will support the course topics.

References:

Instrument manual, program manual, books and material used during training stage.

Details of Contents			
	Contents	**Week no.**	**Hours**
1	**First Step:** Preview already executed projects, and suggested projects. - Display some available projects. - Suggesting some idea for new projects. - Reviewing available survey software and hardware and instruments. - Define the objectives of the project. - Final evaluation requirements regarding: presentation of project out comes.	**1-3**	**12**
2	**Second Step:** Carry out project stages. - Set up project plan. - Evaluate and select required instruments and survey systems, - Field work to collect data. - Office work to process data and compute file results. - Draw final map, and prepare final documents. - Present final product for evaluation.	**4-13**	**40**
Textbook:			

Department	Civil & Architectural Technology	**Major**	Surveying Technology
Course Name	Theory of Errors andObservations Adjustment	**Course Code**	SRV 456
Prerequisites		**Credit Hours** *(L,W,T)*	3 *(3,0,2)*

Course description :

This course is designed for the purpose of examining the nature of measurements, statistical analysis of random errors in measurements, propagation of errors, survey standards and design specifications, development of coordinate geometry and trigonometric solutions of plane surveying problems, analysis of errors and mistakes inindirect measurement.

Topics:

- Fundamentals of Theory of Errors
- Measurements
- Observations and Their Analysis
- Random Error Theory
- Propagation Of Random Errors In Indirectly Measured Quantities
- Error Propagation In Angle and Distance Observations
- Error Propagation In Traverse Surveys
- Error Propagation In Elevation Determination
- Weights Of Observations
- Principles Of Least Squares
- Adjustment Of Level Nets
- Adjustment Of Horizontal Surveys- Triangulation
- Adjustment Of Horizontal Surveys - Traverses And Networks
- Adjustment Of GPS Networks
- Coordinate Transformations

Experiments: if applicable it will support the course topics.

References :

ADJUSTMENT COMPUTATIONS: Spatial Data Analysis, CHARLES D. GHILANI and Paul Wolf, 2010, JOHN WILEY & SONS, INC

Details of Theoretical Contents			
	Contents	**Week no.**	**Hours**

1	**Fundamentals of Theory of Errors:**
	- Standard Errors and Weights
	  - Standard Errors
	  - Weights and Unit-Weight Standard Error
	  - Variance-Covariance Matrix and Cofactor Matrix
	- Error Propagation
	  - Error Propagation in Linear Functions
	  - Error Propagation in Non-Linear -Functions
	  - Propagation of Weights
	  - Propagation of Cofactor Matrices
	  - Point Errors
	- Statistical Analysis
	  - Probability Distributions
	  - Confidence Intervals and Error Tolerances
	  - Hypothesis Tests
	  - Variance Analysis
	  - Regression Analysis
	  - Uncertainty in Measurement
	  - Optimal Estimation
	  - Least Squares Method
	  - Minimum Error Variance Estimation
	  - Matrix Algebra and Numerical Methods
	  - Numerical Solutions of Linear Equation Systems
		1	**3**

2	**Measurements:** - Direct and Indirect Measurements - Measurement Error Sources - Definitions - Precision versus Accuracy - Redundant Measurements in Surveying and Their Adjustment - Advantages of Least Squares Adjustment	**2**	**1**
3	**Observations and Their Analysis:** - Sample versus Population - Range and Median - Graphical Representation of Data	**2**	**2**

	- Numerical Methods of Describing Data		
4	**Random Error Theory:** - Theory of Probability - Properties of the Normal Distribution Curve - Standard Normal Distribution Function - Probability of the Standard Error - 50% Probable Error - 95% Probable Error - Other Percent Probable Errors - Uses for Percent Errors - Practical Examples	**3**	**2**
5	**Propagation Of Random Errors In Indirectly Measured Quantities:** - Basic Error Propagation Equation - Frequently Encountered Specific Functions - Standard Deviation of a Sum - Standard Deviation in a Series - Standard Deviation of the Mean	**3**	**1**
6	**Error Propagation In Angle and Distance Observations:** - Error Sources in Horizontal Angles - Reading Errors - Angles Observed by the Repetition Method - Angles Observed by the Directional Method - Estimated Pointing and Reading Errors with Total Stations - Target Centering Errors - Instrument Centering Errors - Effects of Leveling Errors in Angle Observations - Numerical Example of Combined Error - Propagation in a Single Horizontal Angle - Use of Estimated Errors to Check Angular Misclosure in a Traverse - Errors in Astronomical Observations for an Azimuth - Errors in Electronic Distance Observations - Use of Computational Software	**4**	**2**
7	**Error Propagation In Traverse Surveys:** - Derivation of Estimated Error in Latitude and Departure - Derivation of Estimated Standard Errors in	**5**	**2**

	Course Azimuths - Computing and Analyzing Polygon Traverse Misclosure Errors - Computing and Analyzing Link Traverse Misclosure Errors		
8	**Error Propagation In Elevation Determination:** - Systematic Errors in Differential Leveling - Collimation Error - Earth Curvature and Refraction - Combined Effects of Systematic Errors on Elevation Differences - Instrument Leveling Errors - Rod Plumbing Error - Estimated Errors in Differential Leveling - Error Propagation in Trigonometric Leveling	**5**	**1**
9	**Weights Of Observations:** - Weighted Mean - Relation between Weights and Standard Errors - Statistics of Weighted Observations - Standard Deviation - Standard Error of Weight and Standard Error of the Weighted Mean - Weights in Angle Observations - Weights in Differential Leveling	**6**	**2**
10	**Principles Of Least Squares:** - Fundamental Principle of Least Squares - Fundamental Principle of Weighted Least Squares - Observation Equations - Formulation of the Normal Equations - Using Matrices to Form the Normal Equations - Least Squares Solution of Nonlinear Systems - Least Squares Fit of Points to a Line or Curve - Fitting Data to a Straight Line - Fitting Data to a Parabola - Calibration of an EDM Instrument - Least Squares Adjustment Using Conditional Equations - Observation Equations	**7-8**	**6**

11	**Adjustment Of Level Nets:** - Observation Equations - Unweighted Example - Reference Standard Deviation - Weighted Adjustment	**9**	**3**
12	**Adjustment Of Horizontal Surveys-Triangulation:** - Azimuth Observation Equation - Linearization of the Azimuth Observation Equation - Angle Observation Equation - Adjustment of Intersections - Adjustment of Resections - Adjustment of Triangulated Quadrilaterals	**10**	**3**
13	**Adjustment Of Horizontal Surveys - Traverses And Networks:** - Observation Equations - Redundant Equations - Minimum Amount of Control - Adjustment of Networks	**11**	**3**
14	**Adjustment Of GPS Networks:** - GPS Observations - GPS Errors and the Need for Adjustment - Reference Coordinate Systems for GPS - Converting between the Terrestrial and Geodetic Coordinate Systems - Application of Least Squares in Processing GPS Data - Network Preadjustment Data Analysis - Analysis of Fixed Baseline Measurements - Analysis of Repeat Baseline Measurements - Least Squares Adjustment of GPS Networks	**12**	**3**
15	**Coordinate Transformations:** - Two-Dimensional Conformal Coordinate Transformation - Equation Development - Two-Dimensional Affine Coordinate Transformation - Two-Dimensional Projective Coordinate Transformation - Three-Dimensional Conformal Coordinate Transformation	**13**	**3**

Textbook:	Adjustment computations: spatial data analysis, charles d. Ghilani and paul wolf, 2010, john wiley & sons, inc.

Department	Civil & Architectural Technology	**Major**	Surveying Technology
Course Name	Geographic Information Systems (3)	**Course Code**	SRV 475
Prerequisites		**Credit Hours** (L,W,T)	3 (2,2,0)

Course description :

This course will describe new services which become widely distributed through world today sush as Distributed GIS ,Web Mapping ,Location Based Services

Topics:

- Distributed GIS : Concepts , Applications
- Web Mapping : Introduction , Web mapping supporting technologies , Web mapping services , Web mapping applications
- Location Based Services: Introduction , Applications , Architectures

Experiments: if applicable it will support the course topics.

References:

Internet GIS: Distributed Geographic Information Services for the Internet ... By Zhong-RenPeng, Ming-Hsiang Tsou.

Details of Theoretical Contents			
	Contents	**Week no.**	**Hours**
1	**Distributed GIS:** - Concepts - Applications	**1-2**	**4**
2	**Web Mapping:** - Introduction - Web mapping supporting technologies - Web mapping services - Web mapping applications	**3-7**	**10**
3	**Location Based Services:** - Introduction - Applications - Architectures - Standards - Interfaces - Privacy	**8-13**	**12**
Textbook:	Web GIS: Principles and Applications (by: Pinde Fu and Jiulin Sun)		

Details of Practical Contents			
	Contents	**Week no.**	**Hours**
1	**Web Mapping:** - Introduction - Setting up a WM service - Element of a map - Layout and labeling	**1-6**	**12**
2	**LBS:** - Introduction - Development location aware agents - Build a simple agent - Build a simple location based service - Making agents move and detect each other - Privatize the location information	**7-12**	**12**
Textbook:			

Department	Civil & Architectural Technology	**Major**	Surveying Technology
Course Name	Project (2)	**Course Code**	SRV 496
Prerequisites		**Credit Hours** (L,W,T)	2 (0,4,0)

Course description :

This course is the second part of applied project. Trainee gets the chance to practice using most advanced systems to execute projects. Also Trainee applies his experiences in carrying out some engineering and surveying projects.

Trainee should select a project in coordination with his supervisor. The selected project should meet some standards such as: allows trainee to apply what he already has of skills and experiences during his study. Also Trainee should be able to use available supplies such as computer labs, survey systems and software, modern instruments to collect data, process and adjust data, compute final coordinates and draw maps at required scale, compute volumes of cut and fill from contour maps an longitudinal and cross sections, also use available software of Remote sensing, and geographic information systems, digital photogrammetry.

Experiments: if applicable it will support the course topics.

References:

Instrument manual, program manual, books and material used during training stage.