

**D4 WELDING ENGINEERING**

SEMESTER I				SEMESTER III			
No	COURSES	HRS	CREDITS	No	COURSES	HRS	CREDITS
1	Religious Study	2	2	1	Indonesian Language	2	2
2	English I	3	3	2	Design	6	3
3	Applied Chemistry	4	2	3	Machinery Elements	4	2
4	Applied Mathematics	4	2	4	Material of Mechanics	4	2
5	2D CAD Drafting Practice	4	4	5	NDT Theory	4	2
6	Manufacturing Process	4	2	6	Welding Technology II	4	2
7	Occupational Health and Safety	2	1	7	Welding Practice	8	4
8	Material Sciences	4	2	8	Heat Transfer	4	2
9	Basic Fabrication	4	2				
10							
TOTAL		<b>31</b>	<b>20</b>	TOTAL		<b>36</b>	<b>19</b>
							0
SEMESTER II				SEMESTER IV			
No	COURSES	HRS	CREDITS	No	COURSES	HRS	CREDITS
1	English II	3	3	1	Ship Construction	4	2
2	Indonesian Values and Ideology	2	2	2	Electricity : Practice	4	2
3	Applied Physics	6	3	3	Mettalurgical Welding	4	2
4	Applied Mathematics II	4	2	4	Heat Treatment	4	2
5	Applied Computer	4	2	5	DT - NDT Practice	8	4
6	Ship Building Theory	4	2	6	Welding Practice II	10	5
7	Workshop	8	4	7	Lift Aircraft	2	1
8	Welding Technology I	4	2				
TOTAL		<b>35</b>	<b>20</b>	TOTAL		<b>36</b>	<b>18</b>

SEMESTER V				SEMESTER VII			
No	COURSES	HR S	CREDIT S	No	COURSES	HR S	CREDIT S
1	Statistics	2	1	1	On the Job Training	40	18
2	Element Method	4	2				
3	Computer-aided Manufacturing Practices	4	2				
4	Welding Applied Technology	4	2				
5	DFKI KU & BT	6	3				
6	Nonmetallic Splicing	4	2				
7	Automatic Control	4	2				
8	Fabrication Practices	8	4				
9							
TOTAL		36	18	JUMLAH		40	18
SEMESTER VI				SEMESTER VIII			
No	COURSES	HR S	CREDIT S	No	COURSES	HR S	CREDIT S
1	New Building Technology	4	2	1	Fatigue and Breaking	4	2
2	Optimization Method	4	2	2	Cost Analysis	2	1
3	Research Methodology	2	1	3	Entrepreneurship	2	1
4	Welding Inspection	4	2	4	Quality Assurance	2	1
5	DFKI Tank and Pipe	6	3	5	English III	3	3
6	DFKI Ships	6	3	6	Corrosion and Its Control	4	2
7	Welding Qualification Practice	10	5	7	Thesis	12	6
8							
TOTAL		36	18	JUMLAH		29	16

## SYLLABUS

No.	Course Title	Credits/Hours	Objective/Course Topics/References
1.	Religion Islamic Values	2/2	<p><b>Objectives:</b> Helping to make students have faithful, devout, virtuous, philosophical and rational thinking and dynamic, long view, cooperate with members of a religious community in developing and using knowledge and technology and also the art for the human and national concerns.</p> <p><b>Course Topics:</b> Divinity concept in Islam, human essence in Islam, Law, Science and democracy, Moral ethics and characters, Science and technology in Islam, Reconciliation between members of religious community, Madani Society and their welfare, Islamic culture, Islamic Political System.</p> <p><b>References:</b> 1. <i>Terjemah Al Quran</i> : Depag RI</p>

			<ol style="list-style-type: none"> <li>2. <i>Kuliah Al Islam</i> : T.PAI ITS</li> <li>3. <i>PAI di PTK</i> : Depag RI</li> <li>4. <i>Moral dan Kognisi Islam</i> : Muslim Nurdin</li> <li>5. <i>Karakteristik Islam</i> : Yusuf Qordowi</li> <li>6. <i>Islam dan Pluralitas</i> : M Imarah</li> <li>7. <i>Cita-cita Politik Islam</i> : Nurcholkis Majid</li> <li>8. <i>Etika Islam</i> : Hamzah Ya'qub</li> <li>9. <i>Filsafat Islam</i> : M Rasyidi</li> </ol>
	Christian	2/2	<p><b>Objectives:</b> Completing human so that they can grow and create themselves as the new creation of Jesus Christ, between human and environment. Willing to devote their lives for other concerns in every aspects and life field in which they serve to respect and the glory of Allah.</p> <p><b>Course Topics:</b> The awareness to live religiously in human life, the meaning of Faith ( confession, devine revelation, witness), Religions phenomology ( the similarity and difference of meaning), Religion and Pancasila, Human as Allah's map ( human should be responsible, human as the God will's bearer), the relation between human and science, the meaning of God's laws and the call duty for society and nation life.</p> <p><b>References:</b></p> <ol style="list-style-type: none"> <li>1. Lembaga Alkitab Indonesia, <i>Alkitab</i>.</li> <li>2. Dr. Franz Dahler, <i>Masalah agama</i>.</li> <li>3. Dr. Honig, <i>Ilmu Agama</i>.</li> <li>4. Dr. Bleeker, <i>Pertemuan Agama Dunia</i>.</li> <li>5. Dr. Schuman Olaf, <i>Dialog Antar Umat Beragama</i>.</li> <li>6. Dr. Walter Lempp, <i>Mahasiswa Bertanggungjawab</i>.</li> <li>7. Dr. Walter Lempp, <i>Membangun Manusia Pembangunan</i></li> <li>8. Dr. H. Hadiwijono, <i>Iman Kristen</i>.</li> <li>9. Malcon Brownly, M. Th, <i>Pengambilan Keputusan Etis</i>.</li> <li>10. Dr. DC Mulder, <i>Iman Kristen dan Ilmu Pengetahuan</i>.</li> <li>11. Sularso Sopater, <i>Iman Kristen dan Ilmu Pengetahuan</i>.</li> </ol>
	Catholic	2/2	<p><b>Objectives:</b> The increase comprehending of faith concept in Church, Life in church and society in developing attitudes and personality as catholic that can prove their faith for the sake of Indonesian society.</p> <p><b>Course Topics:</b> Church Faith, Church as the safety sacrament, Church decision, human responsibility as the church member, the service church, leadership in Church.</p> <p><b>References:</b></p> <ol style="list-style-type: none"> <li>1. R. Hadiwiyono Sy, <i>Membina Jemaat Beriman</i>, Jakarta : Dopken MAWI.</li> <li>2. Y. Riberu, <i>Ilham bagi para pengilham</i>, Jakarta, Penerbit Luseat.</li> <li>3. Thom Yakobs, <i>Dinamika Gereja</i>, Jogjakarte : Yayasan Canisius.</li> <li>4. A.P. Budiyo, <i>Mendalami Kitab Suci Dalam Kelompok dengan 30 orang</i>, Jogjakarta Yayasan Canisius</li> </ol>
	Hinduism	2/2	<p><b>Objectives:</b> Firm comprehending and comprehension of religion, strengthen the faith and worship as hindustan to Sang Hyang Widhi Wasa (God) so that they can control themselves in thinking, speaking, and behaving to our nation and UUD 1945, support National development and achieve human life objectives.</p> <p><b>Course Topics:</b> The history of Hindu, the source of hindu, scope, Mawa Darsana, Tantrayanam, Panca Sradha Tattwa, Catur Marga Yoga pranata Sosial, Kala Dharma, Dharmada, Budhisatewa and reconciliation concept.</p> <p><b>References:</b></p> <ol style="list-style-type: none"> <li>1. Sosiologi Hindu Dharma.</li> <li>2. Pengantar Agama Hindu I, II.</li> <li>3. Teologi Hindu.</li> </ol>

			<ol style="list-style-type: none"> <li>4. P4 dan Agama Hindu.</li> <li>5. Kepemimpinan Hindu</li> </ol>
	Buddhism	2/2	<p><b>Objectives:</b> Comprehend, comprehend and also apply the first principle of Pancasila, Dharma and worshipping to strengthen faith (saddha) in keeping the life of religion and nation based on Pancasila and UUD 1945.</p> <p><b>Course Topics:</b> The essence of God, The concept of religious life, Budhisatwa and Budha</p> <p><b>References:</b></p> <ol style="list-style-type: none"> <li>1. Oka Diputhera, <i>Citra Agama Budha dalam filsafat Pancasila</i>.</li> <li>2. Departemen Agama RI, <i>Pedoman Pelaksanaan P4 bagi Agama Budha</i>.</li> <li>3. Proyek Pengadaan Kitab Suci Budha, <i>Dhammapada</i>.</li> <li>4. Bhikku Kheniyo, <i>Pancasila dan Panca dharma</i></li> </ol>
2.	English I		<p><b>Objectives:</b> Students can practice English, both orally and in writing in the scope of work and be able to comprehend simple discourse in English especially in the field of engineering.</p> <p><b>Course Topics:</b> Daily conversations in working and social environment, Describing object based on number, size, shape, quantity, material, color, and characteristic, response to information and make conclusion, writing a command, Filling out a form. Reading a simple letter, Writing a simple letter, write a business letter (simple and advance), reading "Hand-Tools" instructions, Reading safety instructions, Reading gauges manual.</p> <p><b>References:</b></p> <ol style="list-style-type: none"> <li>1. <i>English for Maritime Studies</i> by TN Blakey.</li> <li>2. <i>English for computer Science</i> by Norma D. Mullend P. Charles Brown.</li> <li>3. <i>Question and Answer</i>, Graded oral Comperehensip exercise by L.G. Alexander.</li> <li>4. <i>Breakthrough</i> by J.C. Richard and M.N. Long.</li> <li>5. <i>Practice and Progress</i> by L.G. Alexander.</li> <li>6. <i>Letter writing</i> by L.A. Hill</li> </ol>
3.	Mathematics		<p><b>Objectives:</b> Students are able to apply basic math on the other courses.</p> <p><b>Course Topics:</b> Determinants, Matrices, Vector Algebra, Complex Numbers, Differentiation Functions, Applications of Differentiation, indeterminate Integration. Application of certain integral (area, volume, arc length, surface area of the skin, the coordinates and the coordinates polar), Central Mass, Moment of Inertia, Fluid Pressure, Business and Style, Numerical Integration, sequence and series, Ordinary Differential Equations</p> <p><b>References:</b></p> <ol style="list-style-type: none"> <li>1. <i>Diklat Kuliah Matematika I, II</i>, FMIPA ITS</li> <li>2. Bird, J.O. and A.J.C. May, <i>Technicians</i>, Longman Scientific&amp;Technical, 1978</li> <li>3. Stroud, K.A. , <i>Matematika untuk Teknik</i>, Penerbit Erlangga, 1995</li> <li>4. Baisuni, H.M.H., <i>Kalkulus</i>, UI Press, 1986</li> <li>5. Irwin, J.R., <i>Essentials of Applied Mathematics</i>, Edward Arnold Ltd., 1986</li> </ol>
4.	Manufacturing Process		<p><b>Objectives:</b> Students can comprehend the operation of measuring tools accurately and efficiently.</p> <p><b>Course Topics:</b> Accurate measurement tools and system, geometric tolerances, Lay Out, Work Benches, Sheet Metal, metal flakes and lubricant oil, drill machine (Drill process); Work Planning, Saw Machine, Lathe, Trim, Scrap Machines, grinding machines.</p> <p><b>References:</b></p>

			<ol style="list-style-type: none"> <li>1. <i>Metalwork Terchnology and Practice</i>, Ludwig, Oswald A/Mc. Knight.</li> <li>2. <i>Machine Tool Operation</i>, Krar, Oswald, St. Amand/Mc. Graw-Hill.</li> <li>3. Nelson, Donald H. <i>Applied Manufacturing Process Planning: With Emphasis on Metal Forming and Machining</i> , Upper Saddle River : Prentice Hall, 2001</li> <li>4. Groover, Mikell P. <i>Fundamentals of Modern Manufacturing: Materials, Processes, and Systems</i>, New York ; John Wiley, 2002</li> </ol>
5.	Material Sciences		<p><b>Objective:</b> Students are able to comprehend mechanical characteristics, the use of Ferro metal and its mixture, Non Ferro metal and its mixture, Non Metal Material.</p> <p><b>Course Topics:</b> Mechanical Characteristics and its testing, Crystal Structure and Deformation, Phase Diagram, Ferro and Steel, Kinds of Steel Usage, Non Ferro Metal and its usage, Non Metal and its usage, Transformation Phase, Heat Treatment Process, Surface Treatment, Special Heat Treatment, Heat treatment process tools, metalography.</p> <p><b>References:</b></p> <ol style="list-style-type: none"> <li>1. Williams D. Callister Jr, <i>Material Science abd Engineering on Introduction</i>, Wiley, 1985</li> <li>2. Jastrzebski, <i>The Nature and Properties of Engineering Materials</i></li> <li>3. Hertzberg, <i>Deformation and Fracture Mechanics of Engineering Materials</i></li> <li>4. KW. Vohdin, <i>Mengolah Logam</i></li> <li>5. Van Vlack, <i>Ilmu dan Teknik Bahan</i></li> <li>6. Young, J.F., <i>Materials and Processes</i>, The Goodheart-Willcox Co., Inc., Illinois</li> <li>7. <i>Pengetahuan Bahan Teknik</i>, Prof.Ir. Tata Surdia.</li> <li>8. Davies, D.J., and L. A. Oelmann , <i>The Structure, Properties and Heat Treatment of Metals</i>, Pitman Book Limited, London, 1983</li> <li>9. Daniel A. Brant, <i>Metalurgy Fundamentals</i>, The Goodheart-Willcox Co., 1985</li> </ol>
6.	Occupational Health and Safety		<p><b>Objectives:</b> Students are expected to comprehend the meaning of Occupational Safety and accident prevention can increase production.</p> <p><b>Course Topics:</b> Occupational accidents and its prevention, History of Accident Prevention, Safety Organisation, Welfare Legislation in Employment, Human Factors, the field of Fire Safety, Aircraft, and Vessel Safety with Danger Blasting, Esetilen Aircraft Safety and Electrical, Security Machinery and equipment mechanics, Electricity and Safety, Hazardous Materials and Safety, Safety in Corporate, Government role and Professional Association.</p> <p><b>References:</b></p> <ol style="list-style-type: none"> <li>1. <i>Keselamatan Kerja dan Pencegahan Kecelakaan</i>, Dr.Suma'mur P.K.Msc</li> <li>2. Kavianian, Hamid R. <i>Occupational and Environmental Safety Engineering and Management</i>, New York: Van Nostrand Reinhold, c1990</li> <li>3. <i>Health and Safety in Welding</i>, Milsons Point: AWRA and AWI, 1982</li> </ol>
7.	Basic of Fabrication		<p><b>Objectives:</b></p> <ol style="list-style-type: none"> <li>1. Students are able to create work tools with varied shape and size based on accurate size and measurement tools, and be able to apply the safety rules.</li> <li>2. Students have a basic knowledge and skills about production of a thin plate, introduction of Oxy Acetelyn, pipe forming, welding procedure, safety equipment.</li> </ol> <p><b>Course Topics:</b></p> <ol style="list-style-type: none"> <li>1. Make a point on the work tools; draw a parallel line to the work tools; Tacking painting on the work tools; fitting and Miser usage, hand saws and machinery; chainsaw operation.</li> <li>2. Marking plate, plate cutting, Bending plate, Firing, Filling, chiseling.</li> </ol>

			<p><b>References:</b></p> <ol style="list-style-type: none"> <li>1. <i>Diktat Gambar Teknik I</i>, PMS ITB 1981.</li> <li>2. <i>Diktat Perencanaan Kerja dan Management Bengkel I</i>, PMS-ITB 1978.</li> <li>3. Stam, H. N. C, <i>Keselamatan Kerja Di Tempat Kerja</i>, Djajang Madfya, Cetakan I Jakarta 1989.</li> <li>4. Cox, Cec , <i>Marking-Off Techniques for Metal Fabrication: A Basic Course</i>, New York:McGraw-Hill,c1984</li> </ol>
8.	Engineering Drawing	2/4	<p><b>Objective:</b> Students are able to create and read working drawing plans according to ISO standard images as well as to make information more precisely and objectively.</p> <p><b>Course Topics:</b> Image Function, paper size, image presentation techniques, perspective projection, pieces, size designation, tolerance, drawing bolts and nuts, welding line drawings and images stretch.</p> <p><b>References:</b></p> <ol style="list-style-type: none"> <li>1. G. Takhesi Sato dan N. Sugiarto Hartanto, <i>Menggambar Mesin Menurut Standar ISO</i>, Penerbit Paramita Jakarta, Cetakan III, 1983.</li> <li>2. Verren J. Luzadder,P.E. ; <i>Menggambar Teknik</i>, alih bahasa oleh Hendarsin,H. Penerbit Erlangga Jakarta, Edisi ke 8, 1986.</li> <li>3. Frederick E. Giesecke, Alva Michell, Ivan Leroy Hill, Jhon Thomas Dygdon, Henry Cecil Spencer, <i>Technical Drawing</i>, New York, Macmillan Publishing Co, Inc, 1980.</li> </ol>
9.	English II	2/4	<p><b>Objectives:</b> Students can comprehend more complicated English discourse especially in the field of engineering.</p> <p><b>Course Topics:</b> Reading a complex manual book, reading a paperwork, reading newspapers or magazines, Summarizing article and the paper, writing a simple job instructions, describing objects by size and dimensions, writing workings of a complex, Presenting technological problems, participating in meetings, writing letter, interviews.</p> <p><b>References:</b></p> <ol style="list-style-type: none"> <li>1. <i>English for Maritime Studies</i> by TN Blakey.</li> <li>2. <i>English for computer Science</i> by Norma D. Mullend P. Charles Brown.</li> <li>3. <i>Question and Answer, Graded oral Comperehensip exercise</i> by L.G. Alexander.</li> <li>4. <i>Letter writing</i> by L.A. Hill</li> <li>5. <i>Melamar Pekerjaan</i> by K.C. Bay.</li> </ol>
10.	Introduction to Offshore Construction	2/4	<p><b>Objective:</b> Students know the techniques of offshore construction and its maintenance and reparation.</p> <p><b>Course Topics:</b> And marine environment, offshore building, engineering exploration, marine pipeline installation, production techniques, manufacture techniques of offshore building, transfer system / delay of offshore construction, maintenance and repair of offshore construction.</p> <p><b>References:</b></p> <ol style="list-style-type: none"> <li>1. Graft, W.J., <i>Introduction to Offshore Structures</i>, Gulf Publishing Company, 1981.</li> <li>2. Kennet, J.P., <i>Marine Geology</i>, Prentice-Hall Inc., 1982.</li> <li>3. Mc. Quiliar, R., <i>Exploring the Geology of Self Seas</i>, Graham &amp; Trotman Limited, 1977.</li> <li>4. Gerwick, Ben C. <i>Consruction of offshore structures</i>, New York: John Wiley &amp; Sons, c1986</li> <li>5. Gerwick, Ben C., Jr. <i>Construction of marine and offshore structures</i>, Boca Raton : CRC Press, 2000</li> </ol>

11.	Welding Technology I	2/4	<p><b>Objective:</b> To comprehend various welding technologies and explore hand welding and gas welding.</p> <p><b>Course Topics:</b> Knowing the history &amp; development: welded Metal, know and comprehend the various ways of welding and cutting, comprehend and be able to operate hand welding. Comprehending and operating gas welding and soldering / brazing, Comprehending and operating gas welding and soldering / brazing.</p> <p><b>References:</b></p> <ol style="list-style-type: none"> <li>1. <i>Teknologi Las</i>, Prof. Dr. Ir. Harsono</li> <li>2. <i>Weldability of steels</i>, Milsons Point: Australian Welding Research Association, 1982</li> <li>3. SOSNIN, H.A. <i>Arc welding instructions for the beginner</i>, CLEVELAND: The James F. Lincoln</li> <li>4. <i>Dasar-dasar pengelasan Kenyon</i>, W. Jakarta: Erlangga, 1985</li> <li>5. <i>Basic welding Gibson</i>, Stuart W. London: Macmillan, 1993</li> </ol>
12.	Chemistry	2/4	<p><b>Objective:</b> Students are able to comprehend the chemical properties of various materials and metal corrosion in order to supports knowledge of engineering materials</p> <p><b>Course Topics:</b> Chemical elements of commercial metals, polymer chemistry, carbon chemistry: fuel and lubricants, Electrochemistry, Corrosion, corrosion prevention, corrosion properties of some metals.</p> <p><b>References:</b></p> <ol style="list-style-type: none"> <li>1. Sienko and Plane, <i>General Chemistriy</i></li> <li>2. James E Brady, <i>General Chemistry: Principals and Structure</i>, John Wiley and Sons Singapore, 1990</li> <li>3. Fontana, M.G, <i>Corrosion Engineering</i>, NACE, Texas</li> <li>4. Thretewey, <i>Korosi, Untuk mahasiswa Sains dan Rekayasawan</i>, Gramedia, Jakarta</li> </ol>
13.	Material Mechanics	4/8	<p><b>Objective:</b></p> <ol style="list-style-type: none"> <li>1. Students can calculate and comprehend basic stresses, geometry property, Mechanical Properties, stress on the axial loading and internal vorce.</li> <li>2. Students can comprehend and be able to calculate the static strength and indeterminate static with various methods</li> </ol> <p><b>Course Topics:</b> The concept of voltage, geometric properties, mechanical properties, Stress strain on axial loading, beam force, flexural internal integration methods, Torque, Transverse Loading, combination loading, column.</p> <p><b>References:</b></p> <ol style="list-style-type: none"> <li>1. Beer, Ferdinand Pierre dan E. Kussel Jhonston Jr., <i>Mechanics of Materials</i>, 1 st printing, Mc. Graw-Hill, 1981</li> <li>2. Blodgett, Omer W. <i>Design of Welded Structure</i>, 5th printing, The James F. Lincoln, "ARC Welding Fondation", 1972..</li> </ol>
14.	Practice of Machine Tools	4/8	<p><b>Objective:</b> Students master the manufacture of assembly objects/production.</p> <p><b>Course Topic:</b> Turning with mandrel, turning with phase plate, turning with eccentric things, turning a pattern, foundation milling; jaw roads milling, carrier basis honing, jaw milling, grinding, operate a spindle lathe on whorl carrier, assemble and pen setting.</p> <p><b>References:</b></p> <ol style="list-style-type: none"> <li>1. Gerling, H., <i>Alll About Machine Tools</i>.</li> <li>2. Schnonments, A., <i>Pengerjaan Logam Dengan Mesin</i>.</li> <li>3. Juzts, H., E. Scharkus, <i>Westerman Tables</i>.</li> </ol>

15.	Applied Physics	3/6	<p><b>Objectives:</b></p> <ol style="list-style-type: none"> <li>1. Students are able to apply the laws of physics through mathematical calculations and conceptual logic and simple application.</li> <li>2. Students are able to comprehend the laws of particles and objects motion, to analyze the basic movements of particles and objects and the forces on the particles and objects.</li> <li>3. Students are able to apply the basic concepts of physics in simple practices.</li> </ol> <p><b>Course Topics:</b></p> <p>vector, velocity and acceleration, straight and curved motion, newton's laws, force: friction, centripetal, work, kinetic energy and gravitational potential energy, center mass, momentum and impulse, circular motion, angular momentum, moment of force, moment of inertia, rolling motion, momentum permanency of angle hard objects, hard object equilibrium, harmony and damped vibrations, elasticity, hydrostatic, fluid dynamics, heat transfer, first and second law of thermodynamics, ideal cycles on gas and steam. basics of dynamics, particles kinematics, particle kinetics, kinetics of particle systems, stiff kinematics field, kinetics of stiff body field, waves, vibrations, atomic physics, ionizing radiation.</p> <p><b>References:</b></p> <ol style="list-style-type: none"> <li>1. Halliday and Resnick, <i>Fundamental of Phisics</i></li> <li>2. Alonso and Finn, <i>Fundamental University Phisics</i>, Vol. I</li> <li>3. Dosen FMIPA ITS, <i>Diktat Fisika I</i></li> <li>4. Meriem JL, <i>Dynamics</i>, John Willey &amp; Sons Inc., 1976.</li> <li>5. Mc Lean, Nelson, <i>Engineering Mechanics (Schaum's Outline Series) 3<sup>rd</sup> Edition</i>, Mc Graw-Hill Book Company, 1980.</li> <li>6. Timoshenko &amp; Young, <i>Engineering Mechanis</i>, Fourth Edition, Mc Graw-Hill Book Company.</li> <li>7. Halliday Resnick, <i>Physics</i></li> <li>8. Frederick J. Bueche, <i>Theory &amp; Problem of Coollege Physics</i></li> <li>9. Dosen Fisika PPNS ITS, <i>Modul Fisika Terapan</i></li> <li>10. Dosen Fisika PPNS ITS, <i>Modul Praktikum Fisika Terapan</i></li> </ol>
16.	Statistics	1/2	<p><b>Objective:</b></p> <p>Students comprehend statistic and able to apply it to another courses.</p> <p><b>Course Topics:</b></p> <p>Descriptive statistics, distribution of a random variable with mean function and types, probability, permutations and combinations, parameter estimation, confidence intervals, hypothesis testing, regression and correlation analysis.</p> <p><b>References:</b></p> <ol style="list-style-type: none"> <li>1. <i>Diktat Kuliah Statistika</i>, ITS</li> <li>2. Spiegel, M. R., <i>Statistika</i>, Penerbit Erlangga 1994</li> <li>3. Hogg, R.V., and A. T Craig, <i>Introduction to the Mathematical Statistical</i>, Macmillan Publishing Company, 1978.</li> <li>4. Montgomery, D.C. and G.C. Runger, <i>Applied Statistics and Probability for Engineers</i>, John Wiley &amp; Sons 1994</li> </ol>
17.	NDT Theory	3/6	<p><b>Objective:</b></p> <p>Students are able to comprehend the basics of Non Destructive Test.</p> <p><b>Course Topics:</b></p> <p>Testing, Visual, Magnetic, Ultrasonic, Radiography (X-Ray) Dye penetrant</p> <p><b>References:</b></p> <ol style="list-style-type: none"> <li>1. Non. Destructive Testing, Barry, Hull, Vermanjau.</li> <li>2. ASME Sect. 1</li> <li>3. API standart 110</li> <li>4. AWS D.1.1 Section 6</li> </ol>
18.	Heat Treatment	2/4	<p><b>Objective:</b></p> <p>Students are able to comprehend and carry out the heat treatment process of the material</p> <p><b>Course Topics:</b></p> <p>Transformation during heating and cooling, transformation diagrams,</p>



			<p>hardenability, residual stress, influence of alloying elements, behavior of heat, case hardening, precipitation hardening.</p> <p><b>References:</b></p> <ol style="list-style-type: none"> <li>1. <i>Advances in electric heat treatment of metals</i>, Lord, Norman W. Ann Arbor: , c1981</li> <li>2. <i>Heat treatment of metal</i>, Zakharov, B. Moscow : Peace Publishers, 1962.</li> <li>3. <i>Heat-treatment of metals</i>, Zakharov, B. Moscow: Peace, 1962</li> <li>4. <i>Steel and its heat treatment</i>, Thelning, Karl-Erik London: Butterworths, 1984</li> <li>5. <i>Thermal stress and strain generation in heat treatment</i>, A.J. Fletcher London: Elsevier Applied Science, c1989</li> </ol>
19.	Welding Technology II	4/8	<p><b>Objective:</b> Students are able to comprehend the various welding processes and related factors, as well as comprehend the operation.</p> <p><b>Course Topics:</b> Various process of Welding and Cutting; welding metallurgy, welding material, welding position, welding connections, welding flaws, weld symbols, operation procedures of Electric Arc Welding; Welding electrical resistivity, operation procedure of Gas Welding and Soldering / Brazing, operation of MIG / MAG welding, TIG</p> <p><b>References:</b></p> <ol style="list-style-type: none"> <li>1. Prof.Dr.Ir.Harsono., Teknologi pengelasan logam</li> <li>2. Howard D, Modern Welding Technology</li> </ol>
20.	Steel Construction	2/4	<p><b>Objective:</b> Students are able to plan a construction (connection design and material) steels in accordance with the regulation.</p> <p><b>Course Topics:</b> The types of connections, cross-sectional profiles construction, system and connection construction of modulus and testing construction calculation in accordance with regulations such as: API-A 620, ASME Sect. IX/SII-2205-87</p> <p><b>References:</b></p> <ol style="list-style-type: none"> <li>1. API-A 620,</li> <li>2. ASME IX</li> <li>3. <i>Konstruksi baja Mashari</i>   Jakarta: Bag. Proyek Pengadaan Buku Pendidikan teknologi. Depdikbud, 1980</li> <li>4. <i>Manual of steel construction : allowable stress design</i> Chicago, Illinois: American Institute of Steel Construction, 1989</li> <li>5. <i>Structural steel selection considerations : a guide for students educators designers, and builders</i> Chicago:American Institute of Steel Construction, 2001</li> </ol>
21.	Welding Practice I	4/8	<p><b>Objectives:</b> Comprehending the various welding technologies and explore hand welding and gas welding operation.</p> <p><b>Course Topics:</b> History &amp; Development: welded metal, various ways of welding and cutting, know and comprehend the kinds of welding and cutting, comprehend and be able to operate hand welding, you comprehend and can operate gas welding and soldering / brazing.</p> <p><b>References:</b></p> <ol style="list-style-type: none"> <li>1. <i>Teknologi Las Oleh</i> : Prof. Dr. Ir. Harsono</li> <li>2. <i>Petunjuk kerja las</i>, Sriwidharto Jakarta: Pradnya Paramita; c1987</li> </ol>
22.	Computer Application	3/6	<p><b>Objective:</b> Students are able to make a calculation programs using multiple programming languages.</p> <p><b>Course Topics:</b></p>

			<p>ITC (Introduction to Computer), Basic Programming, Pascal Turbo, Fortran: Introduction to programming languages, data entry, counting statement, input / output, control program (loop), array (indexed modifier) &amp; sub routines (sub-program).</p> <p><b>References:</b></p> <ol style="list-style-type: none"> <li>1. Yogyianto, HM., <i>Turbo Pascal</i></li> <li>2. Abdul Kadir, <i>Turbo C dan Turbo Pascal</i></li> </ol>
23.	Welding Metallurgy	3/6	<p><b>Objective:</b> Students are able to comprehend basics of metallurgy, micro material structure, preheat/post heating.</p> <p><b>Course Topics:</b> Basics of metallurgy, melting process, metallurgical process, welding process in term of metallurgy, microstructure and weld zone requirements, HAZ and base metal, preheating, post-weld heat treatment (PWHT), welding precipitation hardening alloys are reviewed based on metallurgy.</p> <p><b>References:</b></p> <ol style="list-style-type: none"> <li>1. PEDC, <i>Pelapisan Logam</i>, Bandung, 1982</li> <li>2. JE Neely, <i>Practical Metallurgy of Materials of Industry</i>, John Willey &amp; Sons, 1984.</li> <li>3. Herman W. and Pollack, <i>Material Science of Metallurgy</i> Reston Publishing Company Inc., A. Prentice-Hall Company Reston, Virginia, 1991.</li> </ol>
24.	Machine Characteristics and Wire Welding	2/4	<p><b>Objective:</b></p> <ol style="list-style-type: none"> <li>1. Students are able to comprehend the characteristics of the machine and welding wire.</li> <li>2. Students are able to choose and operate a machine and welding wire.</li> </ol> <p><b>Course Topics:</b></p> <ol style="list-style-type: none"> <li>1. Welding and the use of various types of welding machines, current election, appropriate voltage.</li> <li>2. Welding and the use of various types of electrodes and electrode selection.</li> </ol> <p><b>References:</b></p> <ol style="list-style-type: none"> <li>1. <i>Karakteristik Mesin Dan Kawat Las</i>, Diklat inspektor las</li> <li>2. JE Neely, <i>Practical Metallurgy of Materials of Industry</i>, John Willey &amp; Sons, 1984</li> <li>3. Herman W. and Pollack, <i>Material Science of Metallurgy</i> Reston Publishing Company Inc., A. Prentice-Hall Company Reston, Virginia, 1991</li> </ol>
25.	Machine Elements	2/4	<p><b>Objective:</b> Students are able to define the basic planning and selection of machine elements.</p> <p><b>Course Topics:</b> Welded joint's strength and design, pens and pegs's strength and connection design, bolt connection's strength and design, transmission shaft's power and design.</p> <p><b>References:</b></p> <ol style="list-style-type: none"> <li>1. Sularso dan Kiyokatsu, <i>Elemen Mesin</i>, Jakarta, PT. Pradnya Paramita, 1980</li> <li>2. G. Nieman, <i>Elemen Mesin</i>, Jakarta, Erlangga, 1978</li> <li>3. Spott M.F., <i>Design of Machine Elements</i>, New Delhi, Prentice Hall, 1978</li> <li>4. <i>Text Book Of Machine Design</i>, Khurmi, R.S. New Delhi: Eurasia, c1980</li> <li>5. <i>Application Of Mechanics And Materials For Machine Design</i>, Iynkaran, Kannapa New York: Prentice-Hall, c1994</li> <li>6. <i>Machine Design : Theory And Practice</i>, Deutschman, Aaron D. New York: Macmillan, c1975</li> <li>7. <i>Machine design data handbook</i>, Lingaiah, K. New york: McGraw-Hill, 1994</li> <li>8. <i>Schaum` outline of theory and problems of machine design</i>, Hall, Allen S. New York:McGraw-Hill,c1983</li> </ol>

26.	Heat Transfer	2/4	<p><b>Objective:</b> Students are able to comprehend the process of heat transfer</p> <p><b>Course Topics:</b> Heat transfer by convection, conduction, radiation, analytical methods and chart, conduction with heat sources and inserted surface. Air heat exchanger, combined heat and mass transfer.</p> <p><b>Reference:</b></p> <ol style="list-style-type: none"> <li>1. <i>introduction to mass and heat transfer : principles of analysis and design</i> Middleman, Stanley New York: John Wiley, 1998</li> <li>2. <i>Conduction heat transfer</i> Poulikakos, D. Englewood Cliffs: Prentice-Hall, 1994</li> <li>3. <i>Fundamentals of heat transfer</i>, Incropera, Frank P. New York : John Wiley, c1981</li> </ol>
27.	Electrical Practice	2/4	<p><b>Objective:</b> Students comprehend the working principles of electrical appliances, electric motors</p> <p><b>Course Topics:</b> Electric motors, electrical installation, AC and DC power,</p> <p><b>References:</b></p> <ol style="list-style-type: none"> <li>1. <i>Bahan-Bahan Listrik untuk Politeknik</i>, Muhaimin, Jakarta: Pradnya Paramita, 1999</li> <li>2. <i>Buku pegangan teknik tenaga listrik</i>, Arismunandar, Artono Jakarta: Pradnya Paramita;1982</li> <li>3. <i>Dasar Teknik Tenaga Listrik Dan Elektronika Daya</i>, Zuhul Jakarta: Gramedia, 1990</li> </ol>
28.	NDT Practice	4/8	<p><b>Objective:</b> Students are able to conduct test to determine the quality of welding result in NDT (Non Destructive Test)</p> <p><b>Course Topics:</b> Visual testing, magnetic, ultrasonic, radiography (X-ray), Dye penetrant.</p> <p><b>References:</b> <i>Non Destructive Testing</i>, Barry, Hull, Vermanjau.</p>
29.	Welding Practice II	4/8	<p><b>Objective:</b></p> <ol style="list-style-type: none"> <li>1. Students can operate the machines can do the work plate and assembling.</li> <li>2. Students to be able to carry out piping work primarily in plumbing installation vessel. Relations with the lab: Las, Basic Metal, Tools: relations with other courses; ships systems, welding, engineering drawings.</li> <li>3. Students have the basic knowledge and skills about: manual metal arc Welding, manual and automatic cutting, SMAW, GMAW and GTAW.</li> </ol> <p><b>Course Topics:</b></p> <ol style="list-style-type: none"> <li>1. Marking plate, Plate Cutting, Plate Bending, Joining, Fabrication, and Assembling.</li> <li>2. Pipe Cutting, pipe marking, pipe bending (cold pipe); pipe joining installation.</li> <li>3. OAW: ridge welding, plate welding on 1G, 2G, 3G &amp; 4G position, pipe welding in 1G &amp; 5G position, manual cutting ( gas cutting), Automatic Cutting (NC Cutting), Plasma Cutting, SMAW: ridge welding , plate welding with 1G, 2G &amp; 3G position, GMAW: plate welding with 1G and 3G positions, GTAW: plate Welding with 1G position, and pipe welding with 1G position.</li> </ol> <p><b>References:</b></p> <ol style="list-style-type: none"> <li>1. Bundensinstitut Fur Berufsbuiding, Berlin.</li> <li>2. Industri und Handelskammer PAL Stuttgart.</li> <li>3. Oil and Gas Pipiline Fundamentals by Jhon L. Kennedy.</li> </ol>
30.	Finite Element Method	2/4	<p><b>Objectives:</b> Students are able to compute or solve problems numerically using the finite element method.</p> <p><b>Course Topics:</b></p>

			<p>Basic concepts and numerical solution with the finite element method and the concept of matrix stiffness mass matrix. Displacement models and formulations using energy. Example usage for truss elements, beam, plain stress / strain, bending beam. Combination of elements and global coordinates. Natural coordinates and isoperimetric elements. Gauss-quadrature, equation solver, introduction and introductory non-linear dynamics. Some aspects of introductory computer programming and graphics</p> <p><b>References:</b></p> <ol style="list-style-type: none"> <li>1. <i>Using finite elements in mechanical design</i> Mottram, J.T. London: McGraw-Hill, 1996</li> <li>2. <i>Introduction to the finite element method</i>, Reddy, J.N. New York: McGraw-Hill, c1993</li> <li>3. <i>Finite Element Method : Linear Static And Dynamic Finite Element Analysis</i> , Hughes, Thomas J. R. Englewood Cliffs: Prentice-Hall, c1987</li> <li>4. <i>Finite Element Method In Heat Transfer Analysis</i>, Chichester: John Wiley, 1996</li> <li>5. <i>Applied Finite Element Modeling : Pratical Problem Solving For Engineers</i>, Steele, Jeffrey M. New York : Marcel Dekker, c1989</li> <li>6. <i>Dasar-dasar metode elemen hingga Desai</i>, Chandrakant S. Jakarta: Erlangga, 1988</li> </ol>
31.	Lift Aircraft	1/2	<p><b>Objective:</b> Students comprehend the various types of load displacement equipment, and its manual operation.</p> <p><b>Course Topics:</b> Type of material movement and its mechanisms; equipment components, Construction Equipment; Various Load Displacement Equipment.</p> <p><b>References:</b></p> <ol style="list-style-type: none"> <li>1. Apple,James, <i>Plant Put and Material Handling</i>, edisi ke-3 Jhon Wilwy &amp; Sons, Agustus 1977.</li> <li>2. Fred,a.Aunent; Elevator, <i>Electrical and Electro Hidralic Elevator, Escalator, Moving Sidewolks</i></li> </ol>
32.	Applicative Welding Technology	2/4	<p><b>Objectives:</b> Students are expected to comprehend welding applications on specific materials (carbon steel, stainless steel, aluminum)</p> <p><b>Course Topics:</b> Knowledge and application of welding for specific materials:</p> <ul style="list-style-type: none"> <li>• Carbon Steel</li> <li>• Stainless Steel</li> <li>• Aluminium</li> <li>• Cast Iron</li> <li>• Low, medium, and high alloy steel.</li> </ul> <p><b>References:</b></p> <ol style="list-style-type: none"> <li>1. <i>Diving Cutting And Welding In Underwater Salvage Operations</i>, Thompson, Frank E. Cambridge, Maryland: Cornell Maritime, 1944</li> <li>2. <i>Modern Welding Technology</i>, Cary, Howard B. Upper Saddle River: Prentice-Hall, 1998</li> <li>3. <i>Principles Of Welding Technology</i>, Gourd, L.M. London: Edward Arnold, 1995</li> <li>4. <i>Welding ALCOA alumunium</i>, Pennsylvania : Alumunium Company of America, 1969</li> <li>5. <i>Welding Metallurgy: Carbon And Alloy Steels</i>, Linnert, George E. Miami: American Welding Society, 1994</li> <li>6. <i>Welding Metallurgy of Stainless And Heat - Resisting Steels</i>, Castro, R.</li> </ol>
33.	Fabrication Design, Boiler Construction and Pressure Vessel	4/8	<p><b>Objective:</b> Students are able to comprehend and plan the construction of boilers and pressure vessels.</p>

			<p><b>Course Topics:</b></p> <ol style="list-style-type: none"> <li>1. Material requirements for steam boilers construction, WPS steam boilers, Construction Planning, and Fabrication.</li> <li>2. Material requirements for pressure vessel construction, Pressure Vessel Construction for Low alloy Steel and Camber</li> </ol> <p><b>References:</b></p> <ol style="list-style-type: none"> <li>1. ASME. Sect. I</li> <li>2. <i>ASME Boiler And Pressure Vessel Code: An American National Standard</i>, New York : ASME, c1982</li> <li>3. Shields, Carl D. <i>Boilers: Types, Characteristics, And Functions</i>, New York : McGraw-Hill, 1961</li> <li>4. Basu, Prabir <i>Boilers And Burners: Design and Theory</i>, New York: Springer, 2000</li> <li>5. Djokosetyardjo, M.J. <i>Ketel uap Jakarta</i>, Pradnya Paramita, 1999</li> <li>6. Steingress, Frederick M, <i>Low Pressure Boilers</i>, Chicago: American Technical Society, c1970</li> <li>7. Flanagan, George Terence, <i>Marine boilers</i>, Holford Oxford: Heinemann Newnes, 1990</li> <li>8. Vandagriff, Ralph L., <i>Practical Guide to Industrial Boiler Systems</i>, New York : Marcel Dekker, 2001</li> <li>9. ASME. Sect. VIII div. V</li> <li>10. Farr, James R. <i>Guidebook for the design of ASME section VIII pressure vessels</i>, New York: ASME Press, 1998</li> <li>11. Megyesy, Eugene F., <i>Pressure Vessel Handbook</i>, Tulsa, OK: Pressure Vessel Publishing, 1995</li> <li>12. <i>Developments In Pressure Vessel Technology</i>, London: Applied Science, c1980</li> <li>13. Chuse, Robert, <i>Pressure Vessels: The ASME Code Simplified</i>, New York: McGraw-Hill, c1984</li> </ol>
34.	Fabrication Practice	4/8	<p><b>Objective:</b></p> <p>Students are able to carry out piping work primarily in plumbing installation in ship. Practice: welding, basic metal, tools, ships systems, welding engineering drawings</p> <p>Students can operate the plate machines and sub-assembling.</p> <p>Students are able to recognize various codes, address and parameters existing in milling CNC Cutting, as transform it to CNC Cutting into the program. Subsequently able to practice on the computer and CNC Cutting machines, as well as to transfer the program from the computer to the machine.</p> <p><b>Course Topics:</b></p> <p>Pipe Cutting, pipe marking, pipe bending, joining, fabrication, stretch</p> <p>Setting the work tool, cutting tool, program writing, simulation programs 1 D and 3 D either on a computer or on a CNC Cutting machine, CADD-CAM, both program transfer from computer to machine and from the machine to the computer, simulation on work tool.</p> <p><b>References:</b></p> <ol style="list-style-type: none"> <li>1. Diklalt pengelasan dan fabrikasi, PT. Free Port</li> <li>2. Pipeline design and installation, New York: American Society of Civil Engineers, c1990</li> <li>3. Piping handbook Nayyar, Mohinder L. New York: McGraw-Hill, 2000</li> <li>4. Teknik pekerjaan pipa, Daryanto Jakarta: Bumi Aksara, 2000</li> <li>5. Teknologi dan perencanaan sistem perpipaan, Raswari Jakarta: Universitas Indonesia, c1986</li> <li>6. DECKEL AG DIALOG 11.</li> <li>7. Koren, Y, Computer Control of Manufacturing, Mc Graw-Hill, International Editions, 1983.</li> <li>8. Pusztal, J &amp; Sava, M, , Computer Numerical Control, ResPublishing Company</li> </ol>
35.	CAD & CAM	4/8	<p><b>Objective:</b></p>

			<p>1. Introduce basic commands and how to use Autocad, introducing additional Autocad commands and how to use them to demonstrate work's efficiency and effectiveness.</p> <p>2. Introduce CAM (Computer Aided Manufacturing)</p> <p><b>Course Topics:</b></p> <p>1. Drawing preparation, drawing commands, editing commands, help commands, display commands, image printing commands, block and attribute operation, display operation, file management, customizing menu, customizing library.</p> <p>2. Introduction lionkol FANUC program</p> <p>3. Programming, Inter Connection Verification</p> <p>4. CADD</p> <p>5. CAM process</p> <p>6. Interconnection</p> <p><b>Referensi :</b></p> <ol style="list-style-type: none"> <li>1. Cadd/CAM 7.130</li> <li>2. Hawkes, Barry CAD/CAM process London: Pitman, c1988</li> <li>3. Amirouche, Farid M. L., <i>Computer-Aided Design And Manufacturing</i>, Englewood Cliffs, N.J.: Prentice-Hall International , c1993</li> </ol>
36.	DT Practice	2/4	<p><b>Objective:</b></p> <p>Students are able to test the mechanical properties of a material (load, strong-tensile, stretch, contraction, modulus of elasticity) and able to determine the quality of welding result on destructive test.</p> <p><b>Course Topics:</b></p> <p>Tensile testing, impact testing, hardness testing, macro-etching testing, fracture testing.</p> <p><b>References:</b></p> <ol style="list-style-type: none"> <li>1. <i>Measurment of mechanical propertis.</i></li> <li>2. <i>Testing and inspection of Engineering Materials.</i></li> <li>3. Davis, Harmer E. <i>Testing and Inspection of Engineering Materials</i>, New York : McGraw-Hill, c1964</li> </ol>
37.	Fatigue & Breakage	2/4	<p><b>Objective:</b></p> <p>Students are able to explain the process of fatigue and breakage in steel structure. Students are also expected to comprehend the science of breakage, and vessel construction and other floating equipment.</p> <p><b>Course Topics:</b></p> <p>Various kinds of damage to steel construction, basic aspects of fatigue and breakage, stress concentration at the notch, stress intensity on crack, failure due to tensile load, fatigue of materials, breakage mechanics application.</p> <p><b>References:</b></p> <ol style="list-style-type: none"> <li>1. David Broek, <i>"Elementary Engineering Fracture Mevhanic,"</i> Martinus Nijhoff Publisher, 1982.</li> <li>2. J. Schijve, <i>"Lecture Notes on Fatigue Static Tensile Strength and Stress Corrosion on Aircraft Material,"</i> Report 380, Delf.</li> <li>3. J.F. Knot, <i>"Fundamental of Fracture Mechanic,"</i> Butter Worth.</li> <li>4. Smith, R. N. L. <i>BASIC Fracture Mechanics : Including an Introduction to Fatigue</i>, Oxford: Butterworth-Heinemann, 1991</li> <li>5. Thomson, P. F., <i>Ductile fracture of metals</i>, Oxford: Pergamon Press, c1990</li> <li>6. Broek, David, <i>Elementary Engineering Fracture Mechanics</i>, Boston: Martinus Nijhoff, 1982</li> <li>7. Nishida, Shin-Ichi, <i>Failure Analysis In Engineering Applications</i>, Oxford: Butterworths-Heinemann,1992</li> </ol>
38.	Research Methodology	1/2	<p><b>Objective:</b></p> <p>Students critically and constructively are capable find thesis topics, write thesis proposal and comprehend research procedures and presentation of research</p>

			<p>results.</p> <p><b>Course Topics:</b> Introduction, background, scope, selecting and defining the research problem, literature review and critical studies. Research proposal writing, measurement, data analysis, simulation, parameter errors in measurement sample, statistical data processing, modeling and simulation, presenting the results of research, data views, writing style, format, research report writing, oral presentation, seminar, final project proposal seminar.</p> <p><b>References:</b></p> <ol style="list-style-type: none"> <li>1. Beach, DP and Alvoger, TKE, <i>Handbook for scientific and technical Research</i>, Prentice Hall, Englewood Cliffs, New Jersey 1992.</li> <li>2. AIP Style Manual, <i>American Institut Of Physics</i>, New York 1990.</li> <li>3. <i>Guide For The Preparation of Theses</i> , The Graduate School , North Carolina State University, Raleigh NC 1989.</li> </ol>
39.	Welding Inspection		<p><b>Objective:</b> Students are able to comprehend the inspection and qualifying welding procedures and results.</p> <p><b>Course Topics:</b> Common terms in welding inspector, Duties and Responsibilities Welding Inspector, Problems and Definitions of Welding, Welding Symbols, Welding Procedure Specifications and NDT Testing, Welding Defects.</p> <p><b>References:</b></p> <ol style="list-style-type: none"> <li>1. <i>Certification Manual for Welding Inspectors</i>, Miami: American Welding Society, 2000.</li> <li>2. Sri Widharto, <i>Inspeksi Teknik ; jilid 1</i> Jakarta : Pradnya Paramita, 2000.</li> <li>3. Rosandich, Ryan G, <i>Intelligent visual inspection : using artificial neural Networks</i>, .London: Chapman &amp; Hall, 1997.</li> <li>4. Gilb, Tom , <i>Software inspection</i>, Harlow, England: Addison-Wesley, 1993.</li> <li>5. Bayliss, Mel Underwater inspection, London: E and FN Spon, 1988.</li> </ol>
40.	Management	2/4	<p><b>Objective:</b> Students are able to comprehend the principles of general management and production management.</p> <p><b>Course Topics:</b> Function, purpose, management factors, HRD management, organizational systems, policy and decision-making, organizations (factories, companies, job-order), contract documents, basics of production management, production planning, production supervision, production and investment funding systems, Techno-economics concept, production management concept, development thinking about process, schedule, quality products, problem-solving in industry as one of competitiveness of customer service.</p> <p><b>References:</b></p> <ol style="list-style-type: none"> <li>1. Sofyan Assauri, <i>Manajeemen Produksi</i>, UI, 1978</li> <li>2. Elwood S. Buffa, <i>Manajemen Produksi</i></li> <li>3. Alex, <i>Evaluasi Proyek</i></li> <li>4. Riggs, James L. et. al., <i>Industrial Organization and Manajemen</i>, New York, Mc Graw Hill Comppany, 1979</li> <li>5. Askin Ronald, <i>Modeling and Analysis of Manufacturing System</i>, 1993.</li> <li>6. F. Robert Jacobs, Nocholas J Aquilano, Richard B Chase, <i>Production And Operations Management</i>, 1998.</li> </ol>
41.	Tanks and Pipes Construction Design and Fabrication	3/6	<p><b>Objective:</b> Students are able to plan construction (fallout), inspection, and testing of tanks/ pipelines.</p> <p><b>Course Topics:</b> Tank: Rules in planning low-pressure storage tanks, construction, inspection and testing.</p>



			<p>Pipe: fuel pipeline system, gas pipeline system.</p> <p><b>References:</b></p> <ol style="list-style-type: none"> <li>1. API-A 620, A 650 ; ANSI 31.3, 31.4, 31.8</li> <li>2. <i>Pipe Welding Procedures</i>, Rampaul, Hoobasar, New York : Industrial Press, 2003</li> <li>3. <i>Pipeline Design and Installation</i>, New York: American Society of Civil Engineers, c1990</li> <li>4. <i>Piping Handbook</i>, Nayyar, Mohinder L. New York: McGraw-Hill, 2000</li> <li>5. <i>Teknik Pekerjaan Pipa</i>, Daryanto Jakarta: Bumi Aksara, 2000</li> <li>6. <i>Teknologi Dan Perencanaan Sistem Perpipa</i>, Raswari Jakarta: Universitas Indonesia, 1986</li> </ol>
42.	Case Study of Welding & Repair	3/6	<p><b>Objective:</b> Students are able to analyze problems and solutions in welding and be able to apply welding repair stages.</p> <p><b>Course Topics:</b> Steel problem, carbon and alloy steel welding, Non-Ferros, welding problem in the field.</p> <p><b>References:</b></p> <ol style="list-style-type: none"> <li>1. Soeweify, <i>Pengelasan Pada Offshore Structures (Bangunan Lepas Pantai) Dan Masalah-Masalahnya Yang Timbul</i>, Surabaya: FTK-ITS, 1988</li> <li>2. Marlow, Frank M. <i>Welding Fabrication and Repair : Questions and Answers</i>, New York : Industrial Press, 2002</li> <li>3. Linnert, George E., <i>Welding Metallurgy : Carbon And Alloy Steel</i>, Miami: American Welding Society, 1994</li> <li>4. Castro, R, <i>Welding Metallurgy of Stainless And Heat - Resisting Steels</i></li> </ol>
43.	Welding Qualification Practice	4/8	<p><b>Objective:</b> Students are able to comprehend and implement the procedures of welding qualification.</p> <p><b>Course Topics:</b> ASMR Sect. IX / SII-2205-87, Art 1-Welding General Requirements, Art 2-Welding Procedure Qualification, Art 3-Welding Performance Qualification, WPS, PQR.</p> <p><b>References:</b></p> <ol style="list-style-type: none"> <li>1. ASME Sect. IX, API STD 1104, AWS D.1.1 Sect. 5 , PUSTAKA DEPNAKER</li> <li>2. <i>Structural welding code-steel</i>, Miami: American Welding, 2000</li> <li>3. <i>Standard Welding Terms and Definitions</i>, Miami: American Welding Society, 1999</li> </ol>
44.	Indonesian Language	2/4	<p><b>Objectives:</b> Students are able to use and communicate Indonesian language well and also be able to apply it into scientific writing.</p> <p><b>Course Topics:</b> Grammar matters, the use of vocabulary/ terminology, effective sentences and linguistic styles, reasoning/ expressing idea, sentence formation, theme, topic, composition objectives, composition organization and presentation, the mechanic of scientific composition, general cover, other mechanical source (EYD and PUPI).</p> <p><b>References:</b></p> <ol style="list-style-type: none"> <li>1. <i>Kamus besar bahasa Indonesia</i> , Jakarta: Balai Pustaka, c1990</li> <li>2. <i>Pedoman penulisan tata bahasa Indonesia</i>, Jakarta : Pusat Pembinaan dan Pengembangan bahasa - Depdikbud, 1983</li> <li>3. <i>Pemakaian bahasa Indonesia ragam tulis di lingkungan perguruan tinggi</i>, Martin Jakarta: Pusat Pembinaan dan Pengembangan Bahasa Depdikbud, 1995</li> </ol>
45.	Optimization Method	2/4	<p><b>Objective:</b> Students are able to formulate and solve mathematical form based on optimization method.</p> <p><b>Course Topics:</b> Mathematical problems, linear problem, integer problems, non-linear problems.</p>



			<b>References:</b> 1. Nowachi H, <i>Lectures on Optimization in ship design</i> , FT Kelautan ITS, 1985 2. Rao SS, <i>Optimization, Theory and Application</i> , Wiley Eastern Limited, New Delhi 1987
46.	Cost Analysis	1/2	<b>Objective:</b> Students are able to analyze project cost and be able to prepare a Bid Proposal. <b>Course Topics:</b> Cost estimation, budget drafting and method of calculation, cost structure, calculation application, bidding strategies. <b>References:</b> 1. B.O.W 2. <i>Analisa Harga Satuan</i> , Sudrajat 3. Pujawan, I Nyoman. <i>Ekonomi Teknik</i> , Jakarta, , 1995 4. <i>Economic Design of Weldment</i> , Milson Point: Australian Welding Research Association, 1979
47.	Corrosion	2/4	<b>Objective:</b> Students are able to comprehend the principles of corrosion, types of corrosion, corrosion prevention, design and management of corrosion, corrosion economics, and able to analyze problems in the field of corrosion. <b>Course Topics:</b> Introduction, basic theory or corrosion principles, corrosion factors, the types of corrosion, design, control and management of corrosion, corrosion prevention, corrosion economics. <b>Referensi :</b> 1. Chandler, K.A., <i>Marine &amp; Offshore Corrosion</i> , Butterworth & Co Ltd., United Kingdom, 1985. 2. Fontana, M.G., <i>Corrosion Engineering</i> , Mc. Graw-Hill Inc., Singapore, 1987. 3. Haward, R.T., <i>Marine Corrosion</i> , William C. & Sons Ltd, London, 1988. 4. Keneth. R.T., <i>Corrosion</i> , Longman Group UK Ltd., London, 1988. 5. Laque, F.L., <i>Marine Corrosion: Causes and Prevention</i> , John Willey & Sons, Canada, 1985.
48.	Design, Fabrication And Construction Ship	4/8	<b>Objective:</b> Students can comprehend and be able to determine the size and materials used as well as to determine the relationship of ship construction in accordance with the applicable rule. <b>Course Topics:</b> Skeletal system: longitudinal, transverse, mixed; names used in ship sections; major single pedestal construction of vessels, hull, deck, upper; Major relations of Ship Construction: pedestal, hull, deck, niche, bulkhead; Foundation: main engine , tube shaft, prop shaft, rudder, linggi. Explanation of the formulas existing in the rule: loading, determine the distance of ivory, the bulkhead arrangement to determine slab thickness, the base (wrang, keel etc), hull (ivory, senta, cantilever), deck, jib, hatch, building up, transverse, longitudinal, linggi leather, steering, engine foundation. Calculation of construction: sea framework, mast and bom, cahin lockers, hatch, tupang, hope centilever pipe, ventilation and pipe, soundproofed door and window, davits, man-hole, towing hook, bulwark. <b>References:</b> 1. <i>Structural Design of Sea going</i> , N.Barabanov. 2. <i>Ship Design and Construction</i> , Robert Togart, Editor 1980. 3. <i>Merchant Ship</i> .
49.	Entrepreneurship	1/2	<b>Objectives:</b> Students are able to comprehend entrepreneurship principles and apply them well.

			<p><b>Course Topics:</b>  Entrepreneurship principles, the differences of entrepreneur and intra preneur, establishing entrepreneur spirit, entrepreneur strategy, thoughts and ideas, works and creativity, designing and running a business, designing and running capital, project visibility, good relationship and marketing techniques.</p> <p><b>References:</b></p> <ol style="list-style-type: none"> <li>Hodges, Judy, "The Rise Of The Self Service Employee", Computer world HR Online, September 8, 1997.</li> <li>O' Brien, Houres A., Management Information System, 4<sup>th</sup> Edition, By The Mc Graw-Hill Companies, North America, 1999</li> </ol>
50.	Indonesian Values and Ideology	2/2	<p><b>Objectives:</b>  Students are able to have comprehensive concept and able to make an integral approach in social, economic, politic, defence and culture problem solving.</p> <p><b>Course Topics:</b>  The characteristic and essence of state science, theory of state formation, Theory of state objectives, Form of government, Countries relation, Countries association, History of Indonesian defence, Civic history of Indonesian republic, the archipelago concept, National defence, GBHN (Broad Outlines of the Nation's Direction) and Repelita( Five-year Development Plan).</p> <p><b>References:</b></p> <ol style="list-style-type: none"> <li>Mr..M. Hutahuruk, dkk, Civics, P dan K Jakarta 1960.</li> <li>Prof. Mr.M. Nasroen, Asal Ilmu Negara, Aksara, Jakarta 1986.</li> <li>Darji Darmodiharjo, Pancasila Sumber Dari Segala Sumber Hukum, Unibraw Malang 1982.</li> <li>Suhino,SH, Sejarah Ketatanegaraan Indonesia, Leberty, Jogjakarta, 1984.</li> <li>Hasan Zainuri,SH., Pengantar Hukum Tata Negara, Alumni, Bandung 1992.</li> <li>GBHN, 1988-1993. Tap MPR No. II/MPR/1988, Sinar Grafika, Jakarta 1988</li> </ol>
51.	Final Project		<p><b>Objective:</b>  Students are able to apply the knowledge to design, analyze, evaluate and solve problems in the field of welding</p> <p><b>Course Topics:</b>  Welding, heat treatment, fatigue and breakage, welding design and construction, inspection, corrosion.</p> <p><b>References:</b>  Relevant Literatures</p>
52.	On th Job Trainig	12/48	<p><b>Objective:</b>  Broaden student's abilities and skills to apply the knowledge in company.</p> <p><b>Course Topics:i</b>  Fabrication, Sub-Assembly, Assembly, Erection, Welding, inspection, material processing (welding and heat treatment), Material Planning, Facility Planning, Scheduling, Manpower loading, Working loading, Analysis and Evaluation.</p>