POLITEKNIK PERKAPALAN NEGERI SURABAYA (PPNS)
SHIPBUILDING INSTITUTE OF POLYTECHNIC SURABAYA (SHIPS)
Jl. Teknik Kimia Kampus ITS Sukolilo Surabaya 60111, INDONESIA
Telp. (+6231) 5947186 Fax. (+6231) 5925524, e-mail: international@ppns.ac.id

D4 DESIGN AND MANUFACTURE

SEMESTER I

NO	COURSES	HRS	CREDIT
1	Religion	2	2
2	English I	3	3
3	Applied Physics	6	3
4	Applied Mathematics I	4	2
5	Engineering Drawing	4	2
6	Mechanical Technology	2	1
7	Occupational Health and Safety	2	1
8	Practice : Computer I	4	2
9	Workshop I	8	4
TOTAL		**35**	**20**

SEMESTER II

NO	COURSES	HRS	CREDIT
1	English II	3	3
2	Applied Mathematics II	4	2
3	Ship Design	4	2
4	Ship Building Theory	4	2
5	Applied Mechanics	4	2
6	Practice : Engineering Drawing	8	4
7	Workshop II	12	6
TOTAL		**39**	**21**

SEMESTER III

NO	COURSES	HRS	CREDIT
1	Indonesian Values and Ideology	2	2
2	Applied Chemistry	2	1
3	Material Science	4	2
4	Particular Ships	4	2
5	Mechatronics	2	1
6	Ship System and Equipment	4	2
7	Machine Elements	4	2
8	CNC : Theory and Application	4	2
9	Advanced Engineering Drawing	4	2
10	Drawing Line	12	6
11	Enterpreneurship	2	1
TOTAL		**38**	**20**

SEMESTER IV

NO	COURSES	HRS	CREDIT
1	Steel Ship Structure	4	2
2	Welding Technology	4	2
3	Manufacturing Process	4	2
4	Non-Steel Ship Structure	4	2
5	Lift Aircraft	2	1
6	Hydrostatic and Bonjean	4	2
7	General Plan	4	2
8	Finite Element Method	4	2
9	Practice : CAD/CAM 2D (1)	4	2
10	Practice: CNC 2D (1)	4	2
TOTAL		**38**	**19**

SEMESTER V				SEMESTER VII			
NO	COURSES	HRS	CREDIT	NO	COURSES	HRS	CREDIT
1	Indonesian Language	2	2	1	On the Job Training	40	18
2	Welding Practice	4	2				
3	Non-Metal Practice	4	2				
4	Material Testing	4	2				
5	Computer Aided Drafting	4	2				
6	Transverse and Longitudinal Construction						
7	Design I	8	4				
8	Practice : CAD/CAM 2	4	2				
9	Practice : CNC 2	4	2				
TOTAL		38	20	JUMLAH		40	18

SEMESTER VI				SEMESTER VIII			
NO	COURSES	HRS	CREDIT	NO	COURSES	HRS	CREDIT
1	Research Methodology	2	1	1	English III	3	3
2	Optimation Method	2	1	2	Maintenance and Repair	4	2
3	Statistics	2	1	3	Engineering Economics	2	1
4	Production Management	4	2	4	Production Management	4	2
5	DFKI KU / BT	4	2	5	Final Project	12	6
6	Practice : CAD/CAM 3D	8	4				
7	Practice : Pneumatic & Hydraulic	4	2				
8	Design II	4	2				
9	Practice: CNC 3	4	2				
TOTAL		34	17	JUMLAH		25	14

SYLLABUS

No.	Course Title	Credits/ Hours	Objective/Course Title/Reference
1.	Religion Islamic Values	2/2	**Objectives:** Helping to make students have faithfull, 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. **Course Topics:** 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. **References:** 1. *Terjemah Al Quran* : Depag RI 2. *Kuliah Al Islam* : T.PAI ITS 3. *PAI di PTK* : Depag RI 4. *Moral dan Kognisi Islam* : Muslim Nurdin 5. *Karakteristik Islam* : Yusuf Qordowi

			6. *Islam dan Pluralitas* : M Imarah 7. *Cita-cita Politik Islam* : Nurcholkis Majid 8. *Etika Islam* : Hamzah Ya'qub 9. *Filsafat Islam* : M Rasyidi
	Christian	2/2	**Objectives:** 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. **Course Topics:** The awareness to live religiously in human life, the meaning of Faith (confession, devine revelation, witnes), 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. **References:** 1. Lembaga Alkitab Indonesia, *Alkitab*. 2. Dr. Franz Dahler, *Masalah agama*. 3. Dr. Honig, *Ilmu Agama*. 4. Dr. Bleeker, *Pertemuan Agama Dunia*. 5. Dr. Schuman Olaf, *Dialog Antar Umat Beragama*. 6. Dr. Walter Lempp, *Mahasiswa Bertanggungjawab*. 7. Dr. Walter Lempp, *Membangun Manusia Pembangunan* 8. Dr. H. Hadiwijono, *Iman Kristen*. 9. Malcon Brownly, M. Th, *Pengambilan Keputusan Etis*. 10. Dr. DC Mulder, *Iman Kristen dan Ilmu Pengetahuan*. 11. Sularso Sopater, *Iman Kristen dan Ilmu Pengetahuan*.
	Catholic	2/2	**Objectives:** The increase understanding 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. **Course Topics:** Church Faith, Church as the safety secrament, Church decision, human responsibility as the church member, the service church, leadership in Church. **References:** 1. R. Hadiwiyono Sy, *Membina Jemaat Beriman*, Jakarta : Dopken MAWI. 2. Y. Riberu, *Ilham bagi para pengilham*, Jakarta, Penerbit Luseat. 3. Thom Yakobs, *Dinamika Gereja*, Jogjakarte : Yayasan Canisius. 4. A.P. Budiyono, *Mendalami Kitab Suci Dalam Kelompok dengan 30 orang*, Jogyakarta Yayasan Canisius
	Hinduism	2/2	**Objectives:** Firm understanding 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. **Course Topics:** 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. **References:** 1. Sosiologi Hindu Dharma. 2. Pengantar Agama Hindu I, II. 3. Theologi Hindu. 4. P4 dan Agama Hindu. 5. Kepemimpinan Hindu

	Buddhism	2/2	**Objectives:** Understand, 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. **Course Topics:** The essence of God, The concept of religious life, Budhisatwa and Budha **References:** 1. Oka Diputhera, *Citra Agama Budha dalam filsafat Pancasila*. 2. Departemen Agama RI, *Pedoman Pelaksanaan P4 bagi Agama Budha*. 3. Proyek Pengadaan Kitab Suci Budha, *Dhammapada*. *4.* Bhikku Kheniyo, *Pancasila dan Panca dharma*
2.	English I	2/4	**Objectives:** Students are able to understand english text, practice ESP (English for Specific Purposes) conversation, and able to write simple work document. **Course Topics:** General conversation, specific conversation, understanding and giving information, summarizing, simple imperative sentence, simple letters, work documents, hand tools instruction, occupational health and safety. **References:** 1. I.A. Hill, 1965. *Elementary Stories for Reproduction* 2. Richard and Long. 1988. *Breakthrough: A Course in English Communication Practice.* Oxford. Oxford University Press 3. PURNOMO. 1996. *English for Technology and Vocational Education.* Bandung. Remaja Rosdakarya 4. Susan Norman 1990. *We mean Business. An Elementary Course in Business English* 5. Alice Oshima, N. Hogne, 1991 *Writing Academic English* California 6. TNBIakey,1983 *English for Maritime Studies* Pergamon Press Oxford New York
3.	Applied Physics	3/6	**Objectives:** Students are able to comprehend and be able to apply the laws of physics to measure, design, manufacture and analyze. **Course Topics:** Magnitude and Vectors, Solids Statics, Practical Explanation, Rigid body equilibrium, Simulation of cranes and pulleys, solid dynamics, Simulation of rectilinear motion and rotation, solids kinematics, launch simulation, Work and energy, changes in energy, simple aircraft, Momentum and collisions, Power and Energy, fluid statics, Hydrostatic 1, Fluid Dynamics, Hydrostatic 2, Fluid Dynamics, Electricity, Electrical circuit 1, electrical circuit, Electrical circuit 2, Magnet, Electricity and Magnetism, Thermal Dynamics, Electricity and Heat, Waves, Wave and fluid, Atomic Physics, Report Completion and Rasiasi Ionizing **References:** 1. David Halliday, Robert Resnick, Physics, Edisi ke 3, McGrawHill, 1985 2. Frederick J. Bueche, Theory and Problem of College Physics, Edisi ke 8, McGrawHill, 1989 3. Dosen – dosen Fisika, Fisika, ITS, 1997 4. Dosen-dosen Fisika, Modul Fisika Terapan dan Modul Praktikum, PPNS ITS, 2005
4.	Applied Mathematic I	2/4	**Objectives:** Students are able to comprehend and apply basic formula of mathematic, especially differential, integration, numerical method. **Course Topics:** Matrix and Determinant, Differential, Differential Application, Integral

			and Numerical Method. **References:** 1. Matematika Untuk Teknik, *KA STROUD* 2. *Matematika Dasar I*, FMIPA – ITS 3. *Matematika Dasar II*, FMIPA – ITS 4. *Kalkulus*, HM Hasyim Baisuni 5. *Technician Mathematic 3*, JO Bird & AJC May 6. *Matematika Teknik Lanjutan jilid 1*, Erwin Kreyzig 7. *Matematika Teknik Lanjutan jilid 2*, Erwin Kreyzig 8. *Essentials of Applied Mathematics*, JR Irwin 9. *Metoda Numerik*, Bambang Triatmodjo 10. *Komputasi Numerik dengan Turbo Pascal*, R Soegeng
5.	Engineering Drawing	2/4	**Objectives:** Students are able to make and read drawing planning that meet the ISO standard and apply the knowledge in inudstry. **Course Topics:** Line standardization, writing, paper, projection systems, pieces, size, tolerance, stretch, welding drawing. **References:** 1. Walter C Brown , *Drafting For Industry* 2. GTZ , *Technical Drawing Metal Work 2 Advanced Cource With Test* 3. G.Takhesi Sato dan N.Sugiarto , *Menggambar Mesin* 4. Warren J. Luzadder, dan Hendarsin , *Menggambar Teknik untuk desain pengembangan produk dan control numerik* 5. Aida Mahmuda, *Gambar Teknik Mesin*
6.	Mechanical Technology	1/2	**Objectives:** Students comprehend the types of equipment, machine operation or hydraulic system precisely, accurately and efficiently. **Course Topics:** Introduction and the use of work bench tools, accurate measurement system, fabrication system in workshop, need analysis or material estimation, cutting plan and machining system. **References:** 1. *Proses pemesinan*, Taufiq Rachi 2. *Teknologi Bengkel,* P M S 3. *Teknologi Fabrikasi,*Box Hill Institute of TAFE
7.	Occupational Health and Safety	1/2	**Objectives:** Students are able to know and understand occupational health and safety, hazard and control in work environment. **Course Topics:** Introduction and study contract, Introduction to Occupational health and safety , work accident, work safety approach, danger potency control, safety for mechanic, Fire and Hygiene of work Health Company. **References:** 1. *Modul Keselamatan dan Kesehatan Kerja*, PPNS-ITS, 2004 2. *Materi Dasar-dasar K3, dalam seminar Ahli K3*,, 2004 3. *Keselamatan dan Kesehatan kerja*, Suma"mur P.K., M.Sc 4. Himpunan peraturan keselamatan dan kesehatan kerja, Pungky W, ASEAN-OSHNET *5. Fundamental of Higiene Industri* 6. *Materi Pengawasan K3 Mekanik*, dalam seminar AK32004 7. *Materi Pengawasan K3 kebakaran*, dalam seminar AK3, 2004 *8. Penyakit Akibat Kerja* 9. Permenaker 4/Men/1980 10. Permenaker 2/Men/1983

			11. Inmenaker Inst. 11M/BW/1997 12. Kepmenaker 186/Men/1999
8.	Computer Practice	3/6	**Objectives:** Students know the hardware and software of computer. **Course Topics:** Hardware & Network, Ms Word, Ms.Excel, Ms PowerPoint, Ms Visio, Ms Project, Turbo Pascal, Ms Access and Visual Basic **References:** 1. *Instalasi dan Aplikasi Netware Novell*, 1992 2. *Novell Netware* 3.11, 1993 3. *Teknologi Wireless Internet dengan Kecepatan Tinggi*, 2002 4. *Teknologi Warung Internet*, 1999 5. *Buku Pintar Internet TCP/IP*, 2001 6. *Panduan Lengkap Microsoft Word 2000*, 2000 7. *Microsoft Office 97 Integration Step* By Microsoft Word 2000, 2000 8. *Panduan Lengkap Microsoft Excel 97*, 1999 9. *Belajar Praktis Microsoft Excel 2000*,2001 10. *Panduan Praktis Microsoft Excel 2002*,2002 11. *Microsoft Powerpoint 2000*, 2001 12. *Microsoft Office 97 Integration Step By Step*, 1997 *13. Panduan Praktis Pengelolaan Proyek Konstruksi dengan Microsoft Project* *14. Teori dan Aplikasi Program Komputer Bahasa Pascal* *15. Penuntun Praktis Belajar Database menggunakan Microsoft Access* 16. *Sen Visual Basic Acuan Lengkap Pemrograman Database,* 1997 17. *Visual Basic 6.0 Pemrograman Gratis & Multimedia*, 2002 18. *Dasar-Dasar Pemrograman Visual Basic 5.0*, 1999 19. *Database Visual Basic 6.0 dengan Crystal Reports*, 2002
9.	Workshop Practice I	4/8	**Objectives:** Students are able to use bench and measurement tools meet with the working requirement at workshop. Students are able to do basic fabrication work, able to operate cutting, bending, and rolling machines. **Course Topics:** Basic Metal Work, Stud Grip Work, Klem Parallel Work, Introduction and the Use of Work Bench Tools, Marking, Cutting and Chisel, Plate Shaping, thin plate Joint, assembling plate profile, rolling into cylinder, and making transition shapes. **References:** 1. *Elementary Metal Course Training Section I Exercises* ,Published by Bundesinstitut Fur Berufsbildungs forchung Berlin. 2. E.M. Trent , 1977 , *Metal Cutting*, Butterworths, London. 3. Hermann Jutz and Eduard Scharkes, *Westeman Tables for The Metal Trade.*,Wlley Eastern Limited 4. John R.Wolker :*Exploring metal working* 5. *Praktek Bengkel 5*,1977 PMS-ITB, 6. T.Rochim ,1993, *Teori dan Teknologi Proses Pemesinan*, Jurusan Teknik Mesin FTI-ITB. 7. *Technology Of The Metal Trade*, Wlley Eastern Limited ,Special edition for GTZ *8. Teknologi Bengkel A.T.M.I.* *9. Teknologi Bengkel P M S* 10. *Teknologi Fabrikasi* Box Hill Institute of TAFE
10.	English II	3/3	**Objectives:** Students can comprehend simple discourse in English concerning in the field of engineering and maritime.

			Course Topics: Introduction, Tools, Motion, Giving Suggestions, Giving Opinion, Measurement, Job Hunting **References:** 1. Breakthrough by JC. Richards, Daily Conversation 2. *Technical English 1 by David Bonamy* *3. Technical English 2 by David Bonamy* 4. Something to talk about by David Peaty *5.* New Interface by Jack C. Richards. *6. Make your job interview a success by Biegeleisen* *7.* Melamar pekerjaan by KC. Bay
11.	Applied Mathematic II	2/4	**Objectives:** Students are able to understand and use basic methods of mathematic especially integral and differential to solve Integration, sentroid, Differential equations, Moment of Inertia, Fluid Pressure. **Course Topics:** Integral Application, Sentroid, Moment of Inertia, Fluid Pressure and Gheometry. **References:** 1. Stroud. K.A. dan Dexter J.B., (2003), "*Matematika Teknik*", edisi ke-5, Erlangga. Jakarta. 2. Kreyszic, Erwin, (1988), "*Advanced Engineering Mathematics*", edisi ke-6, John Wiley and Sons. 3. Susatio, Y, (2009), "*Matematika Rekayasa Berbasis Mathcad*", Seri B, PT. Revka Petra Media. 4. Varberg, D., Edwin J.P, dan Steven E.R, (2011), "*Kalkulus*", jilid 2, edisi ke-9, Erlangga, Jakarta. 5. Bird, J, (2002), "*Matematika Dasar, Teori dan Aplikasi Praktis*", edisi ke-3, Erlangga, Jakarta
12.	Ship Design	2/4	**Objectives:** Students are able to understand and explain the ship design concept by translating the demand lists into the main ship variables, general requirements in ship design and also the economical calculation of ship life time. **Course Topics:** Ship Design Procedures, Ship Demand List, The main Variable of Ship Design, General Arrangement, Classification Bureau and General Classification Survey and Light Weight Calculation. **References:** 1. Arkenbout Schokker, JC. Ir, " *The Design of Merchant Ship* " 2. Biro Klasifikasi Indonesia, " *Register 1998* " 3. G. DE. Rooij, Ir. " *Practical Ship Building* " 4. Harry Benford, " *Naval Architecture for Non-Naval Architects* " 5. Japan International Cooperation Agency (JICA), Basic Design, Maritime Technology and Safety Bureau, Ministry of Transport Overseas Shipbuilding Cooperation Centre, 1991 6. Lloyd Register of Shipping Cargo Ships, " *Distribution of Light Weight for Still Water Bending Moment Calculation* " 7. Poehls, I. " *Lecture of Ship Design and Ship Theory* " 8. Taylor, DA. " *Merchant Ship Construction* " 9. Schnnekluth, H. " *Ship Design for Efficiency and Economy* " 10. Smith, R.M. " *Applied of Naval Architecture* "
13.	Theory of Naval Architecture	2/4	**Objectives:** Students comprehend basic theory of naval architecture perfectly and was able to use it to solve the problems associated with shipping sciences properly. Students are expected to be able to inform the knowledge to others both orally and in writing. **Course Topics:** Basic Theory of Naval Architecture, General Terms in Naval Architecture, Free Board and Load Lines, a Numerical integration

			Method, Heavy Ship Point, Buoyancy Point, Floatation and Metacentre Point, Lines Plan, Sheer Standart and Chamber, Hydrostatic and Bonjean, Effect of shifting cargo and loading and unloading, static and dynamic stability of the ship, ship stability in Dock and Ship Crashes, Free Surface Effect and inclining Test, Rolling ship in calm water and Trim, Floadable Length **References:** 1. Derret, Captain D.R, *Ship Stability for Master and Mates Fifth Edition,* 1999, Butterworth Heinemann, Oxford. 2. Lewis, Edward V., *Principles of Naval Architecture Second Revision Volume I "Stability and Strength"*, 1988, SNAME. 3. International Conference On Load Lines 1966, "*International Convention on Load Lines 1966*", 1981, IMO, London. 4. Pursey, H. J., *Merchant Ship Stability (Metric Edition),* 1976, Glassgow Brown Son & Ferguson LTD. 5. Tupper, E.C., *Introduction to Naval Architecture Third Edition*, 1996, SNAME. 6. Van Dokkum, Klaas, *Ship Knowledge "A Modern Encyclopedia"*, 2003, DOKMAR
14.	Applied Mechanics	2/4	**Objectives:** To determine stress, strain, torsion angles and / or deflection caused by the axial force, shear force, support force, torque, and bending moment or column load **Course Topics:** Overview of Class I Engineering Mechanics, Drag, Tap and Scroll, The Structure of Axial load, part load Axial Structures, Structural Parts Axial load, Exercise Problem, Torsion, Torsion, Style Sliding and Bending Moment / Bending, Voltage Pull and Press on Beams, Slide the voltage on the beam, the beam deflection, composite beams, columns, Exercise Problem **References:** 1. Ferdinand P. Beer, E. Russell Johnston, Jr [1981], Mechanics of Materials, Student edition, McGraw-Hill Kogakusha,Ltd. 2. Hibbler, R.C., [2000], Mechanics of Materials, Fourth Edition, New Jersey, Prentice Hall 3. Timoshenko, S.P., Gere, J.M., [1984], Mechanics of Materials, Second SI Edition, PWS Egineering, Boston, Massachusetts.
15.	Engineering Drawing Practices	4/8	**Objective:** Students are able to draw 2D and 3D with AutoCAD **Course Topics:** Introduction, Drawing Command, Modify/Edit Command, More Advanced Commands, Dimensioning, Fundamentals of 3D drawing, Surface Modeling, Solid Modeling, Plotting **References:** 1. James D Bethune, "Engineering Graphics with AutoCAD 2002" Prentice Hall, 2002. 2. Stephen J Ethier and Christine A Ethier, "AutoCAD in 3 Dimensions Using AutoCAD 2002", Prentice Hall. 2002 3. A W Boundy, "Engineering Drawing third edition", Mc Graw Hill, Sydney 1986
16.	Workshop Practice II	4/8	**Objective:** After completing practicum, students are expected to operate various types of machine tools available in the workshop and can produce a thing according to working drawings properly. **Course Topics:** Explanation and Operation Machine Tools **References:** 1. C. van Terheijden & Harun ; Alat-alat Perkakas, Gereedschapswerktuigen 3, Wolters Noordhoff by Groningen, 1971.

			2. F. Koenigsberger ; Design Principles of Metal Cutting Machine Tool, Pergamon, Mcmillan Co., New York, 1964. 3. J.A. Schey ; Introduction to Manufacturing Processes, McGraw-Hill international Editions, Singapore, 1987. 4. E. M. Trent ; Metal Cutting, Butterworths, London, 1977. 5. T. Rochim ; Teori dan Teknologi Proses Pemesinan, Jurusan Teknik Mesin FTI – ITB, 1993
17.	Workshop Practice (Sheet Metal)	2/4	**Objectives:** Students are expected to know and understand as well as understand the process of engineering construction **Course Topics:** Introduction, Fundamentals of plate work, Designing construction plat form, making construction **References:** 1. *Diktat Perencanaan Kerja dan Management Bengkel I*, PMS-ITB 1978. 2. *BundensinsBut Fur Berufsbuilding Benin* 3. *Teknologi dan Perencanaan Sistem Perpipaan*, Raswari 4. *Perencanaan dan Penggambaran Sistem Perpipaan* by Raswari
18.	Indonesian Values and Ideology	2/2	**Objectives:** Students are able to have comprehensive concept and able to make an integral approach in social, economic, politic, defence and culture problem solving. **Course Topics:** 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). **References:** 1. Mr..M. Hutahuruk, dkk, Civics, P dan K Jakarta 1960. 2. Prof. Mr.M. Nasroen, *Asal Ilmu Negara*, Aksara, Jakarta 1986. 3. Darji Darmodiharjo, *Pancasila Sumber Dari Segala Sumber Hukum*, Unibraw Malang 1982. 4. Suhino,SH, *Sejarah Ketatanegaraan Indonesia*, Leberty, Jogyakarta, 1984. 5. Hasan Zainuri,SH., *Pengantar Hukum Tata Negara*, Alumni, Banding 1992. 6. GBHN, 1988-1993. Tap MPR No. II/MPR/1988, Sinar Grafika, Jakarta 1988
19.	Applied Chemistry	1/2	**Objectives:** Students understand and know general principles of chemistry explaining the characteristics of matters mostly faced in society, can make decision using basic knowledge of chemistry, and solve problems related to them. **Course Topics:** Material, Combustion Chemistry, Polymer Chemistry, Sea Corrosion and Control, Types of corrosion, Corrosion Control, Environmental Chemistry, Work Safely with Chemical Substance. **References:** 1. Miller, Francis Marion, 1985, *Chemistry: Structure and Dynamics*, Mc Graw Hill Book Co., Singapore 2. Fontana, Mars Guy, 1986, *Corrosion Engineering*, USA 3. NACE, 1984, Corrosion Basic, *An Introduction*, NACE-Texas 4. Threteway, 1985, *Korosi untuk Mahasiswa Sains dan Rekayasawan (Terjemahan)*, Gramedia, Jakarta 5. Chandler, Kenneth A., 1985, *Marine and Offshore Corrosion*, Butter Worths, London

			6. Munger, Charles G., 1997, *Corrosion Prevention by Protective Coating*, National Association of Corrosion Engineeers, Houston, Texas 7. Morgan, John, 1993, *Cathodic Protection*, National Association of Corrosion Engineeers, Houston, Texas 8. IMO, 1992, MARPOL, London 9. *Modul Pelatihan K3 Kimia*, Kerjasama JICA-Depnakertrans RI
20.	Ship System and Equipment	2/4	**Objectives:** Students are able to understand piping system and calculate ship equipment needs. **Course Topics:** Piping system that serves sea water need, fresh water, dirty water, ballast, oil load for tankers, natural and mechanical ventilation system, mooring tools, tether tools, navigation safety system, navigation lights, loading and discharging tools, hatch cover, stairs, doors and windows, rudder and its machine, pumps and compressor calculation, Isolation and cargo handling. **References:** 1. D'Smith, *Marine Auxiliary Machiner*, Butter Worths 1983 2. D'Arca Angelo*, Shipdesign and Contruction*. 3. JP. Dehanan,Ing, *Practical Shipbuilding*, part B, 1957. 4. Edward P. Georking, *Marine Piping Handbook*
21.	Special Ships	2/4	**Objectives:** Students are able to master the properties and characteristics of particular ships and be able to design it in accordance with applicable regulations, able to count fishing boat age, engine power, stability, trim, deck equipment and special cooling systems for fishing vessels **Course Title:** Tankers, bulk cargo ships, container carrier ship, passenger ship and ferry, timber carrier ship, tugs / thrust, Boats, dredgers, fast ship, floating docks. Specifications of fishing vessels (purse seine, gill net, long line, trawl), fishing gear and fishing vessel operations, custody and power estimation engine, deck equipment, refrigeration systems, stability (pulling, free running, move the load, trim) and trim and optimization of fishing vessel (Doust, kupras) **References:** 1. A.B.S. 1977, *Rules of Building and Classing Steel Floating dry dok*, Amaerican Bereau of Shipping. 2. Edward M. Brady, Tugs, Towboat and Towing, Cornell Maritime Press Inc., 1967. 3. Henry F. Cornick et, all, "Dock and Harbour EngineeringVolume I (The Design of Dock," Charles Griffin Company Ltd., 1968. 4. Hubert R. Cooper, "Practical Dredging and allied subjects," Son & Ferquson Ltd., 1974. 5. Hind, J. A., "Stability and Trim of Fishing Vessel", Fishing News (Books) Ltd., London, England, 1967 6. Hjul, Peter (Editor), "The Stern Trawler", Fishing News (Books) Ltd., London, England, 1972
22.	Ferro Ship Sturcture		**Objectives:** After following this course, students are expected to be able to comprehend the part of the ship construction and be able to determine the plate size and profile based on ship classification (BKI VOL II) **Course Topics:** General explanation of construction materials and systems evaluation, Types of ship, parts of the ship construction, Cost Curves, Construction Type, External Load, Internal Load, single board construction, double board construction, hull construction, decks, Barriers, Cantilever , plates, main engines and Threshold foundation hatch **References:**

			1. Taylor , DA , *Merchant Ship Construction* 2. Robert Togart (1980) , *Ship design and Construction* 3. Barabanov , N , *Structural Design Of Sea Going* 4. M. Mahfud , Ir MMT, *Konstruksi Kapal* 5. *Biro Klasifikasi Indonesia* , Vol II , Register 2001
23.	CNC Theory and Applications	2/4	**Objectives:** After following this course, students are expected to be familiar with CNC machines and apparatus and able to understand the basics of CNC programming of G-Code. **Course Topics:** Various G and M codes and other supporting codes, writing CNC programs, linear and circular interpolation, absolute and incremental coordinates, cutting tool radius compensation, sub-program, the drilling cycle and Tap, apply the program to the CNC machine. **References:** 1. *SL. Automatiserung technik Gmbh*, 1993 2. *FANUC Series 0i-MC Operator's manual* 3. *Deckel Ag Dialog 11 Program Hand Book*, 1989 4. JJ.M.Hollenbrands. *Teknik Pemrograman Dan Aplikasi CNC*, 1992 5. E. M. Trent, *Metal Cutting*, Butterworths, London, 1977 6. Rochim, Taufiq, *Teori dan Teknologi Proses Pemesinan*, Jurusan Teknik Mesin FTI-ITB, 1993
24.	Advanced Engineering Drawing	2/4	**Objectives:** After following this course, students are expected to comprehend the expanse and translucence drawing of various objects, discern geometric tolerances, welding symbol image, symbol of craftsmanship and design simple equipment. **Course Topics:** 1. Intersections and development of surfaces. • Line of intersection - cylinders and cones • Development of cylinders • Development of cones • Development of breaches - Y pieces 2. Welding drafting • Basic symbol • Standard welding symbols 3. Geometry Tolerancing • Method of displaying geometry tolerance. • Interpretation of form tolerancing 4. Surface Texture • Surface texture terminology • The standard symbol • Application of surface finish symbols to drawings. 5. Designing simple equipment • Calculation • Sketching • Drafting • Shop drawing **References:** 1. A. W. Boundy, "Engineering drawing" , Third edition, 1986, Mc. Graw Hill. 2. ISO standards Handbook 12, Technical Drawings, Second Edition 1991. 3. G. Takhesi Sato, N. Sugirato Hartanto, Menggambar Mesin Menurut ISO, PT. Pradnya Paramita, 1993. 4. Warren J Luzadder, Menggambar Teknik edisi ke-8, Penerbit Erlangga, 1996.
25.	Design I	6/12	**Objectives:**

			Students are able to explain and design a lines plan drawing, hydrostatic graphics, bonjean, and general plan of the ship **Course Topics:** Determination of the ship's main dimensions, CSA Design, Shape control Design, station design, projecting half breadth plan, Projecting sheer plan, Hydrostatic Graphic, Bonjean Graphics, power calculation engine, Determination of the number and location of the watertight bulkhead, Calculation DWT ship, calculation of fluid tanks, Determination of ship supplies, room accommodation design, Determination of navigational equipment **References:** 1. Arkenbout Schokker, JC. Ir, " The Design of Merchant Ship " 2. Biro Klasifikasi Indonesia, " Register 1998 " 3. G. DE. Rooij, Ir. " Practical Ship Building " 4. Harry Benford, "Naval Architecture for Non-Naval Architects " 5. IMO 1993 6. Japan International Cooperation Agency (JICA), Basic Design, Maritime Technology and Safety Bureau, Ministry of Transport Overseas Shipbuilding Cooperation Centre, 1991 7. Lloyd Register of Shipping Cargo Ships, " Distribution of Light Weight for Still Water Bending Moment Calculation " 8. Poehls, I. " Lecture of Ship Design and Ship Theory " 9. Schnnekluth, H. " Ship Design for Efficiency and Economy " 10. Smith, R.M. " Applied of Naval Architecture " 11. Taylor, DA. " Merchant Ship Construction "
26.	Entrepreneurship	1/2	**Objectives:** to provide understanding and foster the entrepreneurial spirit in order to obtain a broad-based business knowledge **Course Topics:** The basic concept of entrepreneurship, Creative Thinking Processes, Identify Business Opportunities, Business Strategy, Marketing, Financial Management, Management Operations, Business Ethics, Business Plan **References:** 1. Hodges, Judy, "The Rise Of The Self Service Employee", Computterworld HR Online, September 8, 1997. 2. O' Brien, James A., Management Information System, 4th Edition, By The Mc Graw-Hill Companies, North America, 1999
27.	Materials Science	2/4	**Objectives:** 1. To comprehend general knowledge of the structure of materials and their relation to mechanical properties, the treatment affects the mechanical properties, and material processing technologies. 2. To apply knowledge of materials in the field of welding technology **Course Topics:** Introduction, Structure of Crystalline Metal, crystal defects, charateristics of metal mechanics, dislocations and strengthening mechanisms, diagrams phase, transformation phase, structure, properties, and applications of metal alloys, Metal Working Process Materials, Polymers, Composites **References:** 1. Callister, William D. 2007. Materials Science and Engineering: an Introduction. John Wiley & Sons, Inc. 7th Edition. New York 2. Surdia, Tata. 1999. Pengetahuna Bahan Teknik. Jakarta: PT. Pradnya Paramita
28.	Mechatronics	1/2	**Objectives:** Students are able to understand the basic circuit general, calculations of electrical machine and its application **Course Topcs:** The set of DC power, AC power circuits, DC motors, AC motors, Counting motor power, Alternator (generator) 3 phase, synchronization, parallel, 1 phase motors, on the application of the electrical field of the ship

			References: 1. Theraja, BL., Electrical Engineering, Mc Graw Hill Books Co. 2. Watson, GO., Marine Electrical Practice, 5th edition, Butterworths, 1981 Zahal, Teori Dasar Listrik, ITB
29.	Elements of Machine	2/4	**Objectives:** Students are able to understand the basics of the calculation in the selection of machine elements **Course Topics:** Shaft, Pegs, permanent clutch, temporary clutch, brakes, bearings, belts, chains, gears, screw, Spring, Review **References:** 1. Sularso dan Kiyokatsu, Dasar Perencanaan dan Pemilihan Elemen Mesin, Jakarta, PT. Pradnya Paramita, 1980. 2. Nieman, G., Elemen Mesin, Jakarta, Erlangga, 1978 3. Spott M. F., Design of Machine Elements, New Delhi, Prentice Hall, 1978 4. Iykaran, Application of Mechanics and Materials for Machine Design, New York, Prentice Hall, 1994 5. Deutchman, Machine Design: Theory and Practice, New York, Macmillan, 1975 6. Lingaiah, K., Machine Design Data Handbook, New York McGrow-Hill, 1994 7. Khurmi, R.S., Textbook of Machine Design, New Delhi, Eurasia, 1980 8. Text book lain yang ditulis oleh: Shigley, Dobrovolsky, Schaum, Hamrock, Collins, dll
30.	Process Manufacturing	2/4	**Objectives:** To provide an understanding includes: introduction to manufacturing, material processing such as casting and molding, powder metallurgy, metal forming, machining, non-traditional machining and polymer processes. **Course Topics:** Introduction of manufacturing processes, classification, structure, and properties of materials, process of casting and molding, powder metal process, hot forming processes, cold forming process, making papers and seminars, process of sheet metal working, machining process, non-traditional Machining Processes, polymer, making papers and seminars **References:** 1. Groover M.P. (2002). *Fundamentals of Modern Manufacturing : materials, processes, and systems,* Prentice Hall, New York. 2. Kalpakjan, Seroke (1995). *Manufacturing Engineering and Technology*, 3rd Edition, Addison-Wesley Pub. Company. 3. Callister William, D., Jr. (1994). *Materials Sciences and Enginering an in Introduction*, 3 ed, John Wiley & Sons, Inc., New York. 4. Krar Oswald (2000), *Machine Tool Operation*, St. Amand/Mc. Graw-Hill. 5. Metalwork Terchnology and Practice, Ludwig, Oswald A/Mc. Knight. 6. Nelson, Donald H. (2001), *Applied manufacturing process planning : with emphasis on metal forming and machining,* Upper Saddle River, Prentice Hall. 7. Wright, R.Thomas (1987). *Exploring of Manufacturing Processes*, The goodheart-willcox compan, Inc.
31.	Lift Aircraft	1/2	**Objectives:** Students are able to understand the material handling techniques for loading and unloading process and ship production process **Course Topics:**

			Complete description of Class Aircraft Lift (PA), Permennaker 5, 1985, Component PA, Puli Systems, Election Wire Rope, Wire Rope Age, Power mover, Material Handling, Permennaker # 1 In 1989, basic calculations on aircraft construction lift and carrier, BKI-Regulations for the Construction and Survey of lifting Appliances, crane stability and Inspection, Testing of lift aircraft, conveyor, elevators, lifting equipment manual **References:** 1. Dickie, D. E., [1981], Lifting Tackle Manual, Butterworth & Co Ltd, UK 2. Germanischer Lloyd, [1992], Grundsatze fur die Ausfuhrung und Prufung von Hebezeugen, Hamburd 3. Rudenko, N., [1996], Mesin Pengangkat , Erlangga 4. Davis, B.R., [2002], A Guide to Crane Safety, N.C. Department of Labor, Raleigh 5. Litle B.P, [2002], Enhanced Safety Crane Workshop, Review and Aplication of ASME NOG 1-1998, ASME NUM 1-2000, NASA, Florida, USA 6. DEPNAKERTRANS, [1995], Training Material Kesehatan dan Keselamatan Kerja Bidang Mekanik 7. Permennaker No.5 Tahun 1985 8. Permennaker No.1 Tahun 1989 9. A. Muin, Syukri, Ir., Pesawat - Pesawat Angkat, Rajawali Pers., Jakarta, 1978. 10. BKI -Regulations for the Construction and Survey of Lifting Appliances 11. Bobby R. Davis, A Guide To Crane Safety, North Carolina Department of Labor, 2002. 12. _____, A Guide To Forklift Operator Training, North Carolina Department of Labor, 2002.
32.	Design II	3/6	**Objectives:** Students are able to determine the appropriate size rule based on BKI construction Vol.II and describe parts they will be in the direction of the construction section cross-sectional and longitudinal pieces of the ship in accordance with the type of vessel and construction. **Course Topics:** Introduction, size, cross sketch according to the type of construction, layout of ivory profile, wrang, bulkhead at longitudinal direction, load, calculation of slab thickness and ivory modulus, construction pictures of transverse & longitudinal section. **References:** 1. Taylor, DA “Merchan Ship Construction“ 2. Robert Togart (1980), “Ship design and Construction“ 3. Barabanov, N. “Structural Design of Sea Going“ 4. M. Mahfud, Ir MMT. “ Konstruksi Kapal I“ 5. Biro Klasifikasi Indonesia Vol II
33.	Finite element method	2/4	**Objectives:** Students are able to understand and solve problems Structure of Linear Static using Finite Element Method Software. **Course Topics:** Introduction of Finite Element Method, Introduction of Patran MSC program, Making 1D linear element - Rod, Making 1D linear element - Beam, Task 1: 1D Element, Discussion and Evaluation, Task 1: 1D Element, Production of 2D linear element Surface-Plates, Production of 2D linear element Surface Plates, Production of 2D linear Element Surface-Plates, Mid-Term Exam Evaluation, Production of 3D linear elements linear elements, Production of 3D Pipeline, Production of 3D linear element profile, Task 2: self-design, Discussion and Evaluation Task 2: Design **References:** 1. Daryl L. Logan, [1993], A First Course in The F

			inite Element Method, PWS Publishing Company, USA. 2. Sugerlind L.J., [1984], Applied Finite Element Analysis, John Wiley and Sons Inc. 3. MSC.Software Corporation, [2002], Introduction to MSC Patran, United States
34.	Practice CAD / CAM 2D (1)	2/4	**Objectives:** Provide basic knowledge in recognition, understanding and application Mastercam software in simulation program creation of 2D work piece on CNC machines consisting of machine: Milling, Lathe and WireCut **Course Topics:** Basic Operational Commands of Master Cam Software, Tool Path on a CNC Milling machine, Tool Path on CNC Lathe machines, Tool Path on CNC Wire Cut machine, Practice of Program Application **References:** 1. SL.Automatiserung technik Gmbh.1993 2. Deckel Ag Dialog 11Program HandBook. 1989 3. JJ.M.Hollenbrands. Teknik Pemrograman Dan Aplikasi CNC.1992 4. E. M. Trent, Metal Cutting, Butterworths, London, 1977. 5. Rochim, Taufiq, Teori dan Teknologi Proses Pemesinan, Jurusan Teknik Mesin FTI – ITB, 1993
35.	2D CNC Practice (1)	2/4	**Objectives:** Provide basic capabilities in CNC-based machining operations on lathes and Milling machines **Course Topics:** Operation of CNC Lathe, CNC Milling Machine Operation **References:** 1. Milling FANUC Series 0i-MC Operator's manual 2. Lathe FANUC Series 0i-MC Operator's manual
36.	Indonesian	2/4	**Objectives:** Students are able to use and communicate Indonesian language well and correct its grammar, and also able to apply it into scientific writing. **Course Topics:** 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). **References:** 1. Kamus besar bahasa Indonesia , Jakarta: Balai Pustaka, c1990 2. Pedoman penulisan tata bahasa Indonesia Jakarta : Pusat Pembinaan dan Pengembangan bahasa - Depdikbud, 1983 3. Pemakaian bahasa Indonesia ragam tulis di lingkungan perguruan tinggi Martin Jakarta: Pusat Pembinaan dan Pengembangan Bahasa Depdikbud, 1995
37.	Welding Technology	2/4	**Objectives:** Students are able to understand kinds of welding process and associated factors, and know how to operate it. **Course Topics:** Kinds of welding and cutting process, Welding Metallurgy, welding material, welding position, welding joints, welding defects, welding symbols, how to operate electric arch welding, electric resistant welding, operation of gas welding and soldering/brazing, operating MIG/MAG, TIG welding. **References:** 1. Prof. Dr. Ir. Harsono., Teknologi pengelasan logam 2. Howard D, Modern Welding Technology
38.	Non Ferro Ship	1/2	**Objectives:**

			Students are able to explain material requirements for wooden boat and FRP, calculate construction dimension of wooden boat and FRP based on standard rules, explain the stage of wooden boat and FRP building process and also explain the maintenance and repair procedures of wooden boat and FRP. **Course Topics:** Introduction, Wood material for ship, wooden boat construction, wooden boat building process, FRP material for FRP ship building, FRP ship construction, FRP Ship building process, and wooden and FRP ship repair. **References:** 1. Heri S. Bangunan Kapal Non Baja 2. BKI Kayu 1996 3. BKI FRP 1996 4. Martawijaya, Atlas Kayu Indonesia 5. LR Small Craft 1978 6. David, C. How to Build a Wooden Boat 7. Gardner J. Buiding Classic Small Craft 8. Staton T. Osmosis & Glassfiber Yacth Construction 9. ABS Reinforced Plastic Vessel 1978
39.	Statistic	1/2	**Objectives:** Provide an understanding of statistical principles in solving research problems. **Course Topics:** Population & Samples, Methods, Validity and Reliability Testing, Hypothesis of Testing and Data Analysis, Experiments Design by Taguchi Method **References:** 1. Djarwanto, Ps, (1992), "Mengenal Beberapa Uji Statistik dalam Penelitian", edisi ke-2, Liberty Yogyakarta 2. Hasan, M, "Metode Penelitian dan Aplikasinya" 3. Siegel, AF dan CJ. Morgan, "Statistics and Data Analysis : an Introduction" 4. Soejanto, I, (2009), "Desain Eksperimen dengan Metode Taguchi", edisi pertama, Graha Ilmu Yogyakarta. 5. Walpole, R.E. dan R.H. Myers, (1995), "Ilmu Peluang dan Statistika untuk Insinyur dan Ilmuwan", edisi ke-4, ITB Bandung. 6. Alhusin, S., (2003), "Aplikasi Statistik Praktis dengan SPSS.10 for Windows", edisi pertama, Graha Ilmu Yogyakarta. 7. Iriawan, N. dan Septin, P.A. (2006), "Mengolah data Statistik dengan Mudah Menggunakan Minitab 14", edisi pertama, Andi Offset Yogyakarta
40.	Computer aided design	2/4	**Objectives:** Introducing basic Autocad rules and also the way how to use them, introducing additional Autocad rules and the way to use them in order to show the effeciency and effectivity in working, introducing the special rules in 3D drawing and its use. **Course Topics:** Drawing preparation, Drawing instruction, Editing Instruction, supplementary instruction, Display Instruction, Printing Instruction, Block and Attribute Instruction, Screen Operation, File Management, Customizing Menu, Customizing Library, 3D Coordinate System, 3D Drawing Display Instruction, 3D Drawing Instruction, 3D Printing Commands. **References:** 1. AutoCAD, AutoDesk Inc 2. 3D Studio, AutoDesk Inc. 3. Electric Image Animation System, Electric Image Inc. 4. FormZ, Auto-des-sys
43.	Design III	4/8	**Objectives:** 1. Students are able to design construction cranes, bridges, buildings

			and other constructions. **Course Topics:** 1. Sketch drawings, manual calculations, using software calculations and working drawings **References:**
44.	Non-Metal Practice	2/4	**Objectives:** Students can build wooden boats and FRP according to a predetermined design **Course Topics:** Practice Plant, Ship Lofting Timber, Manufacture Construction Hull, Hull Laying Construction, Installation hull Board, Finishing. **References:** 1. Heri S. Bangunan Kapal Non Baja 2. David, C. How to Build a Wooden Boat 3. Gardner J. Buiding Classic Small Craft
45.	Practice CAD / CAM 2D (2)	2/4	**Objectives:** Students are able to draw a 2-dimensional (2D) using CAD software and able to create tool path and choose the right tool and simulate CNC process on a computer using CAM software. **Course Topics:** Preparatory drawing, 2D coordinate system and origin, drawing commands, editing commands, display commands, tool path face commands and contour tool path commands, the calculation of machining parameters, simulation commands. **References:** 1. Marsudi, *Memprogram Mesin CNC Dengan Mastercam*, Informatika 2. Tambunan, Tigor, *Belajar Sendiri Mastercam Versi 9*, Elex Media Komputindo
46.	Practice CNC 2D (2)	2/4	**Objectives:** Students should be able to set the work tools, write and include CAM 2D program results, create simulation program in CNC machine. **Course Topics:** • Preparation of the machine, preparation of tools, machine button functions and mode, Work tool setting, tools setting, manual program writing, program editing, program running. • CNC Milling machines Fanuc 0I-MC Series, CNC Lathe Fanuc 0I-MC Series, Deckel CNC Milling machine, Wire Cut 2D CNC machine. **References:** 1. *Milling* FANUC Series 0i-MC Operator's manual 2. *Lathe* FANUC Series 0i-MC Operator's manual 3. *Milling* DECKEL Dialog 11 Programming's manual 1 & 2 4. *Wirecut* CHMER Programming's manual
47.	Research Methodology	1/2	**Objectives:** Students critically and constructively are capable to search thesis topics, write thesis proposal and understands research procedures. Students will be able to have a presentation of research results. **Course Topics:** Introduction, background, scope and understanding, selecting and defining the research problem, review of literature and critical studies. Research proposal writing, measurement, data analysis, and simulation, parameter and errors in sampling, statistical data processing, modeling and simulation, presenting the results of research, views of data, writing style, format, writing research reports, oral presentations, seminars, seminar final project proposal. **References:** 1. Beach, DP and Alvoger, TKE, Handbook for scientific and technical Research Prentice Hall, Engiewood Cliffs, New Jersey

			1992. 2. AIP Style Manual, American Institut Of Physics, New York 1990. 3. Guide For The Preparation Of Theses , The Graduate School , North Carolina State University, Raleigh NC 1989.
48.	Optimization Methods	1/2	**Objective:** Students are expected to comprehend the basic level of knowledge and expertise about the general concept of system analysis deals with the identification, formulation and problem-solving of a simple engineering problem that can be applied to the planning, design, and management relating to the application of linear and non-linear programming optimization techniques. **Course Topics:** Linear Programming formulation, a simple form and Graphics interpretation, Simplex Method, Duality, Post Optimal Analysis, Integer Programming, Transportation, Transshipment and Assignment Problems **References:** 1. Nowachi H., "Lectures on Optimization in Ship Design," FT Kelautan ITS, 1985. 2. Rao SS, "Optimization, Theory and Applications," Wiley Eastern Limited, New Delhi, 1987. 3. Richard Bronson, "Operation Research," Schaum's Outline Series, Mc Graw Hill International Book Company, 1983. 4. Menyusun Laporan Teknik, M.M. Purwo Hadiwidjoyo, Penerbit ITB bandung 5. Metode Penelitian Bis, Donald R. Cooper, Penerbit Erlangga
49.	Practice Pneumatic & Hydraulic	2/4	**Objectives:** Students are expected to have a basic knowledge of mechanical control systems using air and oil movers media to control mechanisms in pneumatic and hydraulic machines. **Course Topics:** Basic theory of pneumatic and hydraulic, pneumatic and hydraulic symbols; basic pneumatic circuit; pneumatic and hydraulic elements and functions; design / assemble / install and trouble shooting in pneumatic and hydraulic systems. **References:** [1] Ernset C. Fitch, Fluid Power and Control System, McGraw-Hill Book Company, New York, 1966. [2] Festo didactic, Fundamentals of Pneumatik Control Enineering, essligen 1987. [3] Jhon Pippernger & Tyler Hicks, Industrial Hidraulics, McGraw-Hill Book Ce, Singapore, 1985.
50.	Welding Practice	2/4	**Objectives:** To understand, implement safety guidelines, implementing work procedures welding, SMAW welding and ÖAW do by default **Course Topics:** K3 Welding, OAW and SMAW welding equipment, thickening of the plate 1surface with OAW, thickening of the plate 2 (swing) surface with ÖAW, 1G OAW welding blunt Connection, 1F ÖAW welding corner (inside and outside), thickening of plate 1 surface with SMAW, thickening of the surface plate 2 (swing) with SMAW, 1G SMAW welding blunt connection and 1F SMAW welding corner connection (inside and outside). **References:** 1. W, harsono, Okumura, tashie, Teknologi Pengelasan logam, pradnya Paramita, Jakrta, 1994. 2. Carry, Howard B, Modern welding Technology, Prentice hall, California, 1989 3. Kobelco, Fundamental of welding and inspection, Kobe steel

			Ltd. 4. Witjaksono, Untung, Las busur manual, TEDC, Bandung
51.	**Material Testing Practice**	2/4	**Objectives:** Students can learn and comprehend the principle of destructive and non-destructive testing and can do the test correctly. **Course Topics:** Introduction to material testing, Tensile Test Practice, Curves Test Practice, Hardness Test Practice, Impact Test Practice, Metallographic Test Practice, Penetrant Test Practice, Magnetic Particle Test Practice, Ultrasonic Test Practice, Radiography Testing Practices. **References:** 1. Davis, E. Harmer, "The Testing and Inspection of Engineering Materials" 2. _____, AWS D1.1 , struktural steel 3. _____, ASME Sect. IX, welding and brazing 4. _____, ASME Sect. V , non destructive 5. _____, ASM Handbook, Atlas of Microstructure
52.	**DFKI KU & BT**	2/4	**Objectives:** After following this course, students are able to comprehend Design, Boiler Construction Fabrication and Pressure Vessel Inspection, and also introduction to ASME VIII, **Course Topics:** Introduction of DFKI KU and BT, Design of pressure vessel under internal pressure inside dimension, design of pressure vessel under internal pressure outside dimension, Pressure vessel under external pressure, Horizontal and support vessel, and strength of attachment Opening joining opening to vessel, fabrication and inspection process of pressure vessels, pressure vessel design task. **References:** 1. Buthot, Paul, 1997," Pressure vessel hand book", Pressure vessel publishing 2. _____, "Boiler and Pressure vessel, ASME VIII, ASME 3. Moss, Dennis, 2004, "Pressure vessel design manual", 3rd edition, elsevier
53.	**Praktek CAD/CAM 3D**	4/8	**Objectives:** Students are able to draw a 3-dimensional (3D) using CAD software. Students are able to create tool path and choose the right tool and simulate CNC process on a computer using CAM software **Course Topics:** 3D Mastercam, Catia Design, Catia Manufacturing **References:** 1. Marsudi, *Memprogram Mesin CNC Dengan Mastercam*, Informatika 2. Tambunan, Tigor, *Belajar Sendiri Mastercam Versi 9*, Elex Media Komputindo 3. Pinem, Daud, *Catia Si Jago Desain Tiga Dimensi*, Kawah Media Pustaka, 2009 4. Ramadoni, Muhammad, *Design Komponen 3d Dengan Catia V5,* Tri Arga Utama, 2009
54.	Design Asssignment IV	2/4	**Objectives:** Students are able to design machines for example: hoist, winch and other machines **Course Topics:** Sketch drawings, manual calculations, calculation using software and working drawings
55.	**CNC 3D Practice**	2/4	**Objective:** After following this course, students should be able to set the work

		piece and the tools, writing and include 3D CAM program results, create simulation program in CNC machine. Students are also expected to operate multiaxis CNC machine. **Course Topics:** CNC Milling FANUC 3D OIM Machine Operation, CNC FANUC 3D OIM Lathe Machine Operation, CNC FANUC Milling 4 Axis Machines Operation, 3 Axis CNC Lathe FANUC Machine Operation, Wirecut 4 Axis CNC Machines Operation **References:** 1. Pustaka Marsudi, *Memprogram Mesin CNC Dengan Mastercam*, Informatika 2. Tambunan, Tigor, *Belajar Sendiri Mastercam Versi 9*, Elex Media Komputindo 3. Pinem, Daud, *Catia Si Jago Desain Tiga Dimensi*, Kawah Media Pustaka, 2009 4. Ramadoni, Muhammad, *Design Komponen 3d Dengan Catia V5*, Tri Arga Utama, 2009
56.	On th Job Training	**Objectives:** Broaden the knowledge of technology application in the company or shipyard. **Course Topics:** Industrial management, health and safety, PPC, implementation in the work place includes mechanical welding design, repair, measurements and tests, report. **References:** 1. K. Sumakmur P, "Keselamatan Kerja dan Pencegahan Kecelakaan", Gunung Agung Jakarta. 2. Sofyan Assantri, "Manajemen Produksi", UI, 1978 Ishikanta Kamru, "Pedoman dan Pengendalian Mutu", Alih Bahasa Hasil tamsil 1983
57.	English III	**Objectives:** Students are able to apply English to write and speak in a work context. **Course Topics:** Speech, writing scientific essays, meetings and presentations, Job Hunting **References:** 1. Dale Carnegie® High Impact Presentation: Participant Manual.. 2. John Robert Powers general Public Relations 3. Jolles, Robert L., 2001, *How to Run Seminars & Workshops,* New York: John Wiley & Son, Inc. 4. Oshima & Hogue, 1991, *Writing Academic English*, Menlo Park: Addison-Wesley publishing Company
58.	Maintenance and Repair	**Objectives:** After following this course, students will comprehend about the types, ways of working, as well as the usability of electronic and mechanical components on CNC machine, able to carry out maintenance (Total Productive Maintenance) and repair (troubleshooting) on CNC machines, able to create CNC machines prototype **Course Topics:** Introduction, Maintenance History, Mechanical Components on CNC Machines, CNC Machines Electronic Components, Inverter, Controller OMRON CJ1M, CPM2A Controller OMRON, SIEMENS S7-300 Controller, Wire Diagram **References:** 1. Morrow,L.C., Maintenance Engineering Handbook, Mc.Graw Hill, 1957. 2. Garg, H.P., Industrial Maintenance, S. Chand & Co. Ltd., 1970. 3. Assauri, Sofjan, *Management Produksi*, Lembaga Penerbitan Ui, 1978. 4. De Beer, C., *Teknologi Pemeliharaan Mesin Perkakas*, ITB, 1974. 5. Corder, Antony, *Teknik Manajemen Pemeliharaan*, Erlangga, 1988

59.	Engineering Economics	**Objectives:** Students are expected to comprehend economic principles and are able to apply decision-making techniques **Course Topics:** Economics Concept, Concept of Money, strategic decisions of engineering economic, cash flow, single payment, annual payment, Capital Budgeting, NPV, Payback Period, EAW, PI, BC ratio, IRR, MIRR **References:** 1. *Engineering Economy*; E. Paul De garmo, William G. Sullivan, James A. Bontadeli, Elin M. Wicks 2. *Engineering Economic Analysis*; Donald G. Newman 3. *Ekonomi Teknik* ; Gerald J. Thuesen, W.J. Fabrycky
60.	Production Management	**Objectives:** Students are expected to have the ability to analyzes and design improvement of production process, as a basis for preparing implementation and control of production factors (materials, labor, machinery, and equipment) in order to design an integrate production systems to achieve maximum productivity of the company. **Course Topics:** Production Management, Product Development, Technical Planning, Production Systems, Planning and Inventory Control, Scheduling, Quality Control, Project Management. **References:** Nasution, A. H., 2006, *Manajemen Industri*, Penerbit Andi, Yogyakarta Nasution, A. H., 2003, *Perencanaan dan Pengendalian Produksi*, Edisi Pertama, Penerbit Guna Widya, Surabaya
61.	Final Project	**Objectives:** Students are able to apply the knowledge gained to design, analyze, evaluate and solve problems in the production process (manufacturing) and modeling (prototype) **Course Topics:** Design I, II, III and IV; writing scientific papers covering the following aspects: design, manufacturing, construction, production processes, power analysis, manufacture of products in the form of a prototype or model **References:** Relevant Literature